Internet Appendix for
‘Informational Hold-up by Venture Capital Syndicates”.

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This Internet Appendix provides all proofs and additional tables referred to in the paper.

Internet Appendix A - Proof of Proposition 1:

Stage 9 – Acceptance of the date-2 offer made by the outside syndicate $\boldsymbol{k}$.

The entrepreneur accepts the offer of $\boldsymbol{k}$ if $R_2 < \rho - R_1$.

Stage 8 – Date-2 offer, R_2, made by the outside syndicate $\boldsymbol{k}$ to the entrepreneur.

Let $\cancel{\boldsymbol{i}}$ denote the set of all possible strategy profiles where either $\boldsymbol{i}$ does not make an offer (Stage 5) or where $\boldsymbol{i}$'s offer will not be accepted (Stage 6). Clearly $\boldsymbol{k}$ only takes a here if the strategy profile belongs to $\cancel{\boldsymbol{i}}$. At the time $\boldsymbol{k}$ takes its decision, each VC in $\boldsymbol{k}$ knows the signal received $\boldsymbol{s}_k$, the skill levels $\boldsymbol{\alpha}_k$, the transparency of their information $\varphi\,\theta$, the skill levels $\boldsymbol{\alpha}_i$, and the date-1 contract (D_1, I_1, R_1). Syndicate $\boldsymbol{k}$ also has beliefs $\phi_{\boldsymbol{k}}^{\boldsymbol{s}_i}$ about the probability of syndicate $\boldsymbol{i}$ receiving signal $\boldsymbol{s}_i$. Probabilities $\phi_{\boldsymbol{k}}^{\boldsymbol{s}_i}$ are formed conditionally on the strategy belonging to set $\cancel{\boldsymbol{i}}$. Let $P(G \mid \boldsymbol{s}_k \cap \cancel{\boldsymbol{i}})$ be the updated belief of syndicate $\boldsymbol{k}$ that the project is good, after receiving signal $\boldsymbol{s}_k$ and $\cancel{\boldsymbol{i}}$. From Bayes' rule,

$$P(G \mid \boldsymbol{s}_k \cap \cancel{\boldsymbol{i}}) \;=\; \frac{P(\boldsymbol{s}_k \mid G)\; P(\cancel{\boldsymbol{i}} \mid G)\; \pi}{P(\boldsymbol{s}_k \mid G)\; P(\cancel{\boldsymbol{i}} \mid G)\; \pi + P(\boldsymbol{s}_k \mid B)\; P(\cancel{\boldsymbol{i}} \mid B)\,(1-\pi)} \;, \tag{18}$$

where $P(\cancel{\boldsymbol{i}}\,|G) = \sum_{\boldsymbol{s}_i} \phi_{\boldsymbol{k}}^{\boldsymbol{s}_i}\, P(\boldsymbol{s}_i|G)$ and $P(\cancel{\boldsymbol{i}}\,|B) = \sum_{\boldsymbol{s}_i} \phi_{\boldsymbol{k}}^{\boldsymbol{s}_i}\, P(\boldsymbol{s}_i|B)$.

From (18), we can write $P(G \mid \boldsymbol{s}_k \cap \cancel{\boldsymbol{i}}) = 1/\left[1 \;+\; Y\; \frac{(1-\pi)}{\pi}\; \prod_{n=1}^{N} h(s_{k_n})\right]$, where

$$Y \;\equiv\; \frac{P(\cancel{\boldsymbol{i}}\,|B)}{P(\cancel{\boldsymbol{i}}\,|G)} \;, \qquad h(s_{k_n}) \;\equiv\; \frac{1-P(s_{k_n}|G)}{P(s_{k_n}|G)} \;. \tag{19}$$

$\frac{\partial P(G|\boldsymbol{s}_k\cap\cancel{\boldsymbol{i}})}{\partial P(\bar{s}_{k_n}|G)} = -[P(G\,|\,\boldsymbol{s}_k \cap \cancel{\boldsymbol{i}})]^2\, \frac{(1-\pi)}{\pi}\, Y\; \frac{\partial h(s_{k_n})}{\partial P(\bar{s}_{k_n}|G)} \prod_{m=1,m\neq n}^{N} h(s_{k_m})$; $\frac{\partial h(\bar{s}_{k_n})}{\partial P(\bar{s}_{k_n}|G)} = \frac{-1}{[P(\bar{s}_{k_n}|G)]^2}$; $\frac{\partial h(\underline{s}_{k_n})}{\partial P(\bar{s}_{k_n}|G)} = \frac{1}{[1-P(\bar{s}_{k_n}|G)]^2}$. Therefore $\frac{\partial P(G|\boldsymbol{s}_k|_{s_{k_n}=\bar{s}_{k_n}}\cap\cancel{\boldsymbol{i}})}{\partial P(\bar{s}_{k_n}|G)} = \left(\frac{P(G|\boldsymbol{s}_k|_{s_{k_n}=\bar{s}_{k_n}}\cap\cancel{\boldsymbol{i}})}{P(\bar{s}_{k_n}|G)}\right)^2 Y\, \frac{(1-\pi)}{\pi}\, \prod_{m=1,m\neq n}^{N} h(s_{k_m})$ and $\frac{\partial P(G|\boldsymbol{s}_k|_{s_{k_n}=\underline{s}_{k_n}}\cap\cancel{\boldsymbol{i}})}{\partial P(\bar{s}_{k_n}|G)} = -\left(\frac{P(G|\boldsymbol{s}_k|_{s_{k_n}=\underline{s}_{k_n}}\cap\cancel{\boldsymbol{i}})}{1-P(\bar{s}_{k_n}|G)}\right)^2 Y\, \frac{(1-\pi)}{\pi}\, \prod_{m=1,m\neq n}^{N} h(s_{k_m})$.

The expected payoff at date 2 of the outside syndicate $\boldsymbol{k}$, if it offers to finance the follow-on round against R_2 after receiving signal $\boldsymbol{s}_k$ and $\cancel{\boldsymbol{i}}$, is

$$V_{\boldsymbol{k},2}(\boldsymbol{s}_k) \;=\; -(1-I_1) \;+\; P(G \mid \boldsymbol{s}_k \cap \cancel{\boldsymbol{i}})\, R_2 \;. \tag{20}$$

The competitive offer $\boldsymbol{k}$ makes solves

$$\min\; R_2 \qquad \text{s.t.}\;\; V_{\boldsymbol{k},2}(\boldsymbol{s}_k) \geq 0 \;\text{ and }\; R_2 < \rho \,-\, R_1 \;. \tag{21}$$

(20) and (21) imply that an offer will only be made if $\frac{1-I_1}{\rho-R_1} \leq P(G|\boldsymbol{s}_k \cap \boldsymbol{\not{i}})$.

Case 1: The outside syndicate $\boldsymbol{k}$ and the date-1 contract (D_1, I_1, R_1) is such that $\frac{1-I_1}{\rho-R_1} \leq P(G \mid \overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})$. If $\boldsymbol{k}$ receives signal $\overline{\boldsymbol{s}}_k$, it makes a date-2 offer $R_2 = \frac{1-I_1}{P(G|\overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})}$. The offer is accepted by the entrepreneur and the follow-on round is financed. Otherwise, the follow-on round is not financed.

Case 2: The outside syndicate $\boldsymbol{k}$ and the date-1 contract (D_1, I_1, R_1) is such that $\frac{1-I_1}{\rho-R_1} > P(G \mid \overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})$. $\boldsymbol{k}$ never makes a date-2 offer and the follow-on round is never financed.

Stage 7 – Outside syndicate $\boldsymbol{k}$ chosen by the entrepreneur.

At the time the entrepreneur takes her decision, she knows the skill levels $\boldsymbol{\alpha}_i$ of the inside VCs $\boldsymbol{i}$ and the date-1 contract (D_1, I_1, R_1). The entrepreneur can choose to not approach any outside syndicate. Her payoff at date 2 is then 0. Alternatively, the entrepreneur approaches an outside syndicate. The entrepreneur's choice falls in one of the two cases identified in stage 8.

Case 1: $\frac{1-I_1}{\rho-R_1} \leq P(G \mid \overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})$. The probability syndicate $\boldsymbol{k}$ receives signal $\overline{\boldsymbol{s}}_k$ is $P(\overline{\boldsymbol{s}}_k)$. The probability the project is good if $\boldsymbol{k}$ receives signal $\overline{\boldsymbol{s}}_k$ is $P(G|\overline{\boldsymbol{s}}_k)$. We have $P(\overline{\boldsymbol{s}}_k)\ P(G|\overline{\boldsymbol{s}}_k) = \prod_{n=1}^{N} P(\overline{s}_{k_n}|G)\ \pi$. The payoff of the entrepreneur at date 2 from seeking financing from $\boldsymbol{k}$ is

$$V_{e,2} \;=\; \prod_{n=1}^{N} P(\overline{s}_{k_n}|G)\ \pi \left(\rho - R_1 - \frac{1-I_1}{P(G|\overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})}\right)\ , \tag{22}$$

$$\;=\; \prod_{n=1}^{N} P(\overline{s}_{k_n}|G)\,\pi\,(\rho - R_1 - 1 + I_1) -\ (1-\pi)\,(1-I_1)\ \prod_{n=1}^{N}(1 - P(\overline{s}_{k_n}|G))\,Y\ . \tag{23}$$

Given that $\frac{\partial\, P(G|\overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})}{\partial\, P(\overline{s}_{k_n}|G)} > 0$ and $\frac{\partial\, P(\overline{s}_{k_n}|G)}{\partial\, \alpha_{k_n}} > 0$, we have $\frac{\partial\, V_{e,2}}{\partial\, \alpha_{k_n}} > 0$, for all $n \in \{1, \ldots, N\}$. Consider the set $\mathcal{F}$ of syndicates such that the date-1 contract (D_1, I_1, R_1) satisfies $\frac{1-\gamma}{\rho-R_1} \leq P(G \mid \overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})$. $\mathcal{F} \;\equiv\; \{(k_1, \ldots, k_N)\,|\,1 \;+\; Y\,\frac{(1-\pi)}{\pi}\prod_{n=1}^{N}\frac{1-P(\overline{s}_{k_n}|G)}{P(\overline{s}_{k_n}|G)} \;\;\leq\;\; \frac{\rho-R_1}{1-I_1}\}$. Given that $\frac{\partial\, P(\overline{s}_{k_n}|G)}{\partial\, \alpha_{k_n}} > 0$, for all $n \in \{1, \ldots, N\}$, it follows that if $(k_1, \ldots, k_N) \in \mathcal{F}$ then any $(k'_1, \ldots, k'_N)$ such that $\alpha_{k'_n} > \alpha_{k_n}$ for one $n \in \{1, \ldots, N\}$ and $\alpha_{k'_m} = \alpha_{k_m}$ for all $m \in \{1, \ldots, N\}$ with $m \neq n$, must also be in $\mathcal{F}$. Therefore, the entrepreneur seeks follow-on financing from an outside venture syndicate $\boldsymbol{k} \in \mathcal{F}$ with highest skill levels $\boldsymbol{\alpha}_k = \mathbf{1}_N$. If syndicate $\boldsymbol{k}$ receives a signal $\overline{\boldsymbol{s}}_k$, it makes a date-2 offer $R_2 = \frac{1-I_1}{\underline{q}}$, where

$$\underline{q} \;\equiv\; P(G|\overline{\boldsymbol{s}}_k \cap \boldsymbol{\not{i}})|_{\boldsymbol{\alpha}_k = \mathbf{1}_N} = 1/\left[1 + \frac{(1-\pi)}{\pi}\left(\frac{1-\underline{p}}{\underline{p}}\right)^{N} Y\right],\;\; \underline{p} \equiv P(\overline{s}_{k_n}|G)|_{\alpha_{k_n}=1} = \frac{1+\varphi\,\theta}{2} \tag{24}$$

and the offer is accepted by the entrepreneur. Otherwise, the follow-on round is not financed. The payoff of the entrepreneur at date 2 from seeking financing from $\boldsymbol{k}$ is then

$$V_{e,2} \;=\; \pi\,(\rho - R_1)\,\underline{p}^{N} \;-\; (1-I_1)\;\left(\pi\,\underline{p}^{N} \;+\; (1-\pi)\,(1-\underline{p})^{N}\,Y\right)\ . \tag{25}$$

Case 2: $\frac{1-I_1}{\rho-R_1} > P(G \mid \overline{\boldsymbol{s}}_k \cap \not{\boldsymbol{i}})$. The follow-on round is not financed. The payoff of the entrepreneur at date 2 is $V_{e,2} = 0$, and assume w.l.o.g. that the entrepreneur does not approach any outside syndicate.

