CHAPTER 24

Risk Sharing Between Households*

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Abstract

This chapter reviews the literature identifying the different roles that family and kinship networks play in sharing risk. After a brief overview of efficient risk sharing, we discuss the channels by which households pool risk and the motives for entering in binding informal arrangements. Informal risk sharing arrangements are often thought to be enforced via reciprocal repeated relationships that are not family or kin specific. Other explanations draw from behavioral psychology and evolutionary biology and emphasize the link between gene transmission, family ties, and altruism. Next, we turn to the formation of risk sharing arrangements, either as partially overlapping networks or as risk sharing groups. We find that both types of arrangements often coexist and complement each other. The nature of strategic interactions among individuals and households has been shown to affect the stability of the resulting risk sharing equilibria. We finish with a discussion of the available evidence on strategic link and group formation.

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1. INTRODUCTION

It has long been observed that human beings rely on friends and family for assistance in times of trouble Ben-Porath (1980). Assistance takes many forms: help to find a job when unemployed (e.g., Granovetter 1995b, Montgomery 1991, Topa 2001), to deal with illness and health-care costs (De Weerdt and Fafchamps 2007), to compensate for a bad harvest (Townsend 1994), to cope with old age (Edmonds, Mammen and Miller 2005), or to overcome the death of a loved one (Dercon, De Weerdt, Bold and Pankhurst 2006). Mutual assistance between households is particularly important in poor countries where social insurance is weak or inexistent and where risk is omnipresent (Fafchamps 2003b).

The household itself is the first port of call for risk sharing. This is so true that newlyweds are traditionally reminded that they are united 'for better and for worse, in sickness and in health'. There is a large literature focusing on the many roles that households play, risk sharing being one of them (Dercon and Krishnan 2000). In their Handbook Chapter on household formation in another volume, Fafchamps and Quisumbing (2007) discuss factors that influence the creation, composition, and survival of households. Households provide their members with benefits, which are generated most cheaply by living together. This simple observation, the authors argue, explains why households exist. However, living together imposes costs as well – particularly in terms of loss of autonomy. Whenever these costs rise above the gains from living together, households split.

In their presentation, Fafchamps and Quisumbing point out that whenever household goods and services can be purchased from the market, the motivation for forming or preserving a household weakens. This, for instance, explains why households in developed economies – especially in urban areas – tend to be smaller than households in less advanced countries. What the authors fail to emphasize is that certain goods and services can be provided outside the household and yet outside the market as well. This is the realm of informal arrangements, transcending household boundaries without taking the form of market transactions. As has been emphasized by many (e.g., Ben-Porath 1980, Posner 1980, Granovetter 1985), this intermediate space between household and market is occupied primarily by extended family and kinship networks.

The purpose of this chapter is to take stock of the literature in identifying the different roles that family and kinship networks play in sharing risk and why. After a brief overview of the literature on efficient risk sharing, we discuss the channels by which households pool risk. We follow with a discussion of the motives households may have for entering in binding informal arrangements. Some of the enforcement mechanisms discussed in the literature are not family or kin specific. They rely instead on quid-pro-quo: I help you today if you help me tomorrow. Others draw from a rich literature in behavioral psychology and evolutionary biology. This literature, discussed for instance by Cox and Fafchamps (2007), emphasizes the link between gene transmission, family ties, and altruism. We review the current evidence for or against these different hypotheses.

Next we turn to the formation of risk sharing arrangements, either as partially overlapping networks or as risk sharing groups. We find that both types of arrangements often coexist and complement each other. The nature of strategic interactions among individuals and households has been shown to affect the stability of the resulting risk sharing equilibria. We finish with an examination of the literature for evidence of strategic link and group formation.

2. EFFICIENT RISK SHARING

A good starting point for understanding risk sharing is a closed exchange economy. Imagine an island with N households, each with a variable and uncertain income stream y_t^i that depends on the state of nature s. We think of s as representing a complete depiction of the state of nature – i.e., for individual i as well as all other $N-1$ individuals on the island. Consumption is similarly denoted c_t^i. Individuals live infinitely and discount the future with common discount factor β. Intertemporal expected utility of individual i is written:

$$EU = \sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{S} \pi(s_{\tau t}) U_i\left[c_t^j(s_{\tau t})\right]$$

where $\pi(s_{\tau t})$ denotes the probability of state of the world s_τ at time t. There are no assets in the model.

The set of all Pareto efficient allocations is found by solving the following social planner problem for all possible welfare weights ω^j:[1]

$$\max \sum_{j=1}^{J} \omega^j \sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{S} \pi(s_{\tau t}) U_i\left[c_t^j(s_{\tau t})\right] \text{ subject to}$$

$$\sum_j c_t^j(s_{\tau t}) = \sum_j y_t^j(s_{\tau t}) \text{ (feasibility constraint)}$$

Let the Lagrange multiplier associated with each feasibility constraint be denoted $\lambda(s_{\tau t})$. First order conditions are of the form:

$$c_t^i(s_{\tau t}) : \omega^i \beta^t \pi(s_{\tau t}) U_i^{'}[c_t^i(s_{\tau t})] - \lambda(s_{\tau t}) = 0 \tag{2.1}$$

Since $\lambda(s_{\tau t})$ is the same for all individuals in each state of the world, we obtain the following set of conditions for Pareto efficiency:

$$\frac{\omega^j}{\omega^i} = \frac{U_i'(s)}{U_j'(s)} = \frac{U_i'(s')}{U_j'(s')} \text{ for all } s \text{ and } s' \text{ and all } i \text{ and } j$$

The above conditions are valid for interior solutions only. If a single household is risk neutral, it is expected to insure the others. In practice, this assumes that the risk neutral household has sufficient income to do so.

[1] We typically assume that $\sum_{i=1}^{N} \omega_i = 1$.

A useful example is when $U(c) = \log(c)$, which implies that $U'(c) = 1/c$. We then obtain:

$$\frac{\omega^j}{\omega^i} = \frac{c_t^j(s)}{c_t^i(s)} = \frac{c_{t+\nu}^j(s')}{c_{t+\nu}^i(s')} \text{ for all } s \text{ and } s', \text{ all } t \text{ and } \nu, \text{ and all } i \text{ and } j$$

From the above we see that the ratio of consumption is fixed across states of nature and over time. Risk sharing need not be egalitarian: if $\omega^j > \omega^i$, then $c^j > c^i$ always. Perfect risk sharing implies unchanging ranks in the distribution of welfare.

