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INTRA-GROUP TRANSFERS AND GROUP FORMATION

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Abstract:

In this paper we consider different forms of intra-group transfers and the resulting type of group formation. We introduce the concept of partial joint liability and revenue sharing and show that this form of intra-group transfer may result in heterogeneous group formation. Its uniqueness is established by the fact that other transfer schemes always result in homogenous group formation.

JEL codes: O12, O16.

Keywords: Heterogeneous group formation, partial joint liability and revenue sharing

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1. Introduction

Group formation is a crucial part in joint responsibility based group lending.

Self-formed groups provide mutual guarantees by being jointly liable for loan repayment. It mitigates the costs and risks of extending loans to the poor and thus deal with problems related to asymmetric information.³

The existing literature shows that the use of joint liability and self-selection of group members can separate the “risky” from the “safe” borrowers. Consequently, homogenous group formation in terms of risk characteristics of the borrower’s project turns out to be the equilibrium outcome.⁴ Borrowing partner’s better information works as a screening device and careful peer selection helps in dealing with the adverse selection problem.⁵

The intuition behind homogenous matching as an equilibrium outcome is that the expected gain of a risky borrower matched with a safe borrower cannot compensate the loss of a safe borrower matched with a risky one. Hence, Ghatak (1999) shows that any transfer payment from the risky type to the safe type cannot generate heterogeneous group formation.

In this paper we consider different types of intra-group transfers and the resulting composition of the self selected group in terms of the homogeneity or heterogeneity of occupational risks. Specifically, we consider the borrowers’ type of being safe or risky as dependent on their occupation rather than based on their attitude

³ According to the 1995 World Bank estimate, in most developing economies the formal financial sector reaches only the top 25% of the economically active population and the bottom 75% have no access to financial source.

⁴ Experimental studies by Abbink et al. (2006), Gine et al. (2006), Natrajan (2004), empirical study by Kritikos et al. (2005) and theoretical studies by Aghion et al. (2000), Ghatak, (1999, 2000, 2002), Ghatak et al.(1999), Murdoch (1999) and Van Tassel(1999) confirms that the self selection of group borrowers leads to homogenous group formation.

⁵ Being physically close to each other, they harness the existing social proximity, which provide social collateral to substitute physical collateral. Gine et al. (2006) and Aghion et. al. (2000) argue that it is difficult to improve repayment discipline through “peer pressure” in urban economies than in “close-knit rural” communities. Group lending is feasible in village economies that are closely knit and they share information and therefore self selection of group members may provide them opportunity to match in a homogenous manner.

towards risk.⁶ We show that only a particular form of intra-group transfer which we refer to as *partial joint liability and revenue sharing* (PJLRS) may result in heterogeneous group formation. The issue of intra-group transfers and the resultant group formation is yet to be addressed in the literature.

In the PJLRS transfer scheme the risky borrower compensates the safe one by sharing a portion of the returns if successful and the safe borrower is jointly liable for repayment if he is successful and the risky borrower is unsuccessful. Thus PJLRS enables the safe borrower to fulfill his individual repayment liability if he is unsuccessful and the risky type is successful.⁷ Hence, the risky type is not jointly liable for repayments. PJLRS works like a risk pooling or diversified portfolio in the sense that if the group members are in the same occupation and have the same source of income then the adverse shocks will affect them simultaneously and may not help in meeting the repayment obligations.

We also consider alternative forms of intra-group transfers and show that they always result in homogeneous group formation. This also establishes the uniqueness of PJLRS scheme in generating heterogeneous group formation.

The PJLRS scheme and our findings conform to the empirical study by Sadoulet and Carpenter (2001) who observes heterogeneous groups because risky members make regular payments to safe group members so that the safe borrowers can repay the risky borrower's loan during bad times.⁸ Several other empirical studies like Kugler and Oppes (2005), Lensik and Mehrteab (2003), Nagarajan et al. (1999)

⁶ Let us consider a hypothetical example of fish cultivation and mat weaving as two possible occupations. Fish is susceptible to diseases hence; fish cultivation is relatively *risky* in terms of the probability of success. Mat weaving is a relatively *safe* business however; the returns are relatively lower compared to fish cultivation. A person specialized in fish cultivation cannot be a specialist mat weaver. We assume that these occupations are pursued over generations and switching occupation is prohibitively costly.