Stage 6 – Acceptance or rejection of a date-2 offer made by the inside VC $\boldsymbol{i}$.

At the time the entrepreneur takes her decision, she knows the skill levels $\boldsymbol{\alpha}_i$, the date-1 contract (D_1, I_1, R_1), and the date-2 contract offer R_2. The entrepreneur has beliefs $\phi_e^{\boldsymbol{s}_i}$ about the probability that syndicate $\boldsymbol{i}$ receiving signal $\boldsymbol{s}_i$ results in $\boldsymbol{i}$ making a date-2 offer. Denote Ψ_e the probability the entrepreneur attributes to the project being good when $\boldsymbol{i}$ makes a date-2 offer. We have $\Psi_e = \sum_{\boldsymbol{s}_i} \phi_e^{\boldsymbol{s}_i} P(G|\boldsymbol{s}_i)$. The probability the entrepreneur attributes to an outside syndicate $\boldsymbol{k}$ with skill levels $\boldsymbol{\alpha}_k = \mathbf{1}_N$ receiving signal $\overline{\boldsymbol{s}}_k$ and the project being good when i makes a date-2 offer is $\underline{p}^N \, \Psi_e$.

– The expected payoff of the entrepreneur at date 2 from accepting the date-2 offer, R_2, from $\boldsymbol{i}$ is

$$V_{e,2} \;=\; \Psi_e \left(\rho - R_1 - R_2\right) \; . \tag{26}$$

– The expected payoff of the entrepreneur at date 2 from seeking alternative financing is

$$\underline{V}_{\,e,2} \;=\begin{cases} \underline{p}^N \, \Psi_e \left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right) & \text{if } \frac{1-I_1}{\rho-R_1} \leq \underline{q}; \\ 0 & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q} \; . \end{cases} \tag{27}$$

Denote R_2^* the level of R_2 which solves $\underline{V}_{\,e,2} = V_{e,2}$. From (27) and (26), we have

$$R_2^* \;=\begin{cases} \rho - R_1 - \underline{p}^N \left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right) & \text{if } \frac{1-I_1}{\rho-R_1} \leq \underline{q}\,; \\ \rho - R_1 & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q} \; . \end{cases} \tag{28}$$

The entrepreneur's reservation strategy consists of seeking alternative financing from $\boldsymbol{k}$. Her expected payoff from doing so is $\underline{V}_{\,e,2}$ in (27). So she accepts $\boldsymbol{i}$'s offer if and only if $R_2 \leq R_2^*$.

Stage 5 – Date-2 offer, R_2, made by the inside syndicate $\boldsymbol{i}$.

At the time syndicate $\boldsymbol{i}$ decides to make a date-2 offer, it knows the signal received $\boldsymbol{s}_i$, the skill levels $\boldsymbol{\alpha}_i$, the transparency of the information φ, and the date-1 contract (D_1, I_1, R_1). If $\boldsymbol{i}$ makes a date-2 offer R_2 and it is accepted, then $\boldsymbol{i}$ is also to receive R_1 from the date-1 contract, if the project is good. The payoff at date 2 of $\boldsymbol{i}$ if it makes a date-2 offer R_2 after receiving signals $\boldsymbol{s}_i$ is

$$V_{\boldsymbol{i},2}(R_2 \,|\, \boldsymbol{s}_i) \;=\; -(1-I_1) \;+\; P(G|\boldsymbol{s}_i)\;(R_1 + R_2) \; . \tag{29}$$

The most self serving offer $\boldsymbol{i}$ can make (acceptable to the entrepreneur) is $R_2 = R_2^*$, where R_2^* is given in (28). $\boldsymbol{i}$ is also to receive R_1 from the date-1 contract, if the project is good. The payoff at date 2 of $\boldsymbol{i}$ if it makes a date-2 offer $R_2 = R_2^*$ after receiving signals $\boldsymbol{s}_i$ is

$$V_{\boldsymbol{i},2}(R_2^* \,|\, \boldsymbol{s}_i) \;=\begin{cases} -(1-I_1) + P(G|\boldsymbol{s}_i)\left(\rho - \underline{p}^N\left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right)\right) & \text{if } \frac{1-I_1}{\rho-R_1} \le \underline{q}; \\ -(1-I_1) + P(G|\boldsymbol{s}_i)\;\rho & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q}\;. \end{cases} \tag{30}$$

If $\boldsymbol{i}$ does not make a follow-on offer, the entrepreneur seeks financing from $\boldsymbol{k}$, or not. $\boldsymbol{i}$ receives R_1 from the date-1 contract, if $\boldsymbol{k}$ finances the follow-on round and the project is good. $\boldsymbol{i}$ receives back $I_1 - \gamma$ if the project is not financed.

– The probability $\boldsymbol{i}$ attributes, after receiving $\boldsymbol{s}_i$, to $\boldsymbol{k}$ (such that $\boldsymbol{\alpha}_k = \mathbf{1}_N$) receiving signal $\overline{\boldsymbol{s}}_k$ and the project being good is $P(\overline{\boldsymbol{s}}_k \cap G \mid \boldsymbol{s}_i)$. Signals being independent, $P(\overline{\boldsymbol{s}}_k \cap G \mid \boldsymbol{s}_i) = \underline{p}^N\, P(G \mid \boldsymbol{s}_i)$.

– The probability $\boldsymbol{i}$ attributes, after receiving $\boldsymbol{s}_i$, to $\boldsymbol{k}$ not receiving signal $\overline{\boldsymbol{s}}_k$ is $P(\not{\overline{\boldsymbol{s}}}_k \mid \boldsymbol{s}_i) = 1 - P(\overline{\boldsymbol{s}}_k \cap G \mid \boldsymbol{s}_i) - P(\overline{\boldsymbol{s}}_k \cap B \mid \boldsymbol{s}_i) = 1 - \underline{p}^N\, P(G \mid \boldsymbol{s}_i) - (1-\underline{p})^N\,(1 - P(G \mid \boldsymbol{s}_i))$.

Then, the payoff at date 2 of $\boldsymbol{i}$ if they do not make an offer after receiving signal $\boldsymbol{s}_i$ is

$$V_{\boldsymbol{i},2}(\not{R}_2 \,|\boldsymbol{s}_i) = \begin{cases} [1-(1-\underline{p})^N - [\underline{p}^N - (1-\underline{p})^N]\; P(G \mid \boldsymbol{s}_i)]\,(I_1 - \gamma) & \\ \qquad + \underline{p}^N\, P(G \mid \boldsymbol{s}_i)\, R_1 & \text{if } \frac{1-I_1}{\rho-R_1} \le \underline{q}; \\ I_1 - \gamma & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q}\;. \end{cases} \tag{31}$$

Let $\Delta(\boldsymbol{s}_i) \equiv V_{\boldsymbol{i},2}(R_2^*|\boldsymbol{s}_i) - V_{\boldsymbol{i},2}(\not{R}_2\,|\boldsymbol{s}_i)$ denote the benefit at date 2 to $\boldsymbol{i}$ of making an offer R_2^* over not making an offer, after receiving signal $\boldsymbol{s}_i$. From (30) and (31),

$$\Delta(\boldsymbol{s}_i) \;=\begin{cases} -(1-I_1) \;-\; [1-(1-\underline{p})^N]\,(I_1 - \gamma) + & \\ P(G|\boldsymbol{s}_i)\Big(\rho - \underline{p}^N\left(\rho - \frac{1-I_1}{\underline{q}}\right) + [1-(1-\underline{p})^N](I_1-\gamma)\Big) & \text{if } \frac{1-I_1}{\rho-R_1} \le \underline{q}\,; \\ -(1-\gamma) + P(G|\boldsymbol{s}_i)\;\rho & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q}\;. \end{cases} \tag{32}$$

From (1), $P(\overline{s}_{i_n}|G) = P(\underline{s}_{i_n}|B)$, for all $n \in \{1,\ldots,N\}$. Denote

$$M \;\equiv\; P(\overline{\boldsymbol{s}}_i\,|\,G) \;=\; \prod_{n=1}^{N} p_{i_n}\;,\quad M' \;\equiv\; P(\overline{\boldsymbol{s}}_i\,|\,B) \;=\; \prod_{n=1}^{N}(1-p_{i_n})\;. \tag{33}$$

By Bayes' rule, $P(G \mid \overline{\boldsymbol{s}}_i) = 1/\left[1 + \frac{(1-\pi)\,M'}{\pi\,M}\right]$. Let $Q \equiv \frac{1-I_1+[1-(1-\underline{p})^N]\,(I_1-\gamma)}{\rho-\underline{p}^N\left(\rho-\frac{1-I_1}{\underline{q}}\right)+[1-(1-\underline{p})^N](I_1-\gamma)}$ and $Q' \equiv \frac{1-\gamma}{\rho}$.

There are four cases:

Case 1(a): $\frac{1-I_1}{\rho-R_1} \le \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$, where $\mathcal{A} \equiv \{\boldsymbol{i} \mid P(G \mid \overline{\boldsymbol{s}}_i) \ge Q\}$.

Case 2(a): $\frac{1-I_1}{\rho-R_1} > \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}'$, where $\mathcal{A}' \equiv \{\boldsymbol{i} \mid P(G \mid \overline{\boldsymbol{s}}_i) \ge Q'\}$.

In both cases, $\Delta(\overline{\boldsymbol{s}}_i) \geq 0$. $\boldsymbol{i}$ offers follow-on financing iif it receives signal $\overline{\boldsymbol{s}}_i$. The PBE consistent beliefs of the outside syndicate $\boldsymbol{k}$ about the history of $\not{\boldsymbol{i}}$ are $\phi_{\boldsymbol{k}}^{\overline{\boldsymbol{s}}_i} = 0$ and $\phi_{\boldsymbol{k}}^{\overline{\not{\boldsymbol{s}}}_i} = 1$. So, $P(\not{\boldsymbol{i}}\,|G) = 1 - \prod_{n=1}^{N} P(\overline{s}_{i_n}|G) = 1 - M$ and $P(\not{\boldsymbol{i}}\,|B) = 1 - \prod_{n=1}^{N} P(\overline{s}_{i_n}|B) = 1 - M'$. From (19) and (24),

$$\underline{q} \;=\; 1/\left[1 + \frac{(1-\pi)}{\pi}\left(\frac{1-\underline{p}}{\underline{p}}\right)^N \frac{1-M'}{1-M}\right] . \tag{34}$$

Case 1(b): $\frac{1-I_1}{\rho-R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$, where $\mathcal{B} \equiv \{\boldsymbol{i} \mid P(G \mid \overline{\boldsymbol{s}}_i < Q\}$.

