The Complete Markets Benchmark

1. The Complete Markets Benchmark

- It is useful to begin with a brief review of the operation of credit and insurance markets under the assumption of complete markets.
  - This is not realistic in most contexts,
  - more appropriate models of financial contracting can be understood as departures from this benchmark case.
- Consider a village of N farmers.
  - We use the term ‘village’ very broadly as a metaphor for any group of individuals who are able to engage in financial trade. It could refer to
    - a small group of farmers tied together by geographic proximity,
    - members of an extended family, or expanded trading circle.

- Each time ‘period’ will be divided into two stages:
  - a ‘pre-harvest stage’ where investments are made and state-contingent contracts are exchanged but in which no production or consumption takes place,
  - a ‘harvest and post-harvest stage’ where project outcomes are realized, contracts are executed, and consumption takes place.
- Villager j has access to a farm production project that will yield stochastic harvest income x_{js}.
  - $s = 1, 2, ..., S$ indexes possible states of the world distributed according to the probability distribution π_s.
  - π_s may be affected by the input and effort choices made by each of the agents in the village.
  - These choices are, for the moment, assumed to be costlessly observed and contractible.

- Let c_{js} represent consumption of villager j in state s and suppose that each individual j wants to maximize expected utility $\sum_s \pi_s u_j\left(c_{js}\right)$;
  - u_j is a standard concave and well-behaved utility function of individual j.
- A Pareto-efficient allocation of risk in the village can then be found by maximizing the weighted sum of the utilities of each of the N villagers,
  - where λ_j is the individual j's weight in the Pareto program.
    - These weights reflect the relative strength of the entitlement that each individual has over village resources.
    - In a nonmarket setting these would be given perhaps by their social status or entitlement standing within the community.
    - In a competitive market setting these weights would be related to the market value of their initial property claims x_{js}.

- A Pareto efficient allocation is found from the following programme:

$$\underset{\{c_{js}\}}{\text{Maximize}} \sum_{j=1}^{N} \lambda_j \sum_s \pi_s u_j \left(c_{js}\right),$$

subject to village-wide resource constraints in each state

$$\sum_{j=1}^{N} c_{js} \leq \sum_{j=1}^{N} x_{js}, \text{ for all } s.$$

- The first-order conditions for an optimum corresponding to c_{js} and c_{ks} yield the following condition relating the marginal utilities of any two villagers j and k in any state of the world s:

$$\frac{u_j'\left(c_{js}\right)}{u_k'\left(c_{ks}\right)} = \frac{\lambda_k}{\lambda_j}, \text{ for all } j, k, s. \qquad (*)$$

- Since the λ's are constant welfare weights, the conditions imply that marginal utilities of all villagers must move together.

$\Rightarrow$ The marginal utility of any household is a monotonically increasing function of the average marginal utility of households in the village in any state.

$\Rightarrow$ Each household's consumption will be monotonically increasing in the level of average village consumption.

- In a Pareto-efficient allocation, then, transient changes in income are fully pooled at the village level.
  - There is no incentive for risk diversification at the household level, because, after controlling for aggregate consumption, household consumption is not affected by shocks to a household's income.
    - The only risk faced by the household is that faced by the village as a whole.

- To see the result in its most stark form, suppose that everyone in the village has an identical constant absolute risk aversion utility function, so that

$$u_j(c) = -\frac{e^{-\sigma c}}{\sigma}.$$

  – Applying this utility function to the first-order condition (*) and taking logs, we find

$$c_{js} = c_{ks} + \frac{1}{\sigma}\left(\ln \lambda_j - \ln \lambda_k\right), \text{ for all } j, k, s.$$

  – Summing across the N equalities we derive

$$c_{js} = \bar{c}_s + \frac{1}{\sigma}\left(\ln \lambda_j - \frac{1}{N}\sum_{i=1}^{N} \ln \lambda_i\right),$$

  where

$$\bar{c}_s = \frac{1}{N}\sum_{i=1}^{N} c_{is}.$$

- So household consumption is equal to the average level of consumption in the village plus a household fixed effect which depends upon the relative weight of the household in the Pareto programme.

- In a Pareto-efficient allocation of risk within a community, households face only aggregate risk; idiosyncratic income shocks are completely insured within the community.