⁷ If both types are successful then they are individually liable for their repayments and if both are unsuccessful then there are no repayments.

⁸ Sadoulet and Carpenter (2001) analyze a 1995 survey of micro credit program groups in Guatemala.

provide evidence to the existence of heterogeneous groups. Survey data in Chatterjee (2007) from the villages in the district of North 24 Pargana in West Bengal, India, provides evidence to self help group formation with heterogeneous occupation like small scale grocer, poultry farmer and so on.⁹

The existing theoretical researches on heterogeneous group formation do not consider the issue of intra-group transfers. Gangopadhyay and Lensink (2005) shows that co-signing of debt contracts induces heterogeneous group formation. Sadoulet (1999) shows that joint liability can be used to create credible insurance arrangements among group partners which may result in heterogeneous group formation. In a recent paper Guttman (2008) shows that the homogeneous group formation result can be reversed in the presence of the threat of not refinancing if the group defaults. Chatterjee and Sarangi (2005) show that when group formation is costly heterogeneous borrowers located closely can have higher repayment than safe borrowers who are distantly located from one another.¹⁰ In the context of imperfect information, Aghion and Gollier (2000) show heterogeneous groups is possible and efficient.

This paper is organized as follows. Section 2 contains the basic model and in Sections 3 we introduce PJLRS. In section 4, we explore alternative intra-group transfer schemes and in section 5, we provide the concluding remarks.

2. The model

⁹ Ross and Savanti (2005) shows that group formation does not follow the screening mechanism as discussed in the theory but may be formed according to geographical location. Further, they note that borrowers do not undertake too risky projects. Shaw (2004) based on the evidence from the Sri-Lanka summarizes that occupation selection is the key factor of poverty exit. Since farmers rely on single crop farming, the massive harvest failure due to 1996 drought lead to 90% of cultivation loans to fall into arrears. Since 1996, Micro Finance Institutions (MFIs) are imposing restrictions on single-season cultivation lending and encouraging them to switch to non-farm microenterprises.

¹⁰ Theoretical models advocating homogeneous group formation are based on the assumption that group members have perfect information about each other or gathering information is costless.

In the model we consider borrowers who are from economically poor background without any collateral and thus need to borrow capital to invest in a self-employment project. The borrowers can be either of a *safe* (S) or *risky* (R) type.¹¹ *Safe* and *risky* refers to the type of occupations which the people have been pursuing for generations and we assume that it is prohibitively costly to switch occupations. The types are not defined with respect to their attitude towards risk but are occupation based and therefore, idiosyncratic. The probabilities of success of the S and R types are P_S and P_R , and are assumed to be independent of one another. We assume that $1 > P_S > P_R > 0$. We allow for sufficient heterogeneity by assuming that the return from the risky occupation differs from the safe one. Let R_R and R_S be the returns from the risky and safe occupations. We assume that $R_R > R_S$. Unlike Ghatak (1999), Morduch (1999), and Natarajan (2004) we do not assume that both types of borrowers have the same mean return i.e. $P_R R_R \neq P_S R_S$.

Each borrower borrows one unit for the self-employment project and the individual liability, r , includes principal and interest. The members of the group are jointly liable for the repayment if one member is unsuccessful. Let c be the joint liability. In our model the loan repayment depends only on the success of the borrowers in the group. A group can repay if at least one of them succeeds, which implies $R_R, R_S \geq c$. The terms of the contract represented by r and c are treated as exogenous variables. That is, like Guttman (2008) we are analyzing a generic case rather than inquiring into the optimal contract.

¹¹ Like other papers, we assume that a group consists of two members. In our model the borrower's type is revealed from the loan application. The borrower cannot misreport his type because lender can verify without incurring any cost whether the borrower is pursuing the occupation stated in the loan application. Further, other group members or members from the community can report to the lender.

We begin our analysis of group formation without intra-group transfers.

Borrowers are assumed to have perfect information about each other's occupational type. The set of possible types of groups is $G = \{(S, S), (S, R), (R, R)\}$. The expected payoff of a type- i borrower grouped with a type- j borrower is $EU_{ij}^i \forall i, j \in \{S, R\}$. The probabilities of success or failure in repayment of a group $(i, j) \in G$ are as follows.