Since the Lagrange multiplier $\lambda(s_{\tau t})$ that enters the first order condition (2.1) only depends on aggregate income $\sum_j y_t^j(s_{\tau t})$, efficient risk sharing implies that individual consumption c_t^i in state $s_{\tau t}$ varies only with aggregate income. This stands in contrast with a no-risk sharing situation in which individual consumption c_t^j would track individual income y_t^j. This observation is the basis for an exclusion restriction test of risk sharing efficiency: regress individual consumption on aggregate income (or aggregate consumption c_t^a) and individual income y_t^j; if risk sharing is efficient, individual income should be non significant. Time-invariant household effects can be controlled for by first differencing the data, yielding a regression model of the form:

$$c_{t+1}^j - c_t^j = \alpha(c_{t+1}^a - c_t^a) + \beta(y_{t+1}^j - y_t^j) + e_t^j \tag{2.2}$$

where efficient risk sharing implies $\alpha = 1$ and $\beta = 0$. Coefficient β captures the extent to which the household manages to smooth consumption in the face of income shocks. Coefficient α measures the extent of risk pooling within the group.

Starting with Hayashi, Altonji and Kotlikoff (1996), a large empirical literature has used this approach to test risk sharing efficiency across households (e.g., Mace 1991, Cochrane 1991, Townsend 1994, Ravallion and Chaudhuri 1997, Kurosaki and Fafchamps 2002). The general conclusion is that considerable risk sharing appears to be taking place. Efficient risk sharing is not always achieved, however, especially for large persistent shocks such as long-term unemployment (Cochrane 1991) or disability (Fafchamps and Kebede 2007), and across village communities (Kurosaki and Fafchamps 2002).

The terms 'risk sharing' and 'consumption smoothing' are often used to mean the same thing. This can be misleading, however. To illustrate this point, let us extend our model to allow for 'taste shifters', that is, shocks that make the household need to consume more to keep its welfare unchanged. A good example are health shocks, which require households to incur additional expenditures to cover health care costs. Following Mace (1991) let b_t^j denote a taste shifter at time t for individual j. Expected utility is written:

$$EU_j = \sum_{t=0}^{\infty} \beta^t \sum_{\tau=1}^{S} \pi(s_{\tau t}) U_j\left[c_t^j(s_{\tau t}) - b_t^t(s_{\tau t})\right]$$

Efficient risk sharing now requires that consumption c_t^j compensate for b_t^j, e.g., to help household j pay for health care expense b_t^t. In this case evidence of that consumption is

smoothed, that is, remains constant in spite of fluctuation in b_t^j implies imperfect risk sharing.

3. FORMS OF RISK SHARING

Although the literature has customarily used the phrase 'risk sharing' to refer to tests based on (2.2), it is now recognized that consumption smoothing – i.e., a low value of β – can be obtained without any mutual insurance between households. This is best seen by introducing a asset in our exchange model, e.g., fiat currency (Sargent 1987). Households with a low income can now liquidate some of their savings to smooth consumption, while households with a high income can accumulate precautionary savings to deal with future shocks (e.g., Deaton 1991, Zeldes 1989). The introduction of an asset in the model makes it possible for households to smooth consumption without explicitly sharing risk.

A high value of α also obtains without mutual insurance whenever the local value of assets and consumption goods fluctuates with collective shocks. To see this, imagine that households in a closed economy keep fiat currency to hedge against fluctations in the production of perishable food. When aggregate output is low, the price of food rises to equilibrate the food market. Since the price of food today is high relative to its expected value tomorrow, the real rate of interest is high, inciting households to save more – and to consume less – even if their individual income was unaffected. Individual consumption is thus correlated with aggregate output even though there is no mutual insurance. A similar conclusion arises if a physical asset (e.g., livestock) is used in lieue of fiat currency: when aggregate output falls, the price of the physical asset falls as well (Sen, 1981).

Aggregate consumption smoothing may be possible if food is storable or if the markets for assets, food, and other consumption goods are integrated with the rest of the world. This will help avert large fluctuations in c_t^a – except in case of stocking out. Even in this case, however, local prices will typically fluctuate with local aggregate shocks whenever transactions costs or information asymmetries cause market friction. Local fluctuation in consumption and asset prices will affect individual decisions to save and dissave, and thus generate correlation in consumption fluctuation at the local level. The correlation between individual and aggregate consumption fluctuations $c_{t+1}^j - c_t^j$ and $c_{t+1}^a - c_t^a$ breaks down only if markets are so perfectly integrated with the rest of the world that all prices are constant.[2]

Reduced form tests of risk sharing based on (2.2) thus have little to say about explicit mutual insurance. Given this, the literature has begun to investigate the channels (if any) through which mutual insurance effectively takes place. Some of these channels help households deal with shocks after they have happened, for instance

[2] Contagion may also take place through markets for goods and services that are only locally traded – see Sen (1981) and his example of domestic servants being laid off during the Ethiopian famine of 1974. Correlation also breaks down when markets are totally nonexistent and every household lives in autarchy, but only in the unlikely absence of locally correlated shocks (e.g., rainfall, epidemics, natural disaster, trade cycle).

helping them to smooth consumption or to pay for health costs. Others channels assist households reduce income risk ex ante.

A large empirical literature has emerged that documents the role played by gifts and transfers between households as risk sharing mechanisms (e.g., Rosenzweig 1988, Rosenzweig and Stark 1989, Stark and Lucas 1988, Fafchamps and Lund 2003). Informal loans have also been shown to be important. Udry (1994) for Nigeria and Fafchamps and Gubert (2007a) for the Philippines further show that the repayment of informal loans is typically contingent on shocks affecting both parties. Contingent repayment is thus itself a form of risk sharing. According to Fafchamps and Gubert, contingent repayment takes place by letting borrowers in difficulty delay repayment and pay off part of the debt in labor.

Risk sharing takes other forms as well (Fafchamps 1992). Labor pooling is an institution commonly found in many developing countries. It takes many different forms, such as rotating arrangements and labor gangs. One of its purposes is to provide protection against health risk. Farming operations must be done in a timely manner. If a farmer is ill and cannot complete a critical task on time, the work of a whole season may be lost. Labor pooling enable farmers to seek assistance from their neighbors. In their discussion of labor pooling groups in rural Ethiopia, Krishnan and Sciubba (2004) point out the role that extended family and kinship play in the formation of these groups.