Case 2(b): $\frac{1-I_1}{\rho-R_1} > \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}'$, where $\mathcal{B}' \equiv \{\boldsymbol{i} \mid P(G \mid \overline{\boldsymbol{s}}_i) < Q'\}$.

In both cases, $\Delta(\overline{\boldsymbol{s}}_i) < 0$. $\boldsymbol{i}$ never offers follow-on financing. The PBE consistent beliefs of $\boldsymbol{k}$ about the history of $\not{\boldsymbol{i}}$ are $\phi_{\boldsymbol{k}}^{\boldsymbol{s}_i} = 1$, for all $\boldsymbol{s}_i$. So, $P(\not{\boldsymbol{i}}\,|G) = P(\not{\boldsymbol{i}}\,|B) = 1$. It then follows that

$$\underline{q} \;=\; 1/\left[1 + \frac{(1-\pi)}{\pi}\left(\frac{1-\underline{p}}{\underline{p}}\right)^N\right] . \tag{35}$$

Stage 4 – Choice of effort by the entrepreneur.

The entrepreneur exerts effort if her continuation payoff, $V_{e,2}$, is greater than her cost of effort ε.

Case 2(a): $\frac{1-I_1}{\rho-R_1} > \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}'$. If $\boldsymbol{i}$ receives signal $\overline{\boldsymbol{s}}_i$ it makes a date-2 offer R_2^* in (28) which leaves the entrepreneur marginally better off than zero. Otherwise it does not offer financing and the entrepreneur does not approach any outside syndicate. Then $V_{e,2} = 0$.

Case 2(b): $\frac{1-I_1}{\rho-R_1} > \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}'$. $\boldsymbol{i}$ never offers follow-on financing and the entrepreneur does not approach any outside syndicate. Then $V_{e,2} = 0$.

In both Cases 2(a) and 2(b), it therefore follows that the entrepreneur exerts no effort. The project generates no return. Cases 2(a) and 2(b) cannot be an equilibrium outcome.

Stage 3 – Acceptance of the date-1 offer made by syndicate $\boldsymbol{i}$.

Case 1(a): $\frac{1-I_1}{\rho-R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$. The entrepreneur receives a dividend D_1. If syndicate $\boldsymbol{i}$ receives signal $\overline{\boldsymbol{s}}_i$, it makes a date-2 offer R_2^* in (28) and the entrepreneur accepts it. The entrepreneur's payoff is then $V_{e,2}$ in (26) with $R_2 = R_2^*$ in (28). If $\boldsymbol{i}$ receives a signal $\overline{\not{\boldsymbol{s}}}_i$, it does not make a follow-on offer. Then if $\boldsymbol{k}$ receives signal $\overline{\boldsymbol{s}}_k$, it makes a date-2 offer $R_2 = \frac{1-I_1}{\underline{q}}$ and the entrepreneur accepts it. Realizing the project entails a private cost ε. The payoff of the entrepreneur at date 1 is then

$$V_{e,1} = D_1 \;+\; P(\overline{\boldsymbol{s}}_i)\, V_{e,2} \;+\; P(\overline{\not{\boldsymbol{s}}}_i) P(\overline{\boldsymbol{s}}_k\, |\overline{\not{\boldsymbol{s}}}_i) P(G \mid \overline{\boldsymbol{s}}_k \cap \overline{\not{\boldsymbol{s}}}_i)\left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right) - \varepsilon. \tag{36}$$

R_2^* in (28) is the level of R_2 such $V_{e,2} = \underline{V}_{e,2}$ in (27). The entrepreneur's beliefs about the probability of $\boldsymbol{i}$ receiving signal $\boldsymbol{s}_i$ results in $\boldsymbol{i}$ making date-2 offer are here $\phi_e^{\overline{\boldsymbol{s}}_i} = 1$ and $\phi_e^{\overline{\not{\boldsymbol{s}}}_i} = 0$.

Then the probability the entrepreneur attributes to the project being good when $\boldsymbol{i}$ makes a date-2 offer equals $\Psi_e = P(G|\bar{\boldsymbol{s}}_i)$. Replacing in (36) the expression of $V_{e,2}$ by $\underline{V}_{e,2}$ in (27) with $\Psi_e = P(G|\bar{\boldsymbol{s}}_i)$, gives

$$V_{e,1} = D_1 + [P(\bar{\boldsymbol{s}}_i)P(\bar{\boldsymbol{s}}_k \mid \bar{\boldsymbol{s}}_i)P(G \mid \bar{\boldsymbol{s}}_k \cap \bar{\boldsymbol{s}}_i) + P(\not\bar{\boldsymbol{s}}_i)P(\bar{\boldsymbol{s}}_k \mid \not\bar{\boldsymbol{s}}_i)P(G \mid \bar{\boldsymbol{s}}_k \cap \not\bar{\boldsymbol{s}}_i)] \left(\rho - R_1 - \frac{1 - I_1}{\underline{q}}\right) - \varepsilon \quad (37)$$

$P(\boldsymbol{s}_i)\ P(\bar{\boldsymbol{s}}_k \mid \boldsymbol{s}_i)\ P(G \mid \bar{\boldsymbol{s}}_k \cap \boldsymbol{s}_i) = P(\boldsymbol{s}_i \mid G)\, P(\bar{\boldsymbol{s}}_k \mid G)\, \pi$, for $\boldsymbol{s}_i = \bar{\boldsymbol{s}}_i$ and $\boldsymbol{s}_i = \not\bar{\boldsymbol{s}}_i$. Then

$$V_{e,1} \;=\; D_1 \;+\; \underline{p}^N\, \pi \left(\rho - R_1 - \frac{1 - I_1}{\underline{q}}\right) - \varepsilon\ , \tag{38}$$

where $\underline{q}$ is given by (34).

Case 1(b): $\frac{1-I_1}{\rho-R_1} \le \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$. $\boldsymbol{i}$ never offers follow-on financing. Then if $\boldsymbol{k}$ receives signal $\bar{\boldsymbol{s}}_i$, it makes a date-2 offer $R_2 = \frac{1-I_1}{\underline{q}}$ and the entrepreneur accepts it. Realizing the project entails a private cost ε. The payoff of the entrepreneur at date 1 is then $V_{e,1}$ in (38), where $\underline{q}$ is given by (35).

Stage 2 – Date-1 offer, (D_1, I_1, R_1), made by syndicate $\boldsymbol{i}$.

Case 1(a): $\frac{1-I_1}{\rho-R_1} \le \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$. The payoff of syndicate $\boldsymbol{i}$ at date 1 is

$$V_{\boldsymbol{i},1} = -D_1 - I_1 + P(\bar{\boldsymbol{s}}_i)\ V_{\boldsymbol{i},2}(R_2^* \,|\, \bar{\boldsymbol{s}}_i) + \ P(\not\bar{\boldsymbol{s}}_i)P(\bar{\boldsymbol{s}}_k \mid \not\bar{\boldsymbol{s}}_i)P(G \mid \bar{\boldsymbol{s}}_k \cap \not\bar{\boldsymbol{s}}_i)R_1 + \ P(\not\bar{\boldsymbol{s}}_i)P(\not\bar{\boldsymbol{s}}_k|\not\bar{\boldsymbol{s}}_i)\,(I_1 - \gamma). \tag{39}$$

From $V_{\boldsymbol{i},2}(R_2^* \,|\, \bar{\boldsymbol{s}}_i)$ in (30), $P(\not\bar{\boldsymbol{s}}_i)P(\bar{\boldsymbol{s}}_k \mid \not\bar{\boldsymbol{s}}_i)P(G \mid \bar{\boldsymbol{s}}_k \cap \not\bar{\boldsymbol{s}}_i) = (1 - P(\bar{\boldsymbol{s}}_i|G))\, P(\bar{\boldsymbol{s}}_k \mid G)\pi$, and $P(\bar{\boldsymbol{s}}_k \mid G) = \underline{p}^N$:

$$V_{\boldsymbol{i},1} = -D_1 - I_1 - P(\bar{\boldsymbol{s}}_i)(1 - I_1) + P(\bar{\boldsymbol{s}}_i \mid G)\,\pi \left[\rho - \underline{p}^N\!\left(\rho - \frac{1 - I_1}{\underline{q}}\right)\right] + \underline{p}^N \pi R_1 + P(\not\bar{\boldsymbol{s}}_i)P(\not\bar{\boldsymbol{s}}_k|\not\bar{\boldsymbol{s}}_i)(I_1 - \gamma) \tag{40}$$

Case 1(b): $\frac{1-I_1}{\rho-R_1} \le \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$. The payoff of syndicate $\boldsymbol{i}$ at date 1 is

$$V_{\boldsymbol{i},1} = -D_1 - I_1 \;+\; \underline{p}^N\, \pi\, R_1 \;+\; P(\not\bar{\boldsymbol{s}}_k)\,(I_1 - \gamma). \tag{41}$$

Syndicate $\boldsymbol{i}$ makes an offer (D_1, I_1, R_1) which maximizes the entrepreneur value, $V_{e,1}$, while meeting its participation constraint, $V_{\boldsymbol{i},1} \ge 0$. Hence (D_1, I_1, R_1) solves

$$\max_{D_1 \ge 0, I_1 \ge \gamma, R_1 \ge 0} V_{e,1} \qquad \text{s.t. } V_{\boldsymbol{i},1} \;\ge\; 0\ . \tag{42}$$

Form the Lagrangian $\mathcal{L} = V_{e,1} \;+\; \Lambda\ V_{\boldsymbol{i},1}$. The Kuhn-Tucker complementary slackness conditions which are necessary for a triple (D_1, I_1, R_1) to be a maximum are

$$\begin{array}{llllll}
1(i): & \frac{\partial \mathcal{L}}{\partial D_1} \;\ge\; 0 & 1(ii): & D_1 \;\ge\; 0 & 1(iii): & D_1 \frac{\partial \mathcal{L}}{\partial D_1} \;=\; 0 \\
2(i): & \frac{\partial \mathcal{L}}{\partial I_1} \;\ge\; 0 & 2(ii): & I_1 - \gamma \;\ge\; 0 & 2(iii): & (I_1 - \gamma) \frac{\partial \mathcal{L}}{\partial I_1} \;=\; 0 \\
3(i): & \frac{\partial \mathcal{L}}{\partial R_1} \;\ge\; 0 & 3(ii): & R_1 \;\ge\; 0 & 3(iii): & R_1 \frac{\partial \mathcal{L}}{\partial R_1} \;=\; 0 \\
4(i): & V_{\boldsymbol{i},1} \;\ge\; 0 & 4(ii): & \Lambda \;\ge\; 0 & 4(iii): & \Lambda\, V_{\boldsymbol{i},1} \;=\; 0\ .
\end{array} \tag{43}$$

From (38), (40) and (41), we obtain $\frac{\partial \mathcal{L}}{\partial D_1} = 1 - \Lambda$, $\frac{\partial \mathcal{L}}{\partial R_1} = -(1-\Lambda)\,\underline{p}^N \pi$ in both cases 1(a) and 1(b).

