

# Research Presentation

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- Investigate market allocations and contractual arrangements in economies with uncertainty and, possibly, asymmetric information. both in competitive and strategic environments
- Study effects of various 'frictions': asymmetric information, limited commitment, ...
- Consider various applications to macro, finance, ...

Main themes, according to framework:

- 1 Competitive markets under uncertainty
- 2 Competitive markets and contracts under asymmetric information
- 3 Information acquisition and transmission in markets with strategic traders
- 4 Effects of information on contracts

# A) Competitive Markets under Uncertainty

## (i) Corporate Finance and Traded Equity

- Stochastic dynamic general equilibrium economy with production
  - Macroeconomic models with production under uncertainty typically exhibit either no traded equity (individual firms only) or complete markets/ representative consumer.
  - Issue: study interaction between firms' decisions (production and capital structure) and equilibrium allocation (risk sharing) and asset prices.

## Basic Economy

- Consumers:

$$\max_{\theta^i, b^i, c^i} u(c_0^i) + \beta E u(c^i(s))$$

subject to

$$\begin{aligned}c_0^i &= w_0^i + [-k + q + p B] \theta_0^i - q \theta^i - p b^i \\c^i(s) &= w^i(s) + [f(k; s) - B] \theta^i + b^i, \quad \forall s, \\ \theta^i, b^i &\geq 0\end{aligned}$$

Note: borrowing constraints

- Firms:

$$V = \max_{k, B} -k + q(k, B) + p B$$

- Price conjectures: production and financial decision affects the firm's cashflow, possibly also the hedging possibilities available to consumers

$$q(k, B) = ??$$

- Can we find  $q(k, B)$  so that shareholders unanimously support the firm's objective of maximizing the firm's value?
- If so, the study of competitive equilibria where equity is traded in the market has a solid foundation.
- Firms' capital structure is, at least partly, determinate because constraints in financial markets (borrowing constraints) imply that MM does not hold.
  - Corporate finance quantities jointly determined with production decisions, thus affecting asset prices.  
Can investigate how capital structure varies with the business cycle, and interaction between financial decisions and production, risk sharing, asset pricing...

## Extensions:

- Allow also for:
  - risky (defaultable) corporate debt,
  - short sales:

firms' decisions have even greater effect on consumers' hedging possibilities

- Allow for informational asymmetries between manager and shareholders (as in standard corporate finance models):  
e.g. some of the production decisions not observable by outside investors (equityholders and/or bondholders), or controlling shareholders have some private information over some characteristics of the firm's returns.
- Extend to infinite horizon economies

Bisin Clementi Gottardi (2017), Bisin Gottardi (2012).

## (ii) Liquidity, Investment, Bankruptcy and Asset Pricing

- Show that firms' decisions may be distorted by their undervaluation occurring in illiquid markets.



## (ii) Liquidity, Investment, Bankruptcy and Asset Pricing

- Show that firms' decisions may be distorted by their undervaluation occurring in illiquid markets.
- Consider a competitive environment where:
  - firms can only finance their investments by issuing short term debt (market incompleteness),
  - there is uncertainty over the timing of the firm's output: can arise at  $t=1$  ( $y_1$ ) or  $t=2$  ( $y_2$ ).

If  $y_2$ , firm's revenue insufficient to repay debt  $d_0$ : either debt renegotiation succeeds and debt is rolled over, or it fails, when

$$d_0 > q_1 y_2,$$

and firm has to default.

- default requires payment of creditors from immediate sale of assets; if markets are illiquid this sale takes place at firesale prices
- this mispricing is the only friction and the only cost of default in the model

- Bankruptcy only entails a redistribution of resources, from shareholders - whose assets sell at a loss - to the firm's buyers.

The anticipation of such losses distorts asset prices and hence also firms' investment decisions, inducing value-maximizing managers to make inefficient decisions

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- Questions:
  - Under what conditions do we have an illiquid market?
  - Can we have endogenous crises, where a self-fulfilling shortage of liquidity and a collapse in asset prices?
  - Which kind of interventions allow to restore efficiency?