Fostering children from another family is a very common practice in many poor countries, particularly to enable children to attend a distant school (Akresh 2004a). Child fostering also takes place in response to shocks, such as the death of one or both parents (e.g., Akresh 2004b, Ksoll 2007). Evans (2004), for instance, illustrate the role that child fostering plays in caring for AIDS orphans in Africa. In all studies, child fostering takes place primarily between close relatives. In their work on South African pensioners, Case and Deaton (1998) and Duflo (2003) for instance document how frequent it is for children to live with their grandparents. Evans (2004) and Ksoll (2007) find the same for AIDS orphans.

The extended family and kinship networks provide other forms of protection against external circumstances. Those who flee drought and famine or roving bandits and lawless armies seek shelter among relatives and kin whenever possible (Sen 1981). Migrants provide shelter and assistance to freshly arrived migrants, creating tightly knit migration networks linking village of origin and place of destination (e.g., Munshi 2003, Beaman 2006).

Funeral societies are another illustration of insurance institutions that transcend the household. Dercon et al. (2006) document the importance of funeral societies in rural Ethiopia as a way of dealing with funeral costs. While the funeral society is in many way a formal institution with clearly defined regular contributions, the enforcement of contractual obligations often rests on extended family and kinship ties (Barr and Stein 2008).

Networks of blood and kin also serve to relay important information, such as information about job or business opportunities that help households deal with

unemployment shocks. Granovetter (1995b), for instance, documents the role that networks play in matching workers and employers, thereby serving an important role in helping unemployed workers find a job – see also Topa (2001). Montgomery (1991) proposes a model in which employed workers help their employer identify suitable recruits. In practice, these new recruits often are relatives and kin members. Munshi (2003), Beaman (2006), and Granovetter (1995a) provide evidence of how information about business opportunities circulates in family and ethnic networks, helping individual deal with unemployment and business risk.

Sometimes cooperation goes beyond the exchange of useful information, as when individuals pool resources together to create a new business, thereby sharing commercial risk. At the heart of many businesses a partnership can be found, and many partnerships are grounded in family and kin ties. Relatives for instance may pool their efforts into a larger farm, as in the case of vertically or horizontally integrated households (Binswanger and McIntire 1987).

Risk sharing can also become embedded in market transactions themselves. This is for instance the case for supplier credit in many developing countries. Since small entrepreneurs often delay payment to suppliers as a way of dealing with liquidity shortages, trade credit de facto plays a risk-sharing role (Fafchamps 2004). It has sometimes been argued that family and kin networks play a role in market transactions themselves. Fisman (2003), for instance, interprets evidence that supplier credit is preferentially given to members of the same ethnic group as evidence of family ties.

Fafchamps (2001) argues that this interpretation is probably too strong: because close relatives are in long-term relationships, exchanges between them seldom take the form of a well-defined market transaction. Fafchamps and Lund (2003), for instance, show that mutual assistance between close relatives takes the form of gifts and transfers while transfers between friends or distant relatives are more likely to be described as 'loans'. It is possible to find examples of preferential hiring and of higher wages paid to employed relatives (Barr and Oduro 2002). But there is also anecdotal evidence that entrepreneurs are reluctant to employ relatives because they are difficult to discipline. A much more common form of family involvement in the business is as unpaid help or partners. This ensures that profits are shared and is a better reflection of the long term risk sharing relationship that typically bind extended family members.

4. THE MOTIVES FOR RISK SHARING

Idiosyncratic risk generates potential gains from trade: risk averse individuals subject to independent sources of risk can increase their welfare by pooling risk. Many of the social welfare institutions that exist in developed economies today began some hundred years ago as mutual insurance societies against illness, death or unemployment. For covariate risk, mutual gains from trade arise whenever economic agents differ in their degree of

risk aversion. In this case it is common for a risk neutral agent – e.g., a rich individual or a corporation – to insure risk averse individuals subject to common shocks.

Risk sharing between households can in principle be achieved through contracts enforceable by courts. This applies for instance to insurance contracts, joint liability contracts, and corporations, among others. Court enforcement is not always feasible, however. Courts may be absent or unreliable, or the arrangement may be unverifiable, illegal, or simply unprotected by law. Because of the contingent nature of mutual insurance arrangements, writing a complete contract allowing for all contingencies may be too time consuming or simply impossible. Furthermore, many transactions are too small to justify court action, or the parties too poor to recover anything in case of victory in court. This is particularly true in developing countries where many firms and market transactions are small and many people are too poor to be sued.

In these circumstances the legal enforcement of risk sharing contracts is problematic even though the mutual gains may be large. Informal enforcement mechanisms become necessary. The literature has explored several mechanisms by which risk sharing between households can be sustained without reliance on the court system. Detailed discussions are provided in Platteau (1994a), Platteau (1994b), Fafchamps (1992), and Cox and Fafchamps (2007).

One possibility is to rely on preferences and emotions, either directly in the form of altruism, or indirectly via social norms that are punished through guilt and shame. Another possibility is to rely on long-term strategic interaction among self-interested individuals. The first avenue has been explored in detail by psychologists, sociologists, and anthropologists, but has also received significant attention from economists. The second was initially put forth by anthropologists and sociologists and subsequently formalized by economists. In this section we present an overview of this literature, beginning with the repeated interaction approach.

4.1 Self-interest and repeated interaction

Economists have paid most attention to mechanisms that rely on rational self-interest. Building on Evans-Pritchard (1940)'s observation that it is scarcity not prosperity that makes the Nuer [in Southern Sudan] generous, Posner (1980) pointed out that informal arrangements can be build on quid pro quo: 'I help you today because I expect you to help me tomorrow'. Behavioral evidence supports the quid pro quo idea: individuals in experimental situations conditionally cooperate even in finitely repeated games. This point was made most forcefully by Axelrod (1984), who described tit-for-tat behavior in such experiments as 'brave reciprocity'. An evolutionary explanation has been proposed for the emergence of this human trait, arguing that brave reciprocity makes it possible for human societies to achieve cooperation in a rapid and decentralized manner.

These insights have subsequently been formalized with the help of repeated game theory to explain how contracts can be enforced in the absence of legal recourse.