Probability that i and j are successful and each repays r is $P_i P_j$. Probability that i and j fails and neither repays is $(1 - P_i)(1 - P_j)$. Probability that i (or j) succeeds and j (or i) fails, in which case i (or j) is jointly liable for the repayment $r + c$, is $P_i(1 - P_j)$ (or $P_j(1 - P_i)$). The expected payoff of borrower i is,

$$EU_{ij}^i = P_i P_j (R_i - r) + P_i (1 - P_j) (R_i - r - c) = P_i (R_i - r) - P_i (1 - P_j) c, \forall i, j \in \{S, R\}. \quad (1)$$

From (1) we get the expected payoffs of the individuals in different groups as,

$$\begin{aligned} EU_{SS}^S &= P_S (R_S - r) - P_S (1 - P_S) c, \\ EU_{RR}^R &= P_R (R_R - r) - P_R (1 - P_R) c, \\ EU_{SR}^S &= P_S (R_S - r) - P_S (1 - P_R) c, \\ EU_{SR}^R &= P_R (R_R - r) - P_R (1 - P_S) c. \end{aligned} \quad (2)$$

Heterogeneous group formation is possible if the following condition hold.

$$\begin{aligned} EU_{ij}^i &\geq EU_{ii}^i \\ EU_{ij}^j &\geq EU_{jj}^j, \quad \forall i, j \in \{S, R\}. \end{aligned} \quad C.1$$

Using equation (2) we get

$$\begin{aligned} EU_{SS}^S - EU_{SR}^S &= c P_S (P_S - P_R) > 0, \\ EU_{RR}^R - EU_{SR}^R &= c P_R (P_R - P_S) < 0. \end{aligned} \quad (3)$$

From equation (3) we observe that the S-type's expected profit grouped with the S-type exceeds that when he is grouped with the R-type. However, the R-type's expected profit when grouped with the S-type exceeds that when grouped with the R-

type. Thus we observe that heterogeneous groups is not possible because it violates the condition for heterogeneous group formation C.1.

The loss to the S-type grouped with the R-type which is $cP_S(P_S - P_R)$ exceeds the gain to the R-type grouped with the S-type, which is $cP_R(P_S - P_R)$. Hence, the R-type cannot compensate the S-type's loss in the case of heterogeneous group formation. These results are summarized in Proposition 1 and they conform to Ghatak's (1999) result.

Proposition 1: *In the case of joint liability lending, expected loss of S-type teamed with R-type exceeds the expected gain of the R-type teamed with the S-type. Therefore self-selection of group members leads to homogenous group formation.*

3. Partial joint liability and revenue sharing

In this section we introduce the concept of partial joint liability and revenue sharing (PJLRS). Suppose S and R decide to form a group. Then S and R decide to split R_R by a fraction θ i.e. if R type is successful it transfers θR_R to S and retains $(1 - \theta)R_R$ for himself. So if R is successful S always repays his own liability r . If both R and S are successful then they are individually liable for their repayment r . However, if R is unsuccessful then S is liable for the individual and joint liability thereby making a repayment $(r + c)$. EU_{SS}^S and EU_{RR}^R are the same as in equation

(2). However, under PJLRS EU_{SR}^S and EU_{SR}^R are as follows:

$$\begin{aligned} EU_{SR}^S &= P_S P_R (R_S + \theta R_R - r) + P_R (1 - P_S) (\theta R_R - r) + P_S (1 - P_R) (R_S - r - c) \\ &= P_S P_R (c + r) + P_S (R_S - r - c) + P_R (\theta R_R - r). \end{aligned} \quad (4)$$

$$EU_{RS}^R = P_R (R_R - \theta R_R - r) \quad (5)$$

From condition C.1 we know that S will prefer to group with R if

$$EU_{SR}^S - EU_{SS}^S = \theta P_R R_R - c P_S (P_S - P_R) - r P_R (1 - P_S) \geq 0. \text{ This condition can be}$$

rewritten as,

$$\frac{c P_S (P_S - P_R) + r P_R (1 - P_S)}{P_R R_R} \equiv \theta_1 \leq \theta. \quad (6)$$

From condition C.1 we know that R will prefer to group with S if

$$EU_{RS}^R - EU_{RR}^R = P_R (1 - P_R) c - \theta P_R R_R \geq 0. \text{ This condition can be rewritten as,}$$

$$\frac{c P_R (1 - P_R)}{P_R R_R} \equiv \theta_2 \geq \theta. \quad (7)$$

From equations (6) and (7) we observe that heterogeneous group formation will take place if both S and R are ready to match with each other, i.e., if $\theta_1 \leq \theta \leq \theta_2$.