- The ability to accomplish such efficient risk sharing presupposes of course the existence of elaborate mechanisms to verify states and efficiently side-contract to redistribute resources between individuals in every state of the world.

- In a market setting this requires the existence and efficient operation of $S-1$ separate competitive asset markets to span the entire state-contingent commodity space.

  – This is quite a requirement.

- The framework above can be readily extended to multiple time periods in the fashion of Arrow and Debreu (1954) to allow state and time contingent income and consumption levels.

  – Efficiency conditions similar to (*) would hold across time and states of nature.

2. Empirical Tests of Efficient Risk Sharing

- The complete markets model yields a number of hypothesis that researchers have sought to test against empirical data.
- In a well-cited study of Indian villages, Townsend (1994) regressed household consumption on household income, village aggregate consumption, and a number of other variables.
  - Under the null hypothesis of full risk sharing household consumption ought to be highly correlated to aggregate village income but independent of household specific shocks.
  - His results indicated a considerable amount of risk pooling, but the hypothesis of full consumption smoothing was clearly rejected as individual households' consumptions appear to adjust considerably to idiosyncratic shocks.
  - Using the same data and more robust methods, Ravallion and Chaudhuri (1997) also conclude that there is evidence against complete risk sharing.

- Broadly similar methods have been used to examine risk sharing in a wide range of different social groups, including families, ethnic groups, and neighbours.
  - Examples include Jalan and Ravallion (1998) using data from China, Grimard (1997) using data from Côte d'Ivoire, Suri (2003) using data from Kenya, Kazianga and Udry (2004) using data from Burkina Faso, Dercon and Krishnan (2004) using data from Ethiopia, and Gertler and Gruber (2002) using data from Indonesia.
  - In each case, the hypothesis of Pareto efficient risk sharing within the relevant social group is rejected, though some evidence of partial risk sharing is usually found.
- Looking more directly at the transfers between households, Udry (1994) arrived at similar conclusions for households in Northern Nigeria, and Fafchamps and Lund (2003) found evidence of only limited risk-sharing in rural Philippines.
- Duflo and Udry (2004), Goldstein (2004) and Dercon and Krishnan (2000) report furthermore that they can reject the hypothesis of efficient risk sharing even *within* the same households in rural Côte d'Ivoire, Ghana, and Ethiopia, respectively.

- All of these studies point to forms of imperfect consumption smoothing and to the existence of more effective risk-sharing within particular subgroups or networks within a village.
  - Kinship, family, clan or religious affiliation may be important because these groups can threaten to impose larger punishments on individuals breaking commitments to mutual insurance arrangements.

3. Consequences of Imperfect Financial Markets

- Even if a small tight-knit group could accomplish the feat of efficient risk pooling, individuals would still very likely remain exposed to substantial risks because
  - the very physical proximity and closeness that is required of agents to be able to enforce state-contingent risk-sharing arrangements will typically expose these individuals to correlated risks.
    - For example, a shortfall of rain is likely to affect most of the agricultural households in the same small dryland farming community. Locals will want to exchange risks with individuals outside of the village.
- Since realistically it would quickly become prohibitively costly and complicated for each individual to separately contract directly with each of many hundreds of other individuals spread out over large distances,
  - it is natural to expect this to create demand for the entry of specialized *financial intermediaries* to help lower the transaction costs of pooling risks and in this way help society to further complete the market and reap the gains to financial trade.

- The entry of efficiency-enhancing financial intermediation may however be delayed or complicated for several reasons.
  - The main problem is that outside financial institutions are just that: *outsiders* that may not have the kind of local information and enforcement mechanisms necessary to verify and enforce detailed state-contingent contracts within the village.
    - This may end up severely limiting the set of feasible contracts a financial institution may be willing to offer.
- Hence, either because the members of their trading networks face correlated risks and/or because financial contracting is incomplete within villages, households and individuals in rural areas are likely to be left facing considerable residual risk.
  - This leads households to search for and adopt other, possibly quite costly, strategies to smooth income or consumption.
  - It also creates significant latent demand for financial trade with outsiders.

- Income smoothing strategies include
  - scattering plots (McCloskey 1976; Townsend 1993),
  - choosing a lower return but more diversified mix of crops and nonfarm production activities,
  - migration and marriage patterns (Rosenzweig and Stark 1998),
  - the adjustment of intertemporal labour supply in response to shocks (Kochar 1999),
  - labour bonding and debt peonage (Srinivasan 1989; Genicot 2002).
- Incomplete financial markets lead individuals to make costly and inefficient adjustments to production and investment plans with obvious welfare consequences.
  - Research pointing to evidence of such costly strategies is vast, and we will mention only a few prominent examples.