Early applications of this principle can be found in the literature on sovereign debt (e.g., Eaton and Gersovitz 1981, Kletzer 1984, Eaton, Gersovitz and Stiglitz 1986). Repeated game theory was first applied to risk sharing by Kimball (1988) and Coate and Ravallion (1993). The centerpiece of this approach is an enforcement constraint which takes the form of an ex post voluntary participation condition of the form:

$$U_i(y_s^i) - U_i(c_s^i) \leq \sum_{t=s+1}^{\infty} \beta^t E_s(U_i(c_t^i) - U_j(y_t^i)) \tag{4.1}$$

where c_s^i denotes the consumption level guaranteed to individual i in period s if he/she continues to participate to the informal risk sharing arrangement, $\beta \leq 1$ is a discount factor, and y_t^i is the autarky level of consumption i reverts to if he/she reneges on his/her obligations to assist others in need. The left-hand side represents the short-term gain from defecting; it is positive whenever $y_t^i > c_t^i$, that is, whenever $\tau_s^i \equiv y_s^i - c_s^i < 0$ and i is asked to assist others. The right-hand side represents the expected future gain from continued participation; the expectation is taken based on information available at time s. When i is risk averse, the expected gain from risk sharing is typically positive. For an informal risk sharing arrangement to be self-enforcing, inequality (4.1) must hold in all states of the world, all periods t, and all households i.

The repeated game framework has provided a number of useful insights. As shown by Coate and Ravallion (1993), self-enforcement constraints set an upper limit on the amount of transfer that can be achieved in the absence of altruism. Fafchamps (1999) showed that egalitarian risk sharing cannot be achieved if some households are approximately risk neutral or, equivalently, able to self-insure. In such cases, asymmetric risk sharing remains sustainable: the rich or risk neutral insure the poor or insecure, an arrangement that has been called 'patronage' in the literature (e.g., Platteau 1995b, Platteau 1995a).

The voluntary participation constraing (4.1) is easier to satisfy for short-lived shocks. It is more difficult to satisfy (4.1) for shocks that are persistent – e.g., a chronic illness – or permanent – e.g., disability. I illustrate this formally with a simple extension of the above model borrowed from De Weerdt and Fafchamps (2007). Consider two agents i and j who share health risk.[3] Let utility $U_i = U_i(y_t^i - \tau_t^i - h_t^i)$ where τ_s^i represents a transfer paid by i to j and $h_t^i \geq 0$ is a health shock. The voluntary participation constraint takes the form:

$$U_i(y_s^i - h_s^i) - U_i(y_s^i - \tau_s^i - h_s^i) \leq E_s[F] \tag{4.2}$$

with

$$F \equiv \sum_{t=s+1}^{\infty} \beta^t (U_i(y_t^i - \tau_t^i - h_t^i) - U_i(y_t^i - h_t^i))$$

[3] The same reasoning applies to a group of arbitrary size, but focusing on only two individuals simplifies the notation somewhat.

Let $\tau_s^{\max}$ denote the maximum transfer to j that satisfies (4.2). Coate and Ravallion (1993) have shown that $\tau_s^{\max}$ is a nondecreasing function of $E_s[F]$: the larger $E_s[F]$ is, the larger is $\tau_s^{\max}$. Sustainable transfers must satisfy $\tau_s^i \leq \tau_s^{\max}$. If β is sufficiently far from 1, (4.2) is more likely to bind, and $\tau_s^{\max}$ is more likely to limit the size of transfers τ_s^i below what would be required for perfect insurance. This general principle can be used to determine how transfers depend on whether shocks are persistent or not.

Suppose that j faces a large health shock h_j while i does not. Let $E_s[F]$ denote the continuation payoff for i if j's shock is purely transitory, with corresponding $\tau_s^{\max}$. Only transfers $\tau_s^i \leq \tau_s^{\max}$ satisfy (4.2). Now let $E_{s'}[F]$ denote the expected gain from insurance for i if the health shock to j is not transitory but persistent. A persistent shock means that j will need assistance not only in period s but also in subsequent periods. Future expected transfers to j reduce the value of the risk sharing arrangement $E_{s'}[F]$ for i, with a corresponding fall in $\tau_{s'}^{\max}$. If the voluntary participation constraint (4.2) is binding for a transitory shock $\tau_s^i = \tau_s^{\max}$, it follows that the transfer following a persistent shock $\tau_{s'}^j < \tau_s^j$. This shows that risk sharing based on anticipated reciprocity is less able to insure against persistent shocks than against transitory shocks. The logic is simply that someone who is chronically ill is less able to reciprocate in the future and therefore less valuable. A similar argument applies to persistent income shocks.[4]

Further extensions by Kocherlakota (1996), Ligon, Thomas and Worrall (2001), Foster and Rosenzweig (2001) and Fafchamps (1999) have bridged the gap between gift exchange and quasi-credit of the kind described by Platteau and Abraham (1987), Udry (1994), and Fafchamps and Gubert (2007a). They have shown that self-enforcing risk sharing contracts are typically not memory-less, even if the Pareto efficient allocation is. This important insight can manifest itself in various ways, one of which is the appearance of quasi-credit, that is, informal loans without interest and set repayment date, but which can only be received in case of need. Calling transfers 'loans' enables the giver to claim a larger future transfer than in a memory-less gift exchange contract. This makes the self-enforcement constraint (4.1) easier to satisfy and increases risk sharing. If there is perfect enforcement, quasi-credit is an unnecessary complication to achieve risk sharing. Hence observing quasi-credit is evidence of limited commitment.

In repeated prisoner's dilemma, the threat of exclusion is the cornerstone of the enforcement strategy: breach of contract is deterred by threatening exclusion. The cost of exclusion rises if an informal arrangement is embedded within a long-term multi-faceted relationship: breaching an informal arrangement not only leads to the loss of further exchange within the arrangement, but possibly leads to the loss of other benefits

[4] Here we have assumed that agents immediately observe whether a shock is persistent or not. If this is not the case, the realization that a shock is persistent may only come when it is repeated in subsequent periods. In this case $E_s[F]$ falls as the shock is repeated and $\tau_s^{\max}$ falls as well. We thus expect 'donor fatigue': if agents are sufficiently impatient, a repeated shock should trigger smaller and smaller transfers as time passes.

associated with this relationship. This point was for instance made by Basu (1986) and many anthropologists. Blood relations are long lasting and generate multifaceted relations between individuals. Consequently, they provide the perfect environment for enforcing informal arrangements.