This implies that the following condition referred to as C.2 is necessary and sufficient for the formation of heterogeneous groups.

$$\theta_1 - \theta_2 = \frac{r P_R (1 - P_S) + c P_S (P_S - P_R) - c P_R (1 - P_R)}{P_R R_R} \leq 0, \quad \text{C.2}$$

The results for the formation of heterogeneous groups under PJLRS are summarized in Proposition 2.

Proposition 2: (i) If $r \geq c$ then there will be homogeneous group formation. (ii) If $r < c$ then heterogeneous group is formed only if $c(P_S - P_R)^2 < P_R(1 - P_S)(c - r)$.

The proof of Proposition 2 follows from condition C.2. Intuitively, if the joint liability c exceeds the interest rate r then it is cheaper for both R and S types to go for

PJLRS that results in heterogeneous group formation. We present a diagrammatic representation of Proposition 2 in Figures 1 and 2 to clarify the intuitive explanation.

We first provide an explanation of the derivation of Figures 1 and 2.

Inequalities presented in (6) and (7) can be written as

$$\frac{\theta P_R R_R}{P_S(P_S - P_R)} - \frac{r P_R(1 - P_R)}{P_S(P_S - P_R)} \geq c \text{ and } c \geq \frac{\theta P_R R_R}{P_R(1 - P_R)}. \text{ Let}$$

$$x = \frac{\theta P_R R_R}{P_S(P_S - P_R)} - \frac{r P_R(1 - P_R)}{P_S(P_S - P_R)} \text{ and } y = \frac{\theta P_R R_R}{P_R(1 - P_R)}. \text{ We plot } x \text{ and } y \text{ against } \theta \in [0,1].$$

$$\text{Now, } x(\theta = 0) = -\frac{r P_R(1 - P_R)}{P_S(P_S - P_R)}, \quad x(\theta = 1) = \frac{P_R R_R}{P_S(P_S - P_R)} - \frac{r P_R(1 - P_R)}{P_S(P_S - P_R)}, \quad y(\theta = 0) = 0$$

$$\text{and } y(\theta = 1) = \frac{P_R R_R}{P_R(1 - P_R)}. \text{ Clearly } x \text{ and } y \text{ are increasing in } \theta. \text{ Suppose } x \text{ and } y \text{ are}$$

such that $y(\theta = 1) > x(\theta = 1)$ as shown in Figure 1. Consider any $c = c_1$. The condition

for R to group with S which is, $c \geq \frac{\theta P_R R_R}{P_R(1 - P_R)}$, hold in the region labeled 'A' and the

condition for S to group with R, which is, $\frac{\theta P_R R_R}{P_S(P_S - P_R)} - \frac{r P_R(1 - P_R)}{P_S(P_S - P_R)} \geq c$, holds in the

region labeled as 'B'. This implies that there is no θ that jointly satisfies the above

two conditions hence, heterogeneous group formation is not possible.