Case 1(a): $\frac{1-I_1}{\rho - R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$. $\frac{\partial \mathcal{L}}{\partial I_1} = \frac{\pi\, \underline{p}^N}{\underline{q}} - \Lambda\, K$, where $K \equiv \Big[P(\overline{\boldsymbol{s}}_i \mid G)\, \frac{\pi\, \underline{p}^N}{\underline{q}} \;+\; P(\not{\overline{\boldsymbol{s}}}_i)\,(1 - P(\not{\overline{\boldsymbol{s}}}_k|\not{\overline{\boldsymbol{s}}}_i))\Big]$. Using $\underline{q}$ in (34), we have $\frac{\pi\, \underline{p}^N}{\underline{q}} = \pi\, \underline{p}^N + (1-\pi)\,(1-\underline{p})^N \frac{1-P(\overline{\boldsymbol{s}}_i|B)}{1-P(\overline{\boldsymbol{s}}_i|G)}$. Also, $P(\not{\overline{\boldsymbol{s}}}_i)\,(1-P(\not{\overline{\boldsymbol{s}}}_k|\not{\overline{\boldsymbol{s}}}_i)) = \pi\, \underline{p}^N (1-P(\overline{\boldsymbol{s}}_i|G)) + (1-\pi)\,(1-\underline{p})^N\, P(\overline{\boldsymbol{s}}_i|G)$. So, $K = \frac{\pi\, \underline{p}^N}{\underline{q}} + (1-\pi)\,(1-\underline{p})^N [1 - P(\overline{\boldsymbol{s}}_i|G) - P(\overline{\boldsymbol{s}}_i|B)]$. So, $\frac{\partial \mathcal{L}}{\partial I_1} = \frac{\pi\, \underline{p}^N}{\underline{q}}(1-\Lambda) \,-\, \Lambda(1-\pi)\,(1-\underline{p})^N [1 - P(\overline{\boldsymbol{s}}_i|G) - P(\overline{\boldsymbol{s}}_i|B)]$.
– Suppose $\Lambda = 0$. Then, we have $\frac{\partial \mathcal{L}}{\partial R_1} = -\underline{p}^2\, \pi < 0$. From 3(i), this is false. Therefore $\Lambda \neq 0$. Hence, from 4(iii), we have $V_{\boldsymbol{i},1} = 0$.
– Suppose $\Lambda = 1$. Then, $\frac{\partial \mathcal{L}}{\partial I_1} < 0$. From 2(i), this is false. Therefore $\Lambda \neq 1$. But then, we have $\frac{\partial \mathcal{L}}{\partial D_1} \neq 0$ and $\frac{\partial \mathcal{L}}{\partial R_1} \neq 0$. Hence, from 1(iii) and 3(iii), we have $D_1 = 0$ and $R_1 = 0$.
– Suppose $\Lambda = \Lambda^*$, where $\Lambda^* \equiv \frac{\pi\, \underline{p}^2}{\underline{q}} \Big/ \Big(\frac{\pi\, \underline{p}^2}{\underline{q}} + (1-\pi)\,(1-\underline{p})^2 [1 - P(\overline{\boldsymbol{s}}_i|G) - P(\overline{\boldsymbol{s}}_i|B)] \Big)$. Then, given that $\Lambda^* \in (0;1)$, we have $\frac{\partial \mathcal{L}}{\partial R_1} < 0$. From 3(i), this is false and therefore $\Lambda \neq \Lambda^*$. But then, we have $\frac{\partial \mathcal{L}}{\partial I_1} \neq 0$. Hence, from 1(iii), we have $I_1 = \gamma$.

So $D_1 = 0$, $I_1 = \gamma$, $R_1 = 0$ and $V_{\boldsymbol{i},1} = 0$ are necessary conditions for a date-1 offer, (D_1, I_1, R_1), to solve (42) in case 1(a). $(1 - P(\overline{\boldsymbol{s}}_i \mid G)) = P(\not{\overline{\boldsymbol{s}}}_i \mid G)$, $\underline{p}^N = P(\overline{\boldsymbol{s}}_k \mid G)$, $\underline{q} \equiv P(G|\overline{\boldsymbol{s}}_k \cap \not{\boldsymbol{i}})$ and here $\not{\boldsymbol{i}} = \not{\overline{\boldsymbol{s}}}_i$. By Bayes' rule, $P(G|\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i) = \frac{P(\not{\overline{\boldsymbol{s}}}_i|G)\, P(\overline{\boldsymbol{s}}_k|G)\, \pi}{P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i)}$. So, $\frac{\pi\, \underline{p}^N}{\underline{q}} = \frac{P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i)}{(1-P(\overline{\boldsymbol{s}}_i|G))}$. We can write (40) as

$$V_{\boldsymbol{i},1} \;=\; -\gamma - P(\overline{\boldsymbol{s}}_i)(1-\gamma) + P(\overline{\boldsymbol{s}}_i \mid G) \left[(1 - P(\overline{\boldsymbol{s}}_k \mid G))\; \pi\, \rho + \frac{P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i)}{(1 - P(\overline{\boldsymbol{s}}_i \mid G))}\,(1-\gamma) \right] \quad (44)$$

Using $V_{\boldsymbol{i},1} = 0$, with M and M' in (33), we can write $V_{e,1}$ in (38) as

$$V_{e,1} \;=\; -\gamma - (1-\gamma)\,[P(\overline{\boldsymbol{s}}_i) + P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i)] + [P(\overline{\boldsymbol{s}}_i \mid G) \;+\; P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i \mid G)]\; \pi\, \rho \;-\; \varepsilon \;\;, \quad (45)$$

where
$$P(\overline{\boldsymbol{s}}_i) \;=\; M\, \pi \;+\; M'\,(1-\pi)\;, \quad (46)$$

$$P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i) \;=\; \underline{p}^N\,(1-M)\, \pi \;+\; (1-\underline{p})^N\,(1-M')\,(1-\pi)\;, \quad (47)$$

$$P(\overline{\boldsymbol{s}}_i \mid G) = M\;, \qquad P(\overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i \mid G) = \underline{p}^N\,(1-M)\;. \quad (48)$$

Case 1(b): $\frac{1-I_1}{\rho - R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$. $\frac{\partial \mathcal{L}}{\partial I_1} = \frac{\pi\, \underline{p}^N}{\underline{q}} - \Lambda\,[1 - P(\not{\overline{\boldsymbol{s}}}_k)]$. Using $\underline{q}$ in (35), we have $\frac{\pi\, \underline{p}^N}{\underline{q}} = \pi\, \underline{p}^N + (1-\pi)\,(1-\underline{p})^N$. Also, $1 - P(\not{\overline{\boldsymbol{s}}}_k) = \pi\, \underline{p}^N + (1-\pi)\,(1-\underline{p})^N$. So, $\frac{\partial \mathcal{L}}{\partial I_1} = \frac{\pi\, \underline{p}^N}{\underline{q}}(1-\Lambda)$.
– Suppose $\Lambda \in [0;1)$. Then, we have $\frac{\partial \mathcal{L}}{\partial R_1} < 0$. From 3(i), this is false. Therefore $\Lambda \neq 0$. Hence, from 4(iii), we have $V_{\boldsymbol{i},1} = 0$.
– Suppose $\Lambda > 1$. Then, $\frac{\partial \mathcal{L}}{\partial I_1} < 0$. From 2(i), this is false. Therefore $\Lambda = 1$. When $\Lambda = 1$, we have $\frac{\partial \mathcal{L}}{\partial D_1} = \frac{\partial \mathcal{L}}{\partial I_1} = \frac{\partial \mathcal{L}}{\partial R_1} = 0$.

Here, $\frac{\pi\, p^2}{\underline{q}} = P(\overline{\boldsymbol{s}}_k)$. Using $V_{\boldsymbol{i},1}=0$ in (41), we can write $V_{e,1}$ in (38) as

$$V_{e,1} \;=\; -\gamma - P(\overline{\boldsymbol{s}}_k)(1-\gamma) \;+\; P(\overline{\boldsymbol{s}}_k \mid G)\,\pi\,\rho \,-\, \varepsilon\ . \tag{49}$$

where $P(\overline{\boldsymbol{s}}_k) = \pi\,\underline{p}^N + (1-\pi)\,(1-\underline{p})^N$ and $P(\overline{\boldsymbol{s}}_k \mid G) = \underline{p}^N$.

Stage 1 – Syndicate $\boldsymbol{i}$ selected by the entrepreneur.

From (45) and (49), the entrepreneur obtains a higher date-1 payoff $V_{e,1}$ in case 1(a), so she selects a syndicate $\boldsymbol{i} \in \mathcal{A}$. Therefore the selected syndicate $\boldsymbol{i}$ is such that, if it makes a date-1 offer $(D_1, I_1, R_1) = (0, \gamma, 0)$, its payoff at date 1 is $V_{\boldsymbol{i},1} = 0$. Using $V_{\boldsymbol{i},1}$ in (44), M and M' in (33), this can be written as: Syndicate $\boldsymbol{i}$ belongs to the set $\mathcal{S} = \{(i_1,\ldots,i_N) \mid V_{\boldsymbol{i},1} = 0 \text{ for } R_1 = 0\}$, and

$$V_{\boldsymbol{i},1} \;=\; -\gamma - (1-\gamma)(1-\pi)[M' - \frac{M}{1-M}(1-M')(1-\underline{p})^N] \;+\; [\rho - (1-\gamma)]\,\pi\, M\;(1-\underline{p}^N)\ . \tag{50}$$

$\boldsymbol{i}$ makes an offer $D_1 = 0$, $I_1 = \gamma$ and $R_1 = 0$. From (45), the entrepreneur's payoff at date 1 is

$$V_{e,1} \;=\; -\gamma - (1-\gamma)(1-\pi)[M' + (1-M')(1-\underline{p})^N] + [\rho - (1-\gamma)]\,\pi\;\left[\underline{p}^N + M\,(1-\underline{p}^N)\right]\ . \tag{51}$$

When $\boldsymbol{i} \in \mathcal{S}$, we have $V_{\boldsymbol{i},1} = 0$. Then

$$V_{e,1} \;=\; -(1-\gamma)(1-\pi)(1-\underline{p})^N\;\frac{1-M'}{1-M} \;+\; [\rho - (1-\gamma)]\,\pi\,\underline{p}^N\ . \tag{52}$$

From (28), the date-2 offer made by $\boldsymbol{i}$ if it receives signal $\overline{\boldsymbol{s}}_i$ at date 2 is $R_2 = \rho - \left(\rho - \frac{1-\gamma}{\underline{q}}\right)\underline{p}^N$.

Internet Appendix B - Proof of Lemma 1:

If $\boldsymbol{i}$ was such that $\boldsymbol{\alpha}_i = \mathbf{1}_N$, then in Stage 8 of the game, if $\boldsymbol{i}$ does not finance the follow-on round, the outside syndicate $\boldsymbol{k}$ does not offer financing either: $\boldsymbol{k}$ does not have superior skill levels and has inferior information transparency. The follow-on round is then not financed.

In Stage 5 of the game, if $\boldsymbol{i}$ receives signal $\overline{\boldsymbol{s}}_i$ it makes a date-2 offer which leaves the entrepreneur marginally better off than zero. Otherwise it does not offer financing and the entrepreneur does not approach any outside syndicate (as $\boldsymbol{k}$ would anyway not finance the follow-on round).

Then in Stage 4, the entrepreneur's expected payoff at date 2 is equal to zero. Therefore the entrepreneur exerts no effort. The project generates no return. This cannot be an equilibrium outcome.