Repeated game theory has also found multiple uses in explaining market institutions (e.g., Greif 1993, Fafchamps 2004). What this body of work has brought to light is the importance of information sharing for informal enforcement. Such contract enforcement processes are typically called reputation mechanism or reputational contracts. Kandori (1992) illustrates how sharing simple information about past behavior can be used to deter cheating in a repeated game setting. This point has been further expanded on by Taylor (2000) and Raub and Weesie (1990) to information sharing within networks. Market efficiency in general depends on the type and extent to which accurate information is shared, and on the inference economic agents draw from past action, a point made by Ghosh and Ray (1996) and by Fafchamps (2002).

It follows that information sharing networks play an important role in market efficiency, even when they do not directly enforce contracts, because they circulate information that is relevant to reputational mechanisms. Fafchamps (2000) and Fafchamps (2003a), for instance, provides evidence that networks facilitate market exchange. Empirical evidence on the role of networks in enforcing contracts is provided, for instance, by Fafchamps and Minten (1999) and Fafchamps and Minten (2002). We have seen that family and kinship often circulate market relevant information. So doing, they may be instrumental to market exchange. This point has been emphasized, for instance, by Granovetter (1985) who argues that all market transactions are embedded in a social context.

4.2 Intrinsic motivation

Repeated game theory is not the only possible enforcement mechanism in informal arrangements. Emotions can also be enlisted to help enforce contracts, a point that has often been overlooked by economists.

The first emotion that is instrumental in enforcing contracts is guilt, that is, the capacity for an individual to feel bad for failing to fulfill a social or moral obligation. Guilt has been studied by psychologists who have demonstrated that it critically depends on upbringing (Platteau 1994b). Individuals who have been repeatedly abused during childhood tend to have a guilt deficit, psychopaths representing the extreme case. If abused parents tend to abuse their own children and vice versa, the capacity to feel guilty may be partly inherited across generations.

Guilt is the negative feedback an individual perceives for doing the wrong thing. It is also possible that an individual perceives a positive feedback for doing the right thing. Self-righteousness and the desire to conform to group norms are examples of such human emotions. They can also be harnessed in support of mutual assistance

arrangements. While all human beings probably have the latent capacity to experience self-inflicted positive and negative feedbacks of this kind, their object can be shaped by upbringing and religion, and are related to identity, a point we revisit below.

Another important emotion that can be mobilized to enforce informal arrangements is shame. Unlike guilt, shame is triggered by public exposure and disapproval and thus requires the sharing of information about one's actions. As Barr (2002) has illustrated, the capacity to resent shame varies across individuals. It also probably varies across cultures. Identification with a group plays an important role in shaming. Individuals who choose to exclude themselves from the rest of the community often feel little or no shame transgressing community rules – or may even derive pride from it (Blume 2002).

Other emotions also play an enforcement role. In many circumstances, it is not rational to retaliate after having been cheated. This means that the threat of retaliation is not subgame perfect and hence not credible. In practice, human beings often become angry and irrational as a result of being cheated. Out of a sense of outrage, they often lash out at the culprit in ways that are self-damaging. Or they decide to sue simply to make a point, to be righted, in spite of the fact that suing costs them time and money. Anger brings an element of irrationality into the situation that makes the threat of retaliation credible (Steiner 2007).

Altruism is another strong emotion – or combination of emotions – that can potentially be harnessed for the enforcement of informal arrangements (e.g., Cox 1987, Ravallion and Dearden 1988). Altruism provides an emotional reward for helping others (e.g., Andreoni 1989, Andreoni and Payne 2003, Stahl and Haruvy 2006). As pointed out by Durlauf and Fafchamps (2005), a bit of altruism is often sufficient to eliminate free riding in prisoner's dilemma situations. Voluntary contributions to public goods, such as a mutual insurance scheme, are easier to achieve if parties are altruistic towards each other.

Emotions are ultimately grounded in brain development processes that have evolved over millennia. The genetic capacity to experience emotions such as guilt and altruism has probably coevolved with the social development of human societies. It therefore should be no surprise that these emotions are related to the way human beings identify with a group of peers, and how they bond with other humans (Akerlof and Kranton 2000).

Since the path-breaking work of Dawkins (1989) on the selfish gene, altruism has been found to be stronger among genetically related individuals. Cox and Fafchamps (2007) devote much of their Handbook chapter on extended family and kinship networks to a review of the evolutionary psychology literature on altruism. The genetic nature of altruism may explain why family and kin ties facilitate the enforcement of informal risk sharing arrangements. Shared genes thus raise the incentive power of altruism. Identification with the family or kinship group also facilitates guilt and shame.

Given this, it is not surprising to find extended family and kinship networks to play a fundamental role in most nonmarket exchange – and in some forms of market exchange as well.

Identification with a group can also created artificially by providing bonding experiences such as initiation ceremonies and other kinship activities. Bonding is strongest if it is accomplished at a young age, probably around puberty and in teenage years. This tends to bond people of the same age together. Once the kin group has been socially engineered, it can serve many of the same functions as extended family.

Other social phenomena, such as religious sects and brotherhoods can also be used to generate strong bonds and create a family feel. Churches often seek to tap into the emotions triggered by family relationships by using titles such as 'father', 'brother', and 'sister'. The use of such titles demonstrates a desire to trigger the same emotional attachment as ideally found within an extended family.

4.3 Evidence on motives

The literature has sought to disentangle the respective strength of these different motives in explaining risk sharing between households. Perhaps influenced by the work of noneconomists (e.g., Sahlins 1972, Scott 1976), the early empirical economic literature on risk sharing focused on altruism and social norms. Examples of such work include Hayashi et al. (1996), Cox, Eser and Jimenez (1998), and Ravallion and Dearden (1988).

Following the advent of self-interested models of risk sharing, a number of papers have sought to test whether risk sharing is best explained by altruism or self-interest. Drawing on original data on short-term mutual insurance among Indian fishermen, Platteau and Abraham (1987) were probably the first economists to describe practices that could only be understood as a hybrid form of exchange between markets and interpersonal relationships. They dubbed these forms of exchange 'quasi-credit': like credit contracts, the borrower was expected to repay the amount borrowed to deal with an emergency; but unlike credit contracts, no interest was charged and no date was set for repayment.