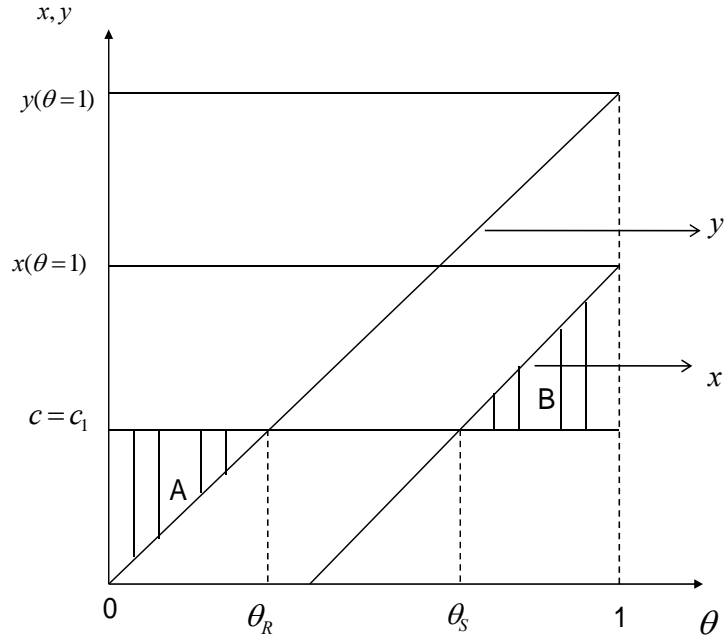


Figure 1

Suppose $y(\theta = 1) < x(\theta = 1)$ which is represented in Figure 2. Therefore, $x(\theta)$ is steeper than $y(\theta)$ hence the single crossing property is satisfied at $\theta = \hat{\theta}$ where

$$\hat{\theta} P_R R_R \left[\frac{1}{P_S (P_S - P_R)} - \frac{1}{P_R (1 - P_R)} \right] = \frac{r P_R (1 - P_R)}{P_S (P_S - P_R)}. \quad (8)$$

From equation (8) we observe that $\hat{\theta}$ is increasing in r . This implies that there is a critical r at which $\hat{\theta} = 1$. Increasing r beyond this critical level will result in the situation shown in Figure 1 since the single crossing property holds at $\hat{\theta}$ that satisfies $\hat{\theta} > 1$. Let us consider any c such that $c \geq \hat{c}$. In this case both conditions

$$c \geq \frac{\theta P_R R_R}{P_R (1 - P_R)} \quad \text{and} \quad \frac{\theta P_R R_R}{P_S (P_S - P_R)} - \frac{r P_R (1 - P_R)}{P_S (P_S - P_R)} \geq c$$

required for heterogeneous group formation are satisfied in the shaded region.

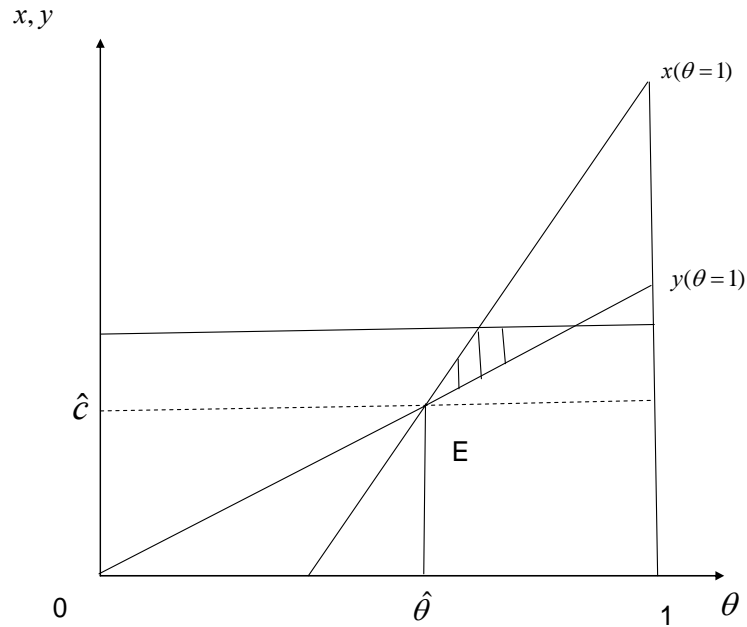


Figure 2

The intuition behind PJLRS that results in heterogeneous group formation is as follows. For the S-type the trade off is the low risk of default in a homogeneous group versus grouping with the R-type and always enjoying a share of the R-type's return if the latter is successful which has a lower probability. For the R-type the trade off is paying the joint liability in case of homogeneous group versus always paying a share of his return if grouped with the S-type. The transfer from the R-type to the S-type and the S-type's joint liability provides mutual insurance that may generate heterogeneous group formation. From Figure 2 we observe that if the joint liability is sufficiently high, that is $c \geq \hat{c}$, then there will be heterogeneous group. In other words the transfer from the R-type to the S-type must be low enough to provide incentive for the transfer to take place. For the S-type this low transfer is acceptable because the alternative is homogeneous group formation with high joint liability. Hence, heterogeneous group formation may result.

4. Alternative transfer schemes and group composition

In this section we discuss some alternative intra-group transfer schemes and the resulting group formations.