Internet Appendix C - Proof of Lemma 2:

Both $\underline{q}$ in (4) and $V_{e,1}$ in (3) are decreasing in (and only depend on characteristics of $\boldsymbol{i}$ through) $J = \frac{1-M'}{1-M}$ in (5). From (1), i_n and i_m have associated conditional probabilities $p_{i_n} = \frac{1+\alpha_{i_n}\varphi}{2}$ and

$p_{i_m} = \frac{1+\alpha_{i_m}\varphi}{2}$. Let $\boldsymbol{p}^-$ denote the $N-2$ associated probabilities $p_{i_l} = \frac{1+\alpha_{i_l}\varphi}{2}$ of the $N-2$ VCs i_l in $\boldsymbol{i}^-$. Extend the notation to reflect the dependence of $J(p_{i_n}, p_{i_m}, \boldsymbol{p}^-)$ and $V_{\boldsymbol{i},1}(p_{i_n}, p_{i_m}, \boldsymbol{p}^-)$ in (50) on the associated probabilities of syndicate $(i_n, i_m, \boldsymbol{i}^-)$.

Consider the function $p_{i_n} \rightarrow m(p_{i_n})$ such that if $p_{i_m} = m(p_{i_n})$ then $V_{\boldsymbol{i},1}(p_{i_n}, p_{i_m}, \boldsymbol{p}^-) = 0$. Essentially, if VC i_n whose skill level is α_{i_n} and the $N-2$ VCs in $\boldsymbol{i}^-$ form a syndicate with a VC i_m whose skill level is α_{i_m} such that $p_{i_m} = m(p_{i_n})$, then the syndicate $(i_n, i_m, \boldsymbol{i}^-)$ belongs to $\mathcal{S}$. We use the "matching" function $m(p_{i_1})$ to determine which syndicate in $\mathcal{S}$ yields the lowest value of J. Consider wlog that amongst the first two VCs, i_n is the VC with higher skill level, i.e. $\alpha_{i_n} \geq \alpha_{i_m}$. So $p_{i_n} \geq m(p_{i_n})$. To prove the Lemma 2, we establish that $\Omega(p) \equiv J(p, m(p), \boldsymbol{p}^-)$ is decreasing in p:

$$\frac{\partial\,\Omega(p)}{\partial\,p} = \frac{\partial\,J(p_{i_n}, p_{i_m}, \boldsymbol{p}^-)}{\partial\,p_{i_n}} + \frac{\partial\,J(p_{i_n}, p_{i_m}, \boldsymbol{p}^-)}{\partial\,p_{i_m}}\,\frac{\partial\,p_{i_m}}{\partial\,p_{i_n}}\,. \tag{53}$$

Along the curve $\Omega(p)$, the following preservation law prevails: $V_{\boldsymbol{i},1}(p, m(p), \boldsymbol{p}^-) = 0$. Differentiating leads to $\frac{\partial\,m(p)}{\partial\,p} = -\,\frac{\partial\,V_{\boldsymbol{i},1}(p,m(p),\boldsymbol{p}^-)}{\partial\,p_{i_n}}\left[\frac{\partial\,V_{\boldsymbol{i},1}(p,m(p),\boldsymbol{p}^-)}{\partial\,p_{i_m}}\right]^{-1}$. This gives $\frac{\partial\,\Omega(p)}{\partial\,p} = \frac{N(p,m(p),\boldsymbol{p}^-)}{D(p,m(p),\boldsymbol{p}^-)}$, where $Num \equiv \frac{\partial V_{\boldsymbol{i},1}(p_{i_n},p_{i_m},\boldsymbol{p}^-)}{\partial\,p_{i_m}}\frac{\partial J(p_{i_n},p_{i_m},\boldsymbol{p}^-)}{\partial\,p_{i_n}} - \frac{\partial V_{\boldsymbol{i},1}(p_{i_n},p_{i_m},\boldsymbol{p}^-)}{\partial\,p_{i_n}}\frac{\partial J(p_{i_n},p_{i_m},\boldsymbol{p}^-)}{\partial\,p_{i_m}}$, and $Den \equiv \frac{\partial\,V_{\boldsymbol{i},1}(p_{i_n},p_{i_m},\boldsymbol{p}^-)}{\partial\,p_{i_m}}$. We obtain

$$Num = \quad -(p_{i_n} - p_{i_m})\,M\,M'\;\frac{(1-\gamma)(1-\pi)[1-(1-\underline{p})^N](1-M') + [\rho-(1-\gamma)]\,\pi\,(1-\underline{p}^N)(1-M)}{p_{i_n}\,(1-p_{i_n})\,p_{i_m}\,(1-p_{i_m})} \tag{54}$$

$$Den = (1-\gamma)(1-\pi)\left[\frac{M'}{1-p_{i_m}} + \frac{M}{1-M}\,(1-\underline{p})^N\left(\frac{J}{p_{i_m}} + \frac{M'}{1-p_{i_m}}\right)\right] + [\rho-(1-\gamma)]\,\pi\,\frac{M}{p_{i_m}}\,(1-\underline{p}^N) \tag{55}$$

So, if $p = m(p)$, then $\frac{\partial\,\Omega(p)}{\partial\,p} = 0$. If $p > m(p)$, then $\frac{\partial\,\Omega(p)}{\partial\,p} < 0$.

Running along the curve $\Omega(p)$ the entrepreneur payoff increases: $\Omega(p)$ is maximum when p is minimum (hence $p = m(p)$). $\Omega(p)$ is minimum when p is maximum (hence $m(p)$ is minimum). Hence, both $\underline{q}$ and $V_{e,1}$ are minimum when $\alpha_{i_n} = \alpha_{i_m}$. Both $\underline{q}$ and $V_{e,1}$ increase with $|\alpha_{i_n} - \alpha_{i_m}|$.

Internet Appendix D - Proof of Proposition 2:

Consider wlog that amongst the two VCs in $\boldsymbol{i}$, i_1 is the VC with higher skill level, i.e. $\alpha_{i_1} \geq \alpha_{i_2}$. From Lemma 2, i_1 has highest skill level, $\alpha_{i_1} = 1$. The remaining α_{i_2}, is obtained using the fact that $\boldsymbol{i}$ belongs to $\mathcal{S}$. That is, α_{i_2} is such that $V_{\boldsymbol{i},1} = 0$, where $V_{\boldsymbol{i},1}$ is given in (50), $M = \overline{p}\,p_{i_2}$, $M' = (1-\overline{p})\,(1-p_{i_2})$, with $p_{i_1} = \overline{p} \equiv \frac{1+\varphi}{2}$ and $p_{i_2} = \frac{1+\alpha_{i_2}\varphi}{2}$. This can be written $V_{\boldsymbol{i},1} = \frac{F(\overline{p}\,p_{i_2})}{1-\overline{p}\,p_{i_2}} = 0$, where

$$F(x) \;=\; -a\,x^2 \;+\; b\,x \;-\; c\;, \tag{56}$$

with a, b and c as defined in (7), (8) and (9). As $N = 2$, the condition $F(\overline{p}\,p_{i_2}) = 0$ can be written as a quadratic equation in α_{i_2} and can be solved for:

We have $a > 0$, $b > 0$ and $c > 0$ (as $\rho > 1-\gamma$). We have $F(0) = -c < 0$ and $F(1) = -a + b - c = (1-\gamma)(1-\pi)\,(1-\underline{p})^2\,[\overline{p} + (1-\overline{p})/\overline{p}] \geq 0$. Then, $F(.)$ is a concave function, with $F(0) < 0$ and $F(1) \geq 0$. The solution is therefore such that $p_{i_2} = \tilde{p}$, where $\overline{p}\,\tilde{p}$ is the smallest of the two roots of $F(\overline{p}\,p_{i_2}) = 0$. Hence $\tilde{p} = [b - \sqrt{b^2 - 4\,a\,c}]/[2\,a\,\overline{p}]$. So $\alpha_{i_2} = \tilde{\alpha}$ in (6), where $\tilde{\alpha} = \frac{2\,\tilde{p}-1}{\varphi}$.

Internet Appendix E:

$F(x)$ in (56) depends on θ only through $\underline{p} = \frac{1+\varphi\,\theta}{2}$. We have $\frac{\partial F(x)}{\partial \underline{p}} = -2\,[-(1-\gamma)+\rho]\,\pi\,\underline{p}\,x\,(1-x) - 2\,(1-\gamma)(1-\pi)\,(1-\underline{p})\,[\overline{p} + (1-\overline{p})/\overline{p}]\,x$. So $\frac{\partial F(x)}{\partial \underline{p}} < 0$, for all $x \in (0;1)$ (given that $\rho > 1-\gamma$). Hence $\frac{\partial F(x)}{\partial \theta} < 0$, for all $x \in (0;1)$. $\overline{p}\,\tilde{p} \in (0;1)$ and solves $F(\overline{p}\,\tilde{p}) = 0$. Therefore $\frac{\partial \tilde{p}}{\partial \theta} > 0$. Then $\frac{\partial \tilde{\alpha}}{\partial \theta} > 0$.

Internet Appendix F:

The probability that syndicate $\boldsymbol{k}$ finances the second round is $P(switch) = P(\overline{\boldsymbol{s}}_k \cap \not{\boldsymbol{i}})$. $P(\overline{\boldsymbol{s}}_k \mid G)|_{\boldsymbol{\alpha}_k=\mathbf{1}_N} = \underline{p}^N$ and $P(\overline{\boldsymbol{s}}_k \mid B)|_{\boldsymbol{\alpha}_k=\mathbf{1}_N} = (1-\underline{p})^N$. The PBE consistent beliefs of $\boldsymbol{k}$ about $\not{\boldsymbol{i}}$ is that $\not{\boldsymbol{i}}$ equals $\not{\overline{\boldsymbol{s}}}_i$. So from (1) and M and M' in (33), $P(\not{\boldsymbol{i}}\,|G) = 1 - P(\overline{\boldsymbol{s}}_i \mid G)$ and $P(\not{\boldsymbol{i}}\,|B) = 1 - P(\overline{\boldsymbol{s}}_i \mid B)$. we therefore have $P(\overline{\boldsymbol{s}}_k \cap \not{\boldsymbol{i}}|\,G) = \underline{p}^N\,(1 - P(\overline{\boldsymbol{s}}_i \mid G))$ and $P(\overline{s}_{k_1} \cap \overline{s}_{k_2} \cap \not{\boldsymbol{i}}|\,B) = (1-\underline{p})^N\,(1 - P(\overline{\boldsymbol{s}}_i \mid B))$. Using M and M' in (33), we have $P(switch) = \underline{p}^N\,(1-M)\,\pi + (1-\underline{p})^N\,(1-M')\,(1-\pi) > 0$.

Internet Appendix G - Model with a "No Hold-up by the Financier" Assumption:

Assume that the informational advantage *does not* increase the bargaining power of the inside syndicate vis-a-vis the entrepreneur in the follow-on round. The syndicate who lends in the early round now has again no bargaining power in the follow-on round. If it wishes to offer follow-on finance, the inside syndicate makes a competitive follow-on financing offer. Such an offer extracts no value from the entrepreneur, so there is no hold-up-by-the-financier.

The sequence of events, actions and information available at each stage of the game is unchanged, except for Date 2 – Stage 5. The game is now such that in Stage 5, the inside syndicate $\boldsymbol{i}$ makes a *perfectly competitive* date-2 offer R_2 to the entrepreneur, or does not make an offer.

We state the equilibrium outcome under this assumption:

Proposition 3 *The entrepreneur seeks and obtains early round financing from a syndicate $\boldsymbol{i}$ with highest skill levels $\boldsymbol{\alpha}_i = \mathbf{1}_N$.*

If $\boldsymbol{i}$ receives signal $\overline{\boldsymbol{s}}_i$, the early round syndicate $\boldsymbol{i}$ also offers to finance the follow-on round and the entrepreneur accepts the offer. Otherwise, the project is not completed.

Proof:

The proof is similar to that of Proposition 1. We establish the equilibrium outcome working backwards the sequence of events.

Events 9, 8, 7 and 6 are unchanged.