These features were subsequently shown to arise naturally as a result of commitment constraints (e.g., Kocherlakota 1996, Fafchamps 1999). Ligon, Thomas and Worrall (2000) formalized this argument using a simulation model. Using detailed household data from Indian villages, Townsend (1994) had shown that efficient risk sharing was not achieved between households in the same village. Using the same data Ligon et al. (2001) estimated a structural risk-sharing model with commitment constraints and showed that the departures from fully efficient risk-sharing documented by Townsend were consistent with commitment constraints. Foster and Rosenzweig (2001) yield somewhat similar conclusions using data from Pakistan, albeit with a less ambitious estimation strategy.

Fafchamps and Lund (2003) revisit these issues using detailed household data from the Philippines. The starting point of their analysis is that, if there is perfect enforcement, quasi-credit is an unnecessary complication to achieve risk sharing. Hence observing quasi-credit is evidence of limited commitment. Fafchamps and Lund show that mutual assistance between close relatives takes the form of gifts and transfers while assistance between friends and distant relatives typically takes the 'quasi-credit' form described by Platteau and Abraham. Similar results are reported in Foster and Rosenzweig (2001) and De Weerdt and Dercon (2006). This is consistent with much of the previous evidence which shows that most transfers between households take place between close relatives (e.g., Hayashi et al. 1996, Cox et al. 1998, Lucas and Stark 1985). Since quasi-credit is predicted to arise only in the presence of binding commitment constraints (Fafchamps 1999), assistance among non closely related individuals is consistent with the self-enforcing mutual insurance model among self-interested agents. In contrast, mutual assistance between close relatives does not appear to be subject to similar constraints, a finding that the authors interpret as evidence of altruism.

In fairness, perfect enforcement may arise for reasons other than altruism. In the limited commitment model, voluntary participation constraints are not binding if agents are sufficiently patient. If agents are patient, however, contraints should not bind among distant relative either, so this does not explain all the empirical findings.[5] Perfect enforcement may also be achieved through external agents. Courts are not a serious possibility here because with court enforcement we would expect explicit insurance contracts (e.g., a mutual insurance society), not gifts and transfers, which are not contractible. Social norms supported by social sanctions are a more serious contender. However, if social sanctions are available to punish deviation from group-prescribed behavior, one may wonder why only assistance among close relatives is observed even though efficient risk sharing would require a much broader remit. Altruism among close kin therefore appears to be the simplest explanation for Fafchamps and Lund's findings, even if it is not the only possible one.

Using census data from an Tanzanian village, De Weerdt and Fafchamps (2007) revisit this issue and examine whether gifts and loans respond equally to persistent and temporary illness shocks. While altruism imposes no restriction on the insurability of persistent shocks, we have argued earlier in this Chapter that reciprocal risk sharing arrangements based on self-interest are less capable of providing insurance against persistent shocks. De Weerdt and Fafchamps test this prediction formally. They find no evidence that persistent illness shocks are less well insured than transitory ones by informal gifts and transfers. They further observe that the overwhelming majority of informal transfers take place between close relatives. In their case it appears that risk sharing through informal gifts follows primarily an altruistic motive. They do,

[5] One may however argue that close relatives have a higher probability of interacting in the future.

however, document the existence of formal mutual health insurance contracts in the same community, a point that we revisit in the next Section.

The literature has also examined whether risk sharing between households depends on the observability of shocks. Risk sharing based on reciprocity among self-interested agents is vulnerable to information asymmetries, a point initially made by Posner (1980) and discussed in detail by Fafchamps (1992). Using a structurally based formal test, Ligon (1998) shows that inefficiencies in inter-household risk pooling are consistent with the presence of information constraints.

Taken together, the available evidence therefore suggests that both altruism and self-interest motives are at work in explaining risk sharing between households. However, systematic evidence of altruism appears limited to relationships between close relatives. To explain the latter finding, Cox and Fafchamps (2007) draw upon the emerging literature on evolutionary psychology, in particular the Hamilton hypothesis which states that altruism is proportional to the proportion of genes individuals have in common. The Hamilton hypothesis provides testable predictions regarding the strength of altruism between households, e.g., that altruism should be stronger between close kin. Much of the early work of Cox and others can be revisited with this hypothesis in mind – and found broadly consistent with it. Other predictions made by evolutionary psychology can be tested or compared with earlier empirical findings. For instance, in her work on government payments to the elderly, Duflo (2003) finds that South African grandchildren receive more help from their maternal grandmothers than from their paternal grandmothers. This finding is consistent with the idea that the maternal blood line is more certain than the paternal blood line, and thus should induce stronger feelings of altruism. Of course, whether this is the correct interpretation for Duflo's finding remains to be demonstrated. This is an area in which more research is needed.

The empirical literature in economics has only just begun to seek to distinguish between altruism and other intrinsic motives, such as the system of intrinsic punishment and reward arising from the existence of social norms. Using detailed inter-household transfer data from Romania, Misrut (2008) seeks to test whether gifts received can be explained by altruism or social norms. She points out that if gifts were driven by altruism then they should only flow from the rich to the poor. In contrast, if they are driven by social norms, they need not. This is indeed what she finds: the rich receive more gifts. She also argues that the data suggest that the size of the gifts is not driven by differences in wealth or income. From this observation, she concludes that social norms require gifts to be given but does not specify the amount. This is in contrast to altruism, which would require the size of the gift to increase with the income or wealth difference between donor and recipient. Although Misrut's results are not fully convincing given the nonexperimental nature of the data, what is commendable in the approach is the attempt to disentangle altruism from social norms.

Building on anthropological evidence and earlier work on the true nature of transfers between households (Platteau 1991), Platteau (1996) questions the notion that transfers between households that appear contingent on shocks should be interpreted as evidence of an intention to share risk. Platteau argues instead that they may be the manifestation of more general, uncontingent redistributive norms. What looks like insurance may in fact be redistribution to unfortunate members of society.

Redistributive social norms and aversion to inequality have also been put forth as a way of explaining empirical and experimental evidence on work relations and low-powered incentive contracts (e.g., Fehr and Falk 2002, Fehr and Schmidt 1999). In a recent analysis of rural Zimbabwean households, Barr and Stein (2008) test this idea by comparing funeral attendance between rich and poor households. They find that virtually all funerals are attended – and contributed to – by at least one representative of each household, but there are considerable differences in the extent to which the head of household is himself present. The authors argue that self-interest would dictate that heads of household be more likely to attend the funeral of wealthy individuals since the relatives of the deceased are a better source of future insurance. Yet they find the opposite. They interpret the results are suggesting disapproval towards financial success, a finding consistent with the existence of redistributive norms. These issues deserve more research.