4.1. Revenue sharing when only one member succeeds

In this case the successful type gives a fraction θ of the return to the unsuccessful type and then they individually make their debt payment. In this case although there is no joint liability payment, however transfer from the successful team member enables co-member with the unsuccessful project to meet the debt obligation. The expected payoff of S and R types in the heterogeneous group are,

$$EU_{SR}^S = (P_R R_R (1 - P_S) - P_S R_S (1 - P_R))\theta + P_S P_R r + P_S R_S - P_S r - P_R r \text{ and}$$

$$EU_{SR}^R = (P_S R_S (1 - P_R) - P_R R_R (1 - P_S))\theta + P_S P_R r + P_R R_R - P_S r - P_R r.$$

The expected payoff S and R types when matched homogeneously are,

$$EU_{SS}^S = P_S R_S - 2P_S r + P_S^2 r \text{ and } EU_{RR}^R = P_R R_R - 2P_R r + P_R^2 r. \text{ Heterogeneous group}$$

formation can be sustained if the following conditions hold.

$$\begin{aligned} EU_{SR}^S - EU_{SS}^S \geq 0 &\Rightarrow r \geq \frac{(P_S R_S (1 - P_R) - P_R R_R (1 - P_S))\theta}{(P_S - P_R)(1 - P_S)}, \\ EU_{SR}^R - EU_{RR}^R \geq 0 &\Rightarrow r \leq \frac{(P_S R_S (1 - P_R) - P_R R_R (1 - P_S))\theta}{(P_S - P_R)(1 - P_R)}. \end{aligned} \quad (9)$$

Inequalities (9) imply that heterogeneous group formation will happen if

$$\frac{(P_S R_S (1 - P_R) - P_R R_R (1 - P_S))\theta}{(P_S - P_R)(1 - P_S)} \leq r \leq \frac{(P_S R_S (1 - P_R) - P_R R_R (1 - P_S))\theta}{(P_S - P_R)(1 - P_R)}.$$

However, this is not possible since $P_S > P_R$, hence there will be homogeneous groups.

4.2. Net revenue sharing

In this case the members of the group decide to share the net joint return. In case of heterogeneous group the S and R types receive θ and $(1 - \theta)$ portion of the

net joint return. In case of homogenous group $\theta = \frac{1}{2}$. The expected payoffs of each

member in different groups are as follows.

$$\begin{aligned}
EU_{SS}^S &= \frac{P_S^2}{2}(2R_S - 2r) + P_S(1 - P_S)(R_S - 2r), \\
EU_{SR}^S &= \theta\{P_S P_R (R_S + R_R - 2r) + P_S(1 - P_R)(R_S - 2r) + (1 - P_S)P_R(R_R - 2r)\}, \\
EU_{RR}^R &= \frac{P_R^2}{2}(2R_R - 2r) + P_R(1 - P_R)(R_R - 2r), \\
EU_{SR}^R &= (1 - \theta)\{P_S P_R (R_S + R_R - 2r) + P_S(1 - P_R)(R_S - 2r) \\
&\quad + (1 - P_S)P_R(R_R - 2r)\}.
\end{aligned} \tag{10}$$

The conditions for sustaining heterogeneous group formation are as follows.

$$\begin{aligned}
EU_{SR}^S \geq EU_{SS}^S &\Rightarrow r \geq \frac{A}{2P_S - P_S^2 - 2\theta B}, \\
EU_{SR}^R \geq EU_{RR}^R &\Rightarrow \frac{A}{2B - \theta B - 2P_R + P_R^2} \geq r, \\
A &= P_S R_S - \theta(P_S R_S + P_R R_R), \\
B &= P_S + P_R - P_S P_R.
\end{aligned} \tag{11}$$

Combining the above two we get

$$\frac{A}{2B - \theta B - 2P_R + P_R^2} \geq r \geq \frac{A}{2P_S - P_S^2 - 2\theta B} \Rightarrow \alpha \geq r \geq \beta.$$

This is not possible since $\alpha - \beta < 0$, hence there will be homogeneous groups.