Stage 5 – Date-2 offer, R_2, made by the inside syndicate $\boldsymbol{i}$.

At the time the inside syndicate $\boldsymbol{i}$ decides to make a date-2 offer, it knows the signal received $\boldsymbol{s}_i$, the skill levels $\boldsymbol{\alpha}_i$, the transparency of their information φ, and the date-1 contact (D_1, I_1, R_1). As in (29), the payoff at date 2 of $\boldsymbol{i}$ if it makes a date-2 offer R_2 after receiving signals $\boldsymbol{s}_i$ is

$$V_{\boldsymbol{i},2}(R_2 \,|\, \boldsymbol{s}_i) \;\equiv\; -(1-I_1) \;+\; P(G|\boldsymbol{s}_i)\;(R_1+R_2)\;. \tag{57}$$

As in (31), the payoff at date 2 of $\boldsymbol{i}$ if they do not make an offer is

$$V_{\boldsymbol{i},2}(\not{R}_2\,|\boldsymbol{s}_i) = \begin{cases} [1-(1-\underline{p})^N - [\underline{p}^N - (1-\underline{p})^N]\,P(G\mid \boldsymbol{s}_i)]\,(I_1\,-\,\gamma) & \\ \qquad\qquad + \,\underline{p}^N\,P(G\mid \boldsymbol{s}_i)\,R_1 & \text{if } \frac{1-I_1}{\rho-R_1} \le \underline{q}; \\ \qquad\qquad I_1\,-\,\gamma & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q}\;. \end{cases} \tag{58}$$

Denote R_2^{**} the level of R_2 which solves $V_{\boldsymbol{i},2}(R_2\,|\,\boldsymbol{s}_i) = V_{\boldsymbol{i},2}(\not{R}_2\,|\boldsymbol{s}_i)$. From (57) and (58), we have

$$R_2^{**} \;=\begin{cases} \frac{[1-(1-\underline{p})^N - [\underline{p}^N-(1-\underline{p})^N]\,P(G|\boldsymbol{s}_i)]}{P(G|\boldsymbol{s}_i)}\,(I_1\,-\,\gamma) + \frac{(1-I_1)}{P(G|\boldsymbol{s}_i)}\; - \left(1\,-\,\underline{p}^N\right)\,R_1 & \text{if } \frac{1-I_1}{\rho-R_1} \le \underline{q}\,; \\ \frac{(1-\gamma)}{P(G|\boldsymbol{s}_i)}\;-\;R_1 & \text{if } \frac{1-I_1}{\rho-R_1} > \underline{q}\;. \end{cases} \tag{59}$$

The entrepreneur accepts $\boldsymbol{i}$'s offer if and only if $R_2 \le R_2^*$, where R_2^* is given in (28). The inside VC being a Stackelberg follower, $\boldsymbol{i}$ makes an offer $R_2 = R_2^{**}$ if $R_2^{**} \le R_2^*$.

From (28) and (59) we obtain $R_2^* - R_2^{**} \,=\, \Delta(\boldsymbol{s}_i)\,/\,P(G\,\mid\,\boldsymbol{s}_i)$, where $\Delta(\boldsymbol{s}_i)$ is given in (32). Therefore, the exact same four cases 1(a), 1(b), 2(a) and 2(b) take place. The inside syndicate $\boldsymbol{i}$ makes a date-2 in the exact same circumstances. The offer is however R_2^{**} in (59) instead of R_2^* in (28). The PBE consistent beliefs of k about the history of $\not{\boldsymbol{i}}$ are exactly the same. So $\underline{q}$ takes the same expressions (34) and (35) depending on the same cases.

Stage 4 – Choice of effort by the entrepreneur.

In Case 2(b), the inside syndicate $\boldsymbol{i}$ never offers follow-on financing and the entrepreneur does not approach any outside syndicate. Therefore the entrepreneur does not exert effort and the project generates no return. Cases 2(b) cannot be an equilibrium outcome.

Stage 3 – Acceptance of the date-1 offer made by syndicate $\boldsymbol{i}$.

Case 1(a): $\frac{1-I_1}{\rho-R_1} \le \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$. The entrepreneur receives a dividend D_1. If syndicate

$\boldsymbol{i}$ receives signal $\overline{\boldsymbol{s}}_i$, it makes a date-2 offer R_2^{**} in (59) and the entrepreneur accepts it. The entrepreneur's payoff is then $V_{e,2}$ in (26) with $R_2 = R_2^{**}$. If $\boldsymbol{i}$ receives a signal $\not{\overline{\boldsymbol{s}}}_i$, it does not make a follow-on offer. Then if $\boldsymbol{k}$ receives signal $\overline{\boldsymbol{s}}_k$, it makes a date-2 offer $R_2 = \frac{1-I_1}{\underline{q}}$ and the entrepreneur accepts it. Realizing the project entails a private cost ε. Given that $\Psi_e = P(G|\overline{\boldsymbol{s}}_i)$, using $P(\overline{\boldsymbol{s}}_i)\, P(G \mid \overline{\boldsymbol{s}}_i) = P(\overline{\boldsymbol{s}}_i \mid G)\, \pi$, $P(\not{\overline{\boldsymbol{s}}}_i)\; P(\overline{\boldsymbol{s}}_k \mid \not{\overline{\boldsymbol{s}}}_i)\; P(G \mid \overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i) = P(\not{\overline{\boldsymbol{s}}}_i \mid G)\, P(\overline{\boldsymbol{s}}_k \mid G)\, \pi$ and $P(\overline{\boldsymbol{s}}_k \mid G) = \underline{p}^N$, the payoff of the entrepreneur at date 1 is

$$V_{e,1} = D_1 \;+\; P(\overline{\boldsymbol{s}}_i)\, P(G|\overline{\boldsymbol{s}}_i)\, (\rho - R_1 - R_2^{**}) +\; P(\not{\overline{\boldsymbol{s}}}_i \mid G)\, \underline{p}^N \pi \left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right) \;-\; \varepsilon. \tag{60}$$

Replacing R_2^{**} in (59), we can write

$$\begin{aligned} V_{e,1} \;=\; & D_1 \;-\; \left[\left(1-(1-\underline{p})^N\right)\, P(\overline{\boldsymbol{s}}_i) - \left(\underline{p}^N - (1-\underline{p})^N\right)\, P(\overline{\boldsymbol{s}}_i \mid G)\, \pi\right] (I_1 \;-\; \gamma) \;-\underline{p}^N \pi\, R_1 \\ & -(1-I_1)\left[P(\overline{\boldsymbol{s}}_i) + P(\not{\overline{\boldsymbol{s}}}_i \mid G)\frac{\underline{p}^N\, \pi}{\underline{q}}\right] + \left[P(\overline{\boldsymbol{s}}_i \mid G) + P(\not{\overline{\boldsymbol{s}}}_i \mid G)\, \underline{p}^N\right]\, \pi\, \rho - \varepsilon \;, \end{aligned} \tag{61}$$

where $\underline{q}$ is given by (34). The entrepreneur accepts the offer if R_1 is such that $V_{e,1} \geq 0$.

Case 1(b): $\frac{1-I_1}{\rho-R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$. The expression of $V_{e,1}$ is as in (38).

$$V_{e,1} \;=\; D_1 \;+\; \underline{p}^N \pi \left(\rho - R_1 - \frac{1-I_1}{\underline{q}}\right) - \varepsilon \;, \tag{62}$$

where $\underline{q}$ is given in 35). The entrepreneur accepts the offer if R_1 is such that $V_{e,1} \geq 0$.

Case 2(a): $\frac{1-I_1}{\rho-R_1} > \underline{q}$ and $(i,j) \in \mathcal{A}'$. $\boldsymbol{s}_i$ only offers follow-on financing if it receives signal $\overline{\boldsymbol{s}}_i$. Otherwise it does not offer financing and the entrepreneur does not approach any outside syndicate. The expression of $V_{e,1}$ is

$$V_{e,1} = D_1 \;+\; P(\overline{\boldsymbol{s}}_i)\, P(G|\overline{\boldsymbol{s}}_i)\, (\rho - R_1 - R_2^{**}) \;-\; \varepsilon. \tag{63}$$

Replacing $R_2 = R_2^{**}$ in (59), using $P(\overline{\boldsymbol{s}}_i)\, P(G \mid \overline{\boldsymbol{s}}_i) = P(\overline{\boldsymbol{s}}_i \mid G)\, \pi$, we can write

$$V_{e,1} = D_1 \;-\; (1-\gamma)\, P(\overline{\boldsymbol{s}}_i) \;+\; P(\overline{\boldsymbol{s}}_i \mid G)\, \pi\, \rho \;-\; \varepsilon. \tag{64}$$

The entrepreneur accepts the offer if R_1 is such that $V_{e,1} \geq 0$.

Stage 2 – Date-1 offer, (D_1, I_1, R_1), made by syndicate $\boldsymbol{i}$.

Case 1(a): $\frac{1-I_1}{\rho-R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}$. The payoff at date 2 of $\boldsymbol{i}$ when it makes a date-2 offer $R_2 = R_2^{**}$ after receiving signals $\overline{\boldsymbol{s}}_i$ is $V_{\boldsymbol{i},2}(R_2^{**} \mid \overline{\boldsymbol{s}}_i) = V_{\boldsymbol{i},2}(\not{R}_2 \mid \overline{\boldsymbol{s}}_i)$, where $V_{\boldsymbol{i},2}(\not{R}_2 \mid \boldsymbol{s}_i)$ is given in (58). The payoff of syndicate $\boldsymbol{i}$ at date 1 is

$$V_{\boldsymbol{i},1} = -D_1 - I_1 + P(\overline{\boldsymbol{s}}_i)\; V_{\boldsymbol{i},2}(\not{R}_2 \mid \overline{\boldsymbol{s}}_i) \;+\; P(\not{\overline{\boldsymbol{s}}}_i) P(\overline{\boldsymbol{s}}_k \mid \not{\overline{\boldsymbol{s}}}_i) P(G \mid \overline{\boldsymbol{s}}_k \cap \not{\overline{\boldsymbol{s}}}_i) R_1 \;+\; P(\not{\overline{\boldsymbol{s}}}_i) P(\not{\overline{\boldsymbol{s}}}_k \mid \not{\overline{\boldsymbol{s}}}_i)\, (I_1 - \gamma). \tag{65}$$

$P(\not{\bar{\boldsymbol{s}}}_i)P(\bar{\boldsymbol{s}}_k \mid \not{\bar{\boldsymbol{s}}}_i)P(G \mid \bar{\boldsymbol{s}}_k \cap \not{\bar{\boldsymbol{s}}}_i) = (1 - P(\bar{\boldsymbol{s}}_i|G))P(\bar{\boldsymbol{s}}_k \mid G)\,\pi$; $P(\bar{\boldsymbol{s}}_k \mid G) = \underline{p}^N$; $V_{\boldsymbol{i},2}(\not{R}_2 \mid \bar{\boldsymbol{s}}_i)$ is in (58). So

$$\begin{aligned} V_{\boldsymbol{i},1} \;&=\; -D_1 \;-\; \gamma \;+\; \underline{p}^N \pi R_1 \\ &\quad + \;\left[\left(1 - (1-\underline{p})^N\right) P(\bar{\boldsymbol{s}}_i) - \left(\underline{p}^N - (1-\underline{p})^N\right) P(\bar{\boldsymbol{s}}_i \mid G)\pi - 1 + P(\not{\bar{\boldsymbol{s}}}_i)P(\not{\bar{\boldsymbol{s}}}_k|\not{\bar{\boldsymbol{s}}}_i)\right]\; (I_1 - \gamma) \end{aligned} \tag{66}$$