- Kochar (1999) showed that over three-quarters of the correlation that Townsend (1994) found between household and village aggregate consumption could be accounted for by the households' increased supply of labour to the agricultural wage market following a shock to their farm production.
  - In other words, when hit by an idiosyncratic production shock, households appear to have smoothed consumption by smoothing income rather than via financial transactions as many readers of Townsend's work might have assumed.
  - Adjustments to labour supply plans can of course be highly disruptive, particularly if they disrupt human capital formation projects.
    - Jacoby and Skoufias (1997) is just one of many studies that finds evidence that children in poor households work more and attend school less in response to idiosyncratic income shocks (Beegle, Dehejia, and Gatti 2003; Jensen 2000; Duryea, Lam, and Levison 2003).

- Another example of costly and inefficient adjustments is the presence of *credit rationing* in these imperfect rural financial markets.
  - Many surveys have found that farmers claim that they would borrow more if additional credit were available at a given interest rate (Diagne and Zeller 2001; Zeller, Diagne, and Mataya 1998).
  - Some papers have attempted to use econometric methods to measure the extent of rationing in rural credit markets (Bell, Srinivasan, and Udry 1997; Kochar 1997).
  - Banerjee and Duflo (2004) show that an arguably exogenous increase (followed by a decrease) in the availability of credit to a set of firms who borrow from a particular Indian bank was associated with an increase (followed by a decrease) in output of those firms, providing well-identified evidence of *credit constraints*.

- Sen (1982) points to the importance of land as an asset for smoothing income when he wrote “a small peasant and a landless labourer may both be poor, but their fortunes are not tied together.”
  - He has argued that wage labor markets often collapse rapidly at the outset of a famine and whereas households with land can often fall-back upon this or other assets for subsistence purposes to buffer the shock, wage laborers have few other assets to work with.
  - Land may also ‘entitle’ the owner to a larger share of the communities’ diminished resources than the landless.
    - For example the household with land may be able to borrow in a crisis, whereas the landless or those with low social standing may not.

- Households may also try to smooth consumption by accumulating or decumulating physical buffer stocks of assets such as animals, grain, land, or jewelry. When the assets are used directly in production and there are incomplete or missing rental markets, consumption-smoothing can again come at the cost of productive efficiency."
  - Rosenzweig and Wolpin (1993) document this cost when partial consumption smoothing is achieved by households in the ICRISAT India villages through the sale and purchase of bullocks that are used in production.
  - Kazianga and Udry (2004) provide evidence of a similar cost for households in the Burkina Faso villages.

- Imperfect financial markets also shape production organization more generally.
- It has been clear since the development of the standard agricultural household model (e.g., Singh et al. (1986); de Janvry et al. (1991)) that the organization of production on the household farm depends upon the nature of the financial markets available to the household.
- Eswaran and Kotwal (1986), for instance, show how access to capital, which in turn is related to the initial distribution of land, may shape equilibrium patterns of production organization, including whether land is worked by wage laborers or tenants or capitalist farmers, and the efficiency of production.

- More generally, the structure of rural economic relations itself depends upon the nature of available financial contracts, which in turn of course depend upon the structure of rural economic activity.
  - This joint causation opens up the possibility of a wide range of potential equilibria, and an important research agenda.
- A series of important papers have examined the role of financial market imperfections in generating a persistent non-degenerate income distribution.
  - Galor and Zeira (1993) and Banerjee and Newman (1993) show in an economy characterized by non-convexities in investment, capital market imperfections can cause initial disparities in wealth to persist across generations.
  - Moreover, the distribution of wealth affects aggregate patterns of economic activity and growth.
- There has been a flowering of related works on linkages between distribution and growth when financial markets are imperfect.

4. References

- This note is based on

1. Conning, Jonathan and Christopher Udry (2007), “Rural Financial Markets in Developing Countries”, in *Handbook of Agricultural Economics*, vol. 3, edited by R. E. Evenson, P. Pingali and T. P. Schultz, Elsevier, 2857–2908.

– The references mentioned in this note can be traced in this survey.