4.3. Gross revenue sharing

In this case for heterogeneous group the gross joint revenue is split with S and R types receiving θ and $(1 - \theta)$ proportions. Each member then repays their individual debt if at least one is successful. For homogenous group the gross joint revenue is shared equally.

$$\begin{aligned}
EU_{SS}^S &= P_S^2(R_S - r) + 2P_S(1 - P_S)\left(\frac{R_S}{2} - r\right), \\
EU_{SR}^S &= P_S P_R(\theta(R_S + R_R) - 2r) + P_S(1 - P_R)(\theta R_S - r) + (1 - P_S)P_R(\theta R_R - r), \\
EU_{RR}^R &= P_R^2(R_R - r) + 2P_R(1 - P_R)\left(\frac{R_R}{2} - r\right), \\
EU_{SR}^R &= P_S P_R((1 - \theta)(R_S + R_R) - r) + P_S(1 - P_R)((1 - \theta)R_S - r) \\
&\quad + (1 - P_S)P_R((1 - \theta)R_R - r).
\end{aligned} \tag{12}$$

S matches with R, if the following two conditions hold.

$$\begin{aligned}
EU_{SR}^S \geq EU_{SS}^S &\Rightarrow r \geq \frac{P_S R_S - \mathcal{G}(P_S R_S + P_R R_R)}{(1 - P_S)(P_S - P_R)} \\
EU_{SR}^R \geq EU_{SS}^S &\Rightarrow r \leq \frac{P_S R_S - \mathcal{G}(P_S R_S + P_R R_R)}{(1 - P_R)(P_S - P_R)}
\end{aligned} \tag{13}$$

These two conditions cannot be satisfied simultaneously since $P_S > P_R$ hence there will be homogeneous groups.

4.4. Conservative sharing

In this case with heterogeneous group both S and R make joint liability payment if one succeeds and other fails. If R is successful he shares θ proportion of his return R_R with S and even if S fails R is jointly liable for repayment. S, if successful, do not share any of his return with R but is jointly liable for repayment if R fails. There is no revenue sharing in case of homogenous groups. The expected payoffs are as follows.

$$\begin{aligned}
EU_{SS}^S &= P_S(R_S - r) + P_S(1 - P_S)c, \\
EU_{SR}^S &= P_S P_R(R_S + \theta R_R - r) + P_S(1 - P_R)(R_S - r - c) + (1 - P_S)P_R(\theta R_R), \\
EU_{RR}^R &= P_R(R_R - r) + P_R(1 - P_R)c, \\
EU_{SR}^R &= P_S P_R((1 - \theta)R_R - r) + (1 - P_S)P_R((1 - \theta)R_R - r - c).
\end{aligned} \tag{14}$$

Heterogeneous group is formed if the following conditions hold.

$$\begin{aligned}
EU_{SR}^S \geq EU_{SS}^S &\Rightarrow \theta \geq \frac{P_S(P_S - P_R)c}{P_S P_R R_R}, \\
EU_{SR}^R \geq EU_{RR}^R &\Rightarrow \theta \leq \frac{P_R(P_S - P_R)c}{P_S P_R R_R}
\end{aligned} \tag{15}$$

Given that $P_S > P_R$, these two conditions cannot hold simultaneously hence heterogeneous group formation is not possible under this rule.

In this section we analyzed four intra-group transfer schemes. The sharing rules embedded in the first three schemes have different degrees of “fairness” in terms of the distribution of the joint return. On the contrary the conservative sharing rule is heavily biased towards the S-type. However, none of them result in heterogeneous group formation and homogeneous group formation turns out to be the unique equilibrium. This highlights the uniqueness of the PJLRS in generating heterogeneous group formation.

5. Conclusions

In this paper we analyzed different intra-group transfer schemes and the corresponding group formations. In contrast to most theoretical studies, we find that heterogeneous group formation is feasible even in the case of voluntary selection of group members under the partial joint liability and revenue sharing (PJLRS) scheme.

The intuition behind this result is the trade-off that each type faces. The transfer from the R-type to the S-type and the S-type’s joint liability provides mutual insurance that may generate heterogeneous group formation. The transfer from the R-type to the S-type must be low enough to provide incentive for the transfer to take place. For the S-type this low transfer is acceptable because the alternative is homogeneous group formation with relatively high joint liability because there is no transfer scheme in the case of homogeneous groups. We also analysed alternative transfer schemes and showed that all of them result in homogeneous group formation.

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