Syndicate $\boldsymbol{i}$ makes a competitive offer such that $V_{\boldsymbol{i},1} = 0$. Replacing (66) in (61) gives

$$\begin{aligned} V_{e,1} \;&=\; -\gamma + \left[-1 + P(\not{\bar{\boldsymbol{s}}}_i)P(\not{\bar{\boldsymbol{s}}}_k|\not{\bar{\boldsymbol{s}}}_i) + P(\bar{\boldsymbol{s}}_i) + \frac{P(\not{\bar{\boldsymbol{s}}}_i|\, G)\, \underline{p}^N\, \pi}{\underline{q}}\right]\, (I_1 - \gamma) \\ &\quad -(1-\gamma)\left[P(\bar{\boldsymbol{s}}_i) + \frac{P(\not{\bar{\boldsymbol{s}}}_i|\, G)\, \underline{p}^N\, \pi}{\underline{q}}\right] + \left[P(\bar{\boldsymbol{s}}_i \mid G) \;+\; P(\bar{\boldsymbol{s}}_k \cap\, \not{\bar{\boldsymbol{s}}}_i|\, G)\right] \pi\, \rho - \varepsilon\ . \end{aligned} \tag{67}$$

$P(\not{\bar{\boldsymbol{s}}}_i)P(\not{\bar{\boldsymbol{s}}}_k|\not{\bar{\boldsymbol{s}}}_i) \;=\; 1 - P(\bar{\boldsymbol{s}}_i) - \pi\underline{p}^N(1 - P(\bar{\boldsymbol{s}}_i|G)) - (1-\pi)(1-\underline{p})^N P(\bar{\boldsymbol{s}}_i|G)$. From $\underline{q}$ in (34), $\frac{P(\not{\bar{\boldsymbol{s}}}_i|G)\,\underline{p}^N\,\pi}{\underline{q}} = \pi\, \underline{p}^N(1 - P(\bar{\boldsymbol{s}}_i \mid G)) + (1-\pi)\,(1-\underline{p})^N(1 - P(\bar{\boldsymbol{s}}_i|B))$. So,

$$\begin{aligned} V_{e,1} \;&=\; -\gamma - (1-\pi)\,(1-\underline{p})^N\,[1 - P(\bar{\boldsymbol{s}}_i|G) - P(\bar{\boldsymbol{s}}_i|B)]\;(I_1 - \gamma) \\ &\quad -(1-\gamma)\left[P(\bar{\boldsymbol{s}}_i) + \frac{P(\not{\bar{\boldsymbol{s}}}_i|\, G)\, \underline{p}^N\, \pi}{\underline{q}}\right] + \;+ [P(\bar{\boldsymbol{s}}_i \mid G) \;+\; P(\bar{\boldsymbol{s}}_k \cap\, \not{\bar{\boldsymbol{s}}}_i|\, G)]\pi\, \rho - \varepsilon\ . \end{aligned} \tag{68}$$

$\underline{p}^N = P(\bar{\boldsymbol{s}}_k \mid G)$, $\underline{q} \equiv P(G|\bar{\boldsymbol{s}}_k \cap\, \not{\boldsymbol{i}})$ and here $\not{\boldsymbol{i}}{=}\not{\bar{\boldsymbol{s}}}_i$. By Bayes' rule, $P(G|\bar{\boldsymbol{s}}_k \cap\, \not{\bar{\boldsymbol{s}}}_i) = \frac{P(\not{\bar{\boldsymbol{s}}}_i|G)\,P(\bar{\boldsymbol{s}}_k|G)\,\pi}{P(\bar{\boldsymbol{s}}_k \cap \not{\bar{\boldsymbol{s}}}_i)}$. So, $\frac{\pi\,\underline{p}^N}{\underline{q}} = \frac{P(\bar{\boldsymbol{s}}_k \cap \not{\bar{\boldsymbol{s}}}_i)}{(1 - P(\bar{\boldsymbol{s}}_i|G))}$. Also, $P(\not{\bar{\boldsymbol{s}}}_i|\, G) = (1 - P(\bar{\boldsymbol{s}}_i \mid G))$, Syndicate $\boldsymbol{i}$ makes an offer (D_1, I_1, R_1) which maximizes the entrepreneur value, $V_{e,1}$. Under (1), $1 - P(\bar{\boldsymbol{s}}_i|G) - P(\bar{\boldsymbol{s}}_i|B) > 0$. So, from (68), we have $\frac{\partial V_{e,1}}{\partial I_1} < 0$ Hence (D_1, I_1, R_1) is such that $I_1 = \gamma$. When $I_1 = \gamma$, we can write (68) as

$$V_{e,1} \;=\; -\gamma - (1-\gamma)[P(\bar{\boldsymbol{s}}_i) + P(\bar{\boldsymbol{s}}_k \cap\, \not{\bar{\boldsymbol{s}}}_i)] + \;[P(\bar{\boldsymbol{s}}_i \mid G) \;+\; P(\bar{\boldsymbol{s}}_k \cap\, \not{\bar{\boldsymbol{s}}}_i|\, G)]\pi\, \rho - \varepsilon\ . \tag{69}$$

When $I_1 = \gamma$, we can write (66) as

$$V_{\boldsymbol{i},1} \;=\; -D_1 - \gamma + \underline{p}^N\, \pi\, R_1\ . \tag{70}$$

(D_1, I_1, R_1) is such that $V_{\boldsymbol{i},1} = 0$ and $I_1 = \gamma$. This leaves an indeterminacy over the couple (D_1, R_1). However, the syndicate $\boldsymbol{i}$ and the entrepreneur have no reason to lend and borrow more than necessary, simultaneously increasing D_1 and R_1. So $D_1 = 0$ and $R_1 = \frac{\gamma}{\underline{p}^N\,\pi}$. The offer (D_1, I_1, R_1) is therefore equal to $(0, \gamma, \frac{\gamma}{\underline{p}^N\,\pi})$.

Case 1(b): $\frac{1 - I_1}{\rho - R_1} \leq \underline{q}$ and $\boldsymbol{i} \in \mathcal{B}$. The payoff of syndicate $\boldsymbol{i}$ at date 1 is

$$V_{\boldsymbol{i},1} {=} {-D_1} - I_1 \;+\; P(\bar{\boldsymbol{s}}_k)P(G \mid \bar{\boldsymbol{s}}_k)R_1 \;+\; P(\not{\bar{\boldsymbol{s}}}_k)\,(I_1 - \gamma). \tag{71}$$

$P(\overline{\boldsymbol{s}}_k)P(G \mid \overline{\boldsymbol{s}}_k) = P(\overline{\boldsymbol{s}}_k \mid G)\,\pi$ and $P(\overline{\boldsymbol{s}}_k \mid G) = \underline{p}^N$. Then (71) gives

$$V_{\boldsymbol{i},1} = -D_1 - \gamma + \underline{p}^N \pi R_1 - [1 - P(\cancel{\boldsymbol{s}}_k)]\,(I_1 - \gamma)\;. \tag{72}$$

Syndicate $\boldsymbol{i}$ makes a competitive offer such that $V_{\boldsymbol{i},1} = 0$. Replacing (72) in (62) gives

$$V_{e,1} \;=\; -\gamma + \left[-1 + P(\cancel{\boldsymbol{s}}_k) + \frac{\pi\,\underline{p}^N}{\underline{q}}\right](I_1 - \gamma) - (1-\gamma)\,\frac{\pi\,\underline{p}^N}{\underline{q}} \;+\; \underline{p}^N \pi\,\rho - \varepsilon\;. \tag{73}$$

Using $\underline{q}$ in (35), we have $\frac{\pi\,\underline{p}^N}{\underline{q}} = \pi\,\underline{p}^N + (1-\pi)\,(1-\underline{p})^N = P(\overline{\boldsymbol{s}}_k)$. So,

$$V_{e,1} \;=\; -\gamma - (1-\gamma)\,P(\overline{\boldsymbol{s}}_k) \;+\; P(\overline{\boldsymbol{s}}_k \mid G)\,\pi\,\rho - \varepsilon\;. \tag{74}$$

Case 2(a): $\frac{1-I_1}{\rho - R_1} > \underline{q}$ and $\boldsymbol{i} \in \mathcal{A}'$. The payoff of syndicate $\boldsymbol{i}$ at date 1 is

$$V_{\boldsymbol{i},1} = -D_1 - I_1 + P(\overline{\boldsymbol{s}}_i)\,V_{\boldsymbol{i},2}(R_2^{**} \mid \overline{\boldsymbol{s}}_i) + P(\cancel{\boldsymbol{s}}_i)\,(I_1 - \gamma). \tag{75}$$

Here $V_{\boldsymbol{i},2}(\cancel{R}_2 \mid \overline{\boldsymbol{s}}_i) = I_1 - \gamma$, from (58). So $V_{\boldsymbol{i},1} = -D_1 - \gamma < 0$. Therefore, no syndicate is willing to make an offer which falls in case 2(a).

Stage 1 – Syndicate $\boldsymbol{i}$ selected by the entrepreneur.

From (69) and (74), the entrepreneur obtains a higher date-1 payoff $V_{e,1}$ in case 1(a), so she selects a syndicate $\boldsymbol{i} \in \mathcal{A}$. Therefore the date-1 offer, (D_1, I_1, R_1), made by the selected syndicate $\boldsymbol{i}$ is therefore such that $D_1 = 0$, $I_1 = \gamma$, $R_1 = \frac{\gamma}{\underline{p}^N \pi}$. Under such an offer, the payoff of the entrepreneur at date 1 is $V_{e,1}$ given in (69). Using M and M' in (33), this can be written as:

$$V_{e,1} \;=\; -\gamma - (1-\gamma)(1-\pi)[M' + (1-M')(1-\underline{p})^N] + [\rho - (1-\gamma)]\,\pi\,\left[\underline{p}^N + M\,(1 - \underline{p}^N)\right]\;. \tag{76}$$

From (33), $\frac{\partial M}{\partial p_{i_n}} = \frac{M}{p_{i_n}}$ and $\frac{\partial M'}{\partial p_{i_n}} = -\frac{M'}{(1-p_{i_n})}$, for any $n \in \{1, \ldots, N\}$. We then have,

$$\frac{\partial V_{e,1}}{\partial p_{i_n}} \;=\; (1-\gamma)\,(1-\pi)\,[1 - (1-\underline{p})^N]\,\frac{M'}{(1-p_{i_n})} + [\rho - (1-\gamma)]\,\pi\,(1 - \underline{p}^N)\,\frac{M}{p_{i_n}}\;. \tag{77}$$

So $\frac{\partial V_{e,1}}{\partial p_{i_n}} > 0$, for any $n \in \{1, \ldots, N\}$. Each VC i_n in syndicate $\boldsymbol{i}$ has highest skill level, $\alpha_{i_n} = 1$.

Internet Appendix H - Supplementary Tables

A.I: Switching v.s. Non-Switching Deals

Notes: This table compares syndicated deals that experience switching by all VC firms in a subsequent round to those that do not (i.e., All Switch=1 v.s. All Switch=0). The sample contains syndicated deals raised between 2010 and 2014 that followed by a subsequent funding round. *All Switch* equals one if none of the investing VC firms no longer participate in any of the follow-on rounds, and zero otherwise. Mean values of the variables are reported as well as the p-values from mean equality tests between switching and non-switching groups. *CA-HQ* and *MA-HQ* are dummy variables that equals to one if an entrepreneurial firm is headquartered in California or Massachusetts, respectively. *IT* and *Healthcare* are dummy variables indicating that an entrepreneurial firm operates in IT and healthcare related fields, respectively.