5. RISK SHARING GROUPS AND NETWORKS

It has long been recognized that risk sharing between households takes place within groups or networks. We discuss these in turn.

5.1 Groups

Group risk sharing refers to situations in which the pooling of risk occurs explicitly at the level of a group of households. Examples of group risk sharing include funeral societies, health insurance groups, and other semi-formal mutual insurance groups such as the mutual fire insurance group 'La Crema' described by Cabrales, Calvo-Armengol and Jackson (2003).[6]

As long as individuals are risk averse and shocks are at least partly idiosyncratic, efficient risk sharing requires that the risk-pooling group be as large as the economy itself. This is the rationale behind the establishment of national health insurance systems, such as the NHS in the UK. Yet there are many examples of mutual insurance groupings that are much smaller than the entire economy. The theoretical literature has sought to provide explanations for such state of affairs.

[6] Formal insurance contracts can ultimately be seen as enabling households to share risk. The literature on formal insurance is well developed, however, and need not be further discussed here.

One approach is to posit a restricted family of risk sharing contracts and to show that certain households opt out of such schemes. For instance, households with a high average income may individually opt out of arrangements that require households to share their pooled income equally (Hoff 1996). This is because equal sharing implies a redistribution of income from the rich to the poor. If redistribution exceeds the rich' willingness to pay for insurance, their voluntary participation constraint is violated. Alternatively, the rich may form a coalition or 'club' that excludes poorer members of society (Arcand and Fafchamps 2008).

Another example is when the marginal distribution of income is identical but aversion to risk varies across households. In this case, redistribution is not a concern since all households have identical expected income. Yet households with different risk preferences may refuse to equally share their pooled income if each household is allowed to choose the level of risk it faces. Households that are nearly risk neutral would prefer high risk/high gain activities while highly risk averse households would prefer low risk/low gain activities. To avoid having to face the risk implied by the other group's income choices, the two groups may prefer to form separate groups. The self-selection of households into different risk pools has been studied by Ghatak (2000) in the context of joint-liability lending schemes.

In both above examples, small self-seggregated groups arise because of the restrictions imposed on the form of the risk pooling arrangement. Allowing for more general, asymmetrical contracts would resolve the issue. The empirical issue then is why such restrictions exist in the first place. The literature on inequality aversion discussed earlier offers one possible justification. How relevant this justification is in practice remains to be shown.[7]

Another strand of the literature has explored the restrictions on group size imposed by voluntary participation in a repeated game setting. Genicot and Ray (2003) is arguably the best example of this literature. The authors formalize the conditions under which coalitions of households can credibly oppose larger risk sharing arrangements. By recursion the authors identify the maximum possible size of self-enforcing risk sharing groups. Their analysis suggests that it is likely to be small. Other theoretical analyses include Cabrales et al. (2003) and Bold (2007).

There is a growing empirical literature investigating these various issues. Dercon et al. (2006) and Dercon et al. (2006) study funeral societies in Ethiopia and elsewhere. They find funeral societies to be highly prevalent in the study areas. They are based on well-defined rules and regulations, often offering premium-based insurance for funeral expenses. Increasingly, they are also offering other forms of insurance and credit to

[7] In a study of convergence in outcomes among members of urban community organizations in Kenya, La Ferrara and Fafchamps (2008) find evidence that self-selection into groups includes a redistributive element: once they control for self-selection into groups, the authors find that convergence in outcomes would have been stronger would group members have been matched at random. This suggests that certain members were taken in to assist them.

cope with hardship. Arcand and Fafchamps (2008) examine assortative matching in community-based organizations in two African countries. Many of these organizations are involved in mutual insurance. They find evidence of self-selection on the basis of wealth and social contacts.

The literature on joint liability lending also provide useful empirical evidence because it explores strategic self-selection into risk pooling groups when group members can independently choose the level of risk to which they wish to be exposed. The evidence suggests that self-selection on the basis of risk preferences is at work at least in some schemes (e.g., Ghatak 2000, Wydick 2001).

Experimental evidence on the formation of risk pooling groups can be found in Barr and Genicot (2008) and Barr, Dekker and Fafchamps (2008). These two papers use data from a field experiment in rural communities of Zimbabwe. In each community the experiment took place over a two day period. On the first day households were asked to volunteer one member to play a risk preference assessment similar to the one used by Binswanger (1980) in India. At the end of the first day participants were told they would play the game again the next day but could form groups to share their earnings. The pooling of earnings was organized using different enforcement mechanisms.

Barr and Genicot (2008) show that the nature of the enforcement mechanisms matters for risk sharing. External enforcement by the researchers led to larger risk pooling groups and more risk taking. In contrast, intrinsic enforcement led to smaller and fewer groups. When reneging on a risk pooling promise had to be made publicly, risk pooling was the smallest. The authors speculate that this may be due to self-commitment failure or conflict avoidance. Barr et al. (2008) revisit the same data and find no evidence of group self-selection on the basis of risk preferences elicited in the first round of the game. They do, however, find plenty of evidence of assortative matching in age and gender. They also find evidence of convergence in risk taking among group members, suggesting some form of coordination in behavior. Regarding enforcement mechanisms, they find evidence that, when reneging is made public, people refrain from forming groups with valuable members of the community, possibly for fear of losing valuable relationships.

5.2 Networks

The literature has also started investigating risk sharing networks. The empirical literature indeed suggests that, in many instances, risk sharing takes place within decentralized and partially overlapping interpersonal networks. In the Philippines, for instance, Fafchamps and Lund (2003) show that gifts and informal loans for risk sharing purposes circulate within networks made primarily of relatives and kin members. Similar evidence is provided for Burkina Faso by Ellsworth (1989) and for Tanzania by De Weerdt and Dercon (2006) and De Weerdt and Fafchamps (2007).

Over the last decade or so an economic literature on social networks has emerged (e.g., Jackson 2008, Goyal 2007, Vega-Redondo 2006). Borrowing from the noneconomic literature on networks, economic agents are seen as nodes and relationships between them are represented as links. The set of nodes and links forms a graph or network. The overall shape of a network is called its *architecture*. Certain networks take the shape of star, for instance, with a center and 'spokes' emanating from it; others take the shape of a polygon. In the context of risk sharing, a star network would be one in which one node – e.g., a 'patron' or an insurance company – insures all other nodes. A polygon would correspond to a decentralized arrangement in which each node/agent has two helping friends.

The star and polygon are useful archetypes in the case of small networks but large networks often have a more complex shape that is difficult to characterize simply. The study of large networks has focused on components, that is, on sets of nodes that are linked to each other either directly or indirectly. The diffusion of disease (or information) over large networks has been shown to depend critically on the presence of a giant component containing a large proportion of nodes. If a disease infects one node in the giant component, it will eventually affect all nodes in it.

Network architecture matters for the efficiency of informal risk sharing among households. To see this, imagine that transfers flow costlessly among nodes in a social network. Risk sharing can only be achieved between nodes that belong to the same component. It follows that efficiency in risk sharing is expected to be constrained by social exclusion – e.g., discrimination against women or ethnic minorities which isolates them – and social segmentation – e.g., socialization along caste or religious lines which divide society in unconnected components.

Whenever there are transactions costs, information asymmetries, or commitment constraints, efficient risk sharing need not be attainable even between nodes within the same component. This issue has begun to attract some attention as theorists seek to investigate the strategic implications of decentralized risk sharing across networks. Bloch, Genicot and Ray (2004) take the structure of the interpersonal network as given and identify the conditions under which decentralized risk pooling between households can be viewed as the stable equilibrium of a strategic game. They provide important results relating the shape of the underlying interpersonal network and the set of sustainable equilibria. It is also suspected that the link formation process itself responds to strategic considerations. The rapidly emerging literature on social networks provides a wealth of insights regarding this process (e.g., Jackson 2008, Goyal 2007, Vega-Redondo 2006). Much remains to be done to apply these insights to risk sharing networks.

The empirical literature has already begun examining the factors that are associated with the formation of risk sharing links. Fafchamps and Gubert (2007b) investigate whether risk-sharing links between Filipino rural households maximize the mutual

gains from risk pooling. They find that they do not. De Weerdt and Fafchamps (2007) report similar results for Tanzania. In both cases, the authors rather find that risk sharing links follow blood ties and geographical proximity, suggesting that the cost of forming and maintaining relationships is important. Altruism between blood relatives may facilitate the mutual trust required for informal risk sharing arrangements.

Using the same data as De Weerdt, Dercon, and Fafchamps, Comola (2007) further investigates the strategic motives for link formation. She tests whether the network architecture influences link formation. There are two conflicting forces potentially at work. Better connected households are more attractive because they can potentially serve as conduit for transfers from other households to which they are connected. But they are also more likely to be asked to assist other households. This taxes the limited resources they have (Cox 1999). The latter is a congestion effect that was first discussed in the context of coauthor networks by Jackson and Wolinsky (1996). Using a structural estimation strategy based on the pair-wise stability concept, Comola finds evidence that both factors matter.

The network formation literature has shown that different network architectures – e.g., star or circle – arise depending on whether link formation is unilateral or bilateral (e.g., Bala and Goyal 2000, Goyal 2007). Since network architecture has far reaching implications for the efficiency of risk sharing outcomes, this is a potentially important question. Using the same Tanzanian data,Comola and Fafchamps (2009) test whether observed risk sharing links are best explained as the result of a unilateral or bilateral link formation process. Bilateral link formation arises whenever both households in a risk sharing relationship must agree to the relationship. In contrast, unilateral link formation naturally arises if risk sharing is driven by social norms and households cannot subtract themselves from their obligation to assist others. There is an extensive descriptive literature documenting the pressure under which many households in developing countries find themselves to assist relatives in need. Comola and Fafchamps (2009) find instead that bilateral link formation is more consistent with the data they have on a single Tanzanian village. It unclear whether similar findings would obtain in other contexts, e.g., for support to migrants (e.g., Munshi 2003, Beaman 2006).

The literature on networks has emphasized the critical role of agents that bridge 'structural holes'[8] and of the strength of weak ties. To our knowledge, no rigorous investigation of these issues has been made for risk sharing networks but the extremely rich descriptive evidence reported by Ellsworth (1989) suggests that bridging agents probably are important. Ellsworth collected data on all transfers within one village in Burkina Faso. She finds that a large proportion of transfers transit via a single individual, a local 'holy man' who serves as a conduit for charitable giving. Most of the contributions collected by this person find their way in the hands of disadvantaged members of

[8] A structural hole exists whenever the removal of the bridging node would yield two or more disjoint components.

the community. But a nonnegligible fraction of the collected funds ends up in the hands of the holy man's brother, an unusual form of capture. Ensminger (2004) provides similar reports of aid capture within social networks of mutual assistance. All these issues deserve further scrutiny.

6. CONCLUSION

The last decades have witnessed the blossoming of a large economic literature on risk sharing between households. The initial literature focused on testing the existence of risk sharing and in identifying the forms that risk sharing takes. It uncovered multi-faceted forms of assistance between households, but also established that efficient risk sharing is not achieved.

The literature then sought to understand the constraints to risk sharing between households. The application of repeated games to the issue provided a wealth of insights, many of which have been supported by data. More recently, however, there has been a revival of interest in altruism and social norms as alternative enforcement mechanisms to support mutual assistance across households. Evolutionary psychology has proved to be a fecund source of alternative hypotheses regarding the sources and forms of altruism. Experimental psychology has similarly supplied new and insightful ways of thinking about how social norms emerge and are sustained in human societies. Much work remains to be done to explore the full implications of these ideas to risk sharing.

More recently, the literature has turned to broader architectural issues, notably the vulnerability of risk sharing groups to deviations by sub-coalitions of households, and the decentralized formation of partially overlapping risk sharing networks. On the first topic, the literature has brought to light possible self-seggregation processes, such as those by which the rich pool risk with the rich to avoid having to redistribute to the poor. On the second topic, the literature has begun investigating issues surrounding strategic decentralized interaction among households, both in the formation and maintenance of network links and in the behavior of households once links exist. On both of these topics the literature is still in its infancy. There remain formidable theoretical and empirical challenges to be resolved but the foundations for successful work have been laid and the prospects for progress have never been better.

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