	1st Round			2nd Round			3rd Round			4th and Later Round		
	AllSwitch=0	AllSwitch=1	p-value	AllSwitch=0	AllSwitch=1	p-value	AllSwitch=0	AllSwitch=1	p-value	AllSwitch=0	AllSwitch=1	p-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CV	0.73	0.83	0.00	0.70	0.78	0.00	0.68	0.78	0.00	0.67	0.79	0.00
Gini	0.68	0.71	0.05	0.66	0.69	0.05	0.65	0.69	0.04	0.66	0.71	0.00
No of VCs	4.79	4.13	0.04	4.67	4.27	0.16	4.44	3.99	0.06	4.88	4.24	0.00
Max fund size($M)	403.78	206.29	0.00	476.62	254.42	0.00	559.26	370.25	0.03	713.64	615.61	0.22
Max VC Exp	450.35	258.63	0.00	468.66	285.01	0.00	552.77	378.05	0.00	622.19	471.87	0.00
Dis. to VC<50 miles	0.82	0.77	0.15	0.79	0.65	0.00	0.77	0.67	0.02	0.71	0.61	0.00
Dis. to VC 50-100 miles	0.05	0.05	0.99	0.04	0.09	0.00	0.05	0.08	0.20	0.05	0.05	0.50
Foreign-HQ VC	0.27	0.31	0.34	0.29	0.35	0.08	0.33	0.27	0.17	0.35	0.34	0.70
IT	0.56	0.56	0.96	0.56	0.46	0.01	0.53	0.50	0.48	0.46	0.46	0.86
Healthcare	0.15	0.13	0.40	0.16	0.19	0.29	0.18	0.15	0.46	0.24	0.23	0.55
CA-HQ	0.46	0.47	0.86	0.48	0.39	0.02	0.48	0.37	0.02	0.46	0.41	0.10
MA-HQ	0.10	0.06	0.10	0.08	0.08	0.79	0.09	0.07	0.54	0.10	0.07	0.08
Observations	691	183		935	198		724	138		1246	332	

A.II: Variable Definitions

Notes: The definitions for all the variables used in the empirical analysis are provided below.

Variables	Definition
CV	Coefficient of variation of VC experience in a syndicate
Gini	Gini coefficient of VC experience in a syndicate
Company Closeness	Closeness centrality of entrepreneurial firms in a network consisting of professional relationships of founding team members
Switching	A binary variable that equals to 1 if all of the investing VC firms no longer invest in subsequent rounds
Company Age	Number of years since founding of the company until the time of a focal investment round
Exp of Lead	Number of prior investments made by lead investor of a focal deal
Seed Stage	A dummy indicating a focal round is of seed stage
Early Stage	A dummy indicating a focal round is of early stage
No of VCs	Number of VC investors in a focal round
DealSize	Investment size of a deal in million USD
GVC Leader	A dummy indicating whether a lead investor is backed by government
GVC Round	A dummy indicating whether there is any government-backed VC firm in a focal round
Est. Good Exit Prob	Estimated probability for an entrepreneurial firm to have a good exit that is either an IPO or an acquisition with disclosed value of at least twice of total capital invested
Dis. to VC < 50 miles	A dummy indicating whether the geographic distance between VC firms and an entrepreneurial firm is less than 50 miles
Dis. to VC 50-100 miles	A dummy indicating whether the geographic distance between VC firms and an entrepreneurial firm is between 50 and 100 miles
Foreign HQ-VC	A dummy indicating whether a foreign VC invests in a focal round
Max Fund Size	Maximum size of all the investing fund in a round
Max VC Exp	Maximum experience of all the investing VC firm in a round

A.III: Robustness Test: Effects of Network Centrality on Heterogeneity of VC Syndicates

Notes: This table reports results from estimating equation (14) in OLS by including fixed effects of lead VC firms. Compared to the baseline results reported in Table **??**, *GVC Leader* is absorbed by the fixed effects and thus dropped from the estimation. Analysis is carried out by rounds of different sequence numbers (i.e., 1st, 2nd, 3rd, and 4th and later rounds). Columns 1 through 4 show results using CV as the measure for syndicate heterogeneity, whereas Columns 5 through 8 report results using Gini as the syndicate heterogeneity measure. Standard errors are clustered at entrepreneurial firm state level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	CV	CV	CV	CV	Gini	Gini	Gini	Gini
	1st Round	2nd Round	3rd Round	4th and Later Rounds	1st Round	2nd Round	3rd Round	4th and Later Round
Closeness Centrality	-4.579*	-4.288**	-0.899	-1.031	-4.396***	-2.715*	-1.487	-0.510
	(2.282)	(1.706)	(3.076)	(1.006)	(1.597)	(1.444)	(2.297)	(0.740)
Log(Company Age)	0.0365***	0.0252*	0.0441*	0.0406***	0.0261***	0.0175	0.0247	0.0302***
	(0.0135)	(0.0140)	(0.0231)	(0.0136)	(0.00865)	(0.0112)	(0.0175)	(0.0108)
Log(DealSize)	-0.0292**	-0.0644***	-0.0366*	0.00569	-0.0178**	-0.0411***	-0.0183	0.00519
	(0.0117)	(0.0111)	(0.0194)	(0.01000)	(0.00804)	(0.00849)	(0.0131)	(0.00793)
Log(Exp of Lead VC)	0.0454**	0.0434	0.0527	-0.00545	0.0296*	0.0313	0.0334	-0.00932
	(0.0212)	(0.0318)	(0.0400)	(0.0278)	(0.0150)	(0.0237)	(0.0304)	(0.0205)
Log(No. of VCs)	-0.309***	-0.254***	-0.237***	-0.335***	0.0266***	0.0723***	0.0751***	0.0170
	(0.0144)	(0.0156)	(0.0224)	(0.0211)	(0.00890)	(0.00843)	(0.0141)	(0.0102)
Seed Stage	0.0324	0.0127	0.0522	-0.0305	0.0369	0.00225	0.0246	-0.0242
	(0.0714)	(0.0358)	(0.0428)	(0.0450)	(0.0529)	(0.0246)	(0.0367)	(0.0310)
Early Stage	0.0161	0.0138	0.0582**	0.0618***	0.0238	0.0139	0.0370**	0.0432***
	(0.0596)	(0.0405)	(0.0227)	(0.0152)	(0.0448)	(0.0295)	(0.0179)	(0.0116)
Lead VC Firm Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Investment Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y
ENT Firm State Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1779	1985	1508	2757	1779	1985	1508	2757
Adjusted R^2	0.400	0.381	0.365	0.358	0.330	0.287	0.290	0.257

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

A.IV: Results for Syndication and Survival Equations

Notes: This table reports results from correcting for selection by jointly estimating equations (17a), (17b), and (17c) using observations of rounds raised between 2010 and 2014. Analysis is carried out by rounds of different sequence numbers (i.e., 1st, 2nd, 3rd, and 4th and later rounds). This table reports coefficients from estimating equations (17b) and (17c) that describe the formation of a syndicate and survival to a subsequent round, respectively. All standard errors are clustered at the entrepreneurial firm state level.

	(1) 1st Round	(2) 2nd Round	(3) 3rd Round	(4) 4th and Later Round	(5) 1st Round	(6) 2nd Round	(7) 3rd Round	(8) 4th and Later Round
Heterogeneity Measure Used	CV	CV	CV	CV	Gini	Gini	Gini	Gini
Results for Equation (17b)	Syndicate	Syndicate	Syndicate	Syndicate	Syndicate	Syndicate	Syndicate	Syndicate
Ind HHI	0.276**	0.355***	0.490***	0.220*	0.278**	0.358***	0.481***	0.220*
	(0.116)	(0.113)	(0.168)	(0.119)	(0.115)	(0.113)	(0.170)	(0.119)
Log(Deal size)	0.191***	0.394***	0.474***	0.442***	0.188***	0.394***	0.474***	0.442***
	(0.0357)	(0.0350)	(0.0411)	(0.0255)	(0.0364)	(0.0350)	(0.0416)	(0.0255)
Early Stage	0.452***	0.233***	0.0939	0.112	0.450***	0.235***	0.0898	0.112
	(0.0960)	(0.0671)	(0.0918)	(0.0743)	(0.0967)	(0.0673)	(0.0930)	(0.0743)
Seed Stage	0.762***	0.598***	0.420***	0.465***	0.761***	0.601***	0.422***	0.465***
	(0.108)	(0.0799)	(0.162)	(0.140)	(0.110)	(0.0800)	(0.155)	(0.140)
Log(Company age)	0.00953	-0.0794	-0.157*	-0.186***	0.0115	-0.0782	-0.156*	-0.186***
	(0.0415)	(0.0558)	(0.0813)	(0.0613)	(0.0403)	(0.0558)	(0.0822)	(0.0613)
Log(Exp of Lead VC)	0.190***	0.176***	0.184***	0.187***	0.191***	0.176***	0.184***	0.187***
	(0.0119)	(0.0158)	(0.0198)	(0.0146)	(0.0117)	(0.0159)	(0.0199)	(0.0146)
GVC leader	0.0442	0.0334	0.224	0.142	0.0459	0.0294	0.222	0.140
	(0.384)	(0.393)	(0.659)	(0.327)	(0.385)	(0.396)	(0.659)	(0.327)
Investment Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y
ENT Firm State Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Results for Equation (17c)	Survival	Survival	Survival	Survival	Survival	Survival	Survival	Survival
Log(No of Investors)	0.205***	0.0915	0.203***	-0.00212	0.209***	0.0884	0.220***	0.0234
	(0.0445)	(0.0723)	(0.0769)	(0.0528)	(0.0406)	(0.0682)	(0.0716)	(0.0535)
Log(Deal size)	0.111***	0.169***	0.177***	0.172***	0.117***	0.170***	0.173***	0.165***
	(0.0407)	(0.0330)	(0.0517)	(0.0259)	(0.0382)	(0.0324)	(0.0513)	(0.0262)
Early Stage	-0.139	-0.401***	0.114**	0.0890	-0.133	-0.403***	0.118**	0.0878
	(0.0897)	(0.0757)	(0.0564)	(0.0665)	(0.0918)	(0.0755)	(0.0550)	(0.0663)
Seed Stage	0.0892	-0.0931	0.373***	0.274**	0.0938	-0.0947	0.358***	0.264*
	(0.105)	(0.124)	(0.128)	(0.135)	(0.109)	(0.126)	(0.123)	(0.135)
Log(Company age)	-0.152***	-0.438***	-0.302***	-0.423***	-0.155***	-0.440***	-0.304***	-0.420***
	(0.0306)	(0.0376)	(0.0873)	(0.0543)	(0.0276)	(0.0365)	(0.0845)	(0.0543)
Log(Exp of Lead VC)	0.0296**	0.0325**	-0.00723	0.0259**	0.0276**	0.0324**	-0.00876	0.0229*
	(0.0127)	(0.0144)	(0.0102)	(0.0126)	(0.0124)	(0.0152)	(0.00999)	(0.0126)
GVC leader	-0.221	-0.168	-0.438	-0.205	-0.205	-0.164	-0.440	-0.199
	(0.302)	(0.216)	(0.278)	(0.272)	(0.308)	(0.217)	(0.280)	(0.271)
Investment Year Dummies	Y	Y	Y	Y	Y	Y	Y	Y
ENT Firm State Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Industry Dummies	Y	Y	Y	Y	Y	Y	Y	Y
Observations	3261	2942	2134	3791	3261	2942	2134	3791

Standard errors in parentheses
* $p < .1$, ** $p < .05$, *** $p < .01$