- Next: we extend the analysis to a dynamic environment, where firms can get funding also via equity (which reduces default risk but is costly - e.g. because of positive corporate income tax):  
what is the dynamics of firms' investment and capital structure decisions?  
Are they efficient? Is investment too high or too low? and firms' leverage?
- Also to financial intermediaries: what is the relationship between the capital structure of corporate firms and banks?
  - Gale Gottardi (2011, 2015, 2017)

### (iii) Dynamic Economies with Collateral, Repo Markets

- Infinite horizon stochastic economy
- Complete financial markets but borrowers can walk away of their obligations with no punishment (this is the only friction in the environment):



borrowing is collateralized with durable goods/physical assets

effective payoff of assets:

$$\min \{r(s); Cq(s)\}$$

with  $r(s)$  payment due on the asset,  $C$  collateral requirement,  $q(s)$  value of collateral

· When is efficient risk sharing still attained at a competitive equilibrium?

When is collateral plentiful?

Can we find ways to 'economize' on collateral? e.g. rehypothecation, pyramiding,...

· When collateral is scarce and equilibrium inefficient, what is the pattern of risk sharing? and of asset prices?

What are the difference wrt other frictions/borrowing restrictions?

Is there scope for welfare improving interventions (e.g. constraints on trades of assets)?

· How 'tractable' is this model?

When does a stationary equilibrium, where prices and allocations only depend on the current state, exist?

· Gottardi Kubler (2015), Maurin (2015), Gottardi, Maurin, Monnet (2017)

#### (iv) Value of Information

- Effects of arrival of news (common signal over future realization of uncertainty) prior to the opening of markets:
  - (i) reduce scope for risk sharing,
  - (ii) but also, with incomplete markets, expand set of attainable payoffs (by allowing to condition trades on new info).
- Consider competitive equilibrium, for some info structure.
  - What are the welfare effects of a change in available info?
  - For which changes in info can we find *an allocation, feasible* with the new information, that allows a welfare improvement? Always, for all changes in info, even an ex post welfare improvement exists!
  - If we consider effect on *competitive equilibria*, prices also vary: for some changes in info welfare increases, for others it decreases. Hence, there exist changes in info s.t. in equilibrium welfare decrease while an (even ex post) improvement is possible.
  - Which types of news induce agents to retrade in the market?

Gottardi Rahi (2013, 2014)

(v) Optimal Ramsey Taxation and debt with Uninsurable Risk

- Economy with uninsurable income risks (markets are incomplete)
- Can distortionary taxation of capital and labor be welfare improving? If so, should we tax or subsidize capital, and labor?

$$\max_{c_i, k_i, l_i} U_i(c_i, l_i) := v_i(c_i^0) + \mathbf{E}[u_i(c_i(s_i), \bar{L}_i - l_i(s_i))]$$

subject to

$$c_i^0 = e_i - k_i$$
$$c_i(s_i) = (1 - \tau_K)r\rho_K(s_i)k_i + (1 - \tau_L)wl_i(s_i)\rho_L(s_i) + T_i$$



- A firm with constant-returns-to-scale technology  $y = F(k, l)$ . Profit maximization condition implies:

$$r = F_K(K, L) \text{ and } w = F_L(K, L)$$

- market clearing:  $K = \frac{1}{I} \sum \mathbf{E} [k_i \rho_K(s_i)]$ , and  $L = \frac{1}{I} \sum \mathbf{E} [l_i(s_i) \rho_L(s_i)]$
- Taxes may have an insurance and a redistribution effect.  
In addition, they affect equilibrium prices (pecuniary externality)

- What is the welfare maximizing level of  $\tau_K, \tau_L$ ?  
Note: no government expenditure or consumption; only role of taxes is to exploit above effects.
- Is there a relationship between the presence of overinvestment (higher  $K$  than in first best) and the optimal tax on capital being positive:  $\tau_K > 0$ ?
- In a dynamic environment, taxing capital or labor has also different implications for the distribution over time of the distortions induced by taxes. What is then the optimal path of taxes? and the optimal path of government debt?

• Gottardi, Kajii, Nakajima (2015, 2016)

## (vi) Intergenerational Risk Sharing and Social Security

- Risk Sharing across generations imperfect even with complete financial markets: consumers unable to insure against realization of uncertainty at their birth.

Can we find on such basis a justification for a PAYGO social security system, entailing transfers from young to old agents?

**Trade-off:** such SS system (state contingent transfers from young to old agents) may improve intergenerational risk sharing, but also tend to reduce savings, hence capital accumulation and output

- Determine the GE effects of SS in a OLG economy with production:
  - direct transfer,
  - indirect transfer generated by price changes (in wages, asset prices) induced by SS transfer,
  - output loss induced by changes in savings (crowding out)
  
- Identify conditions:
  - on the correlation between the shocks affecting agents' consumption when young and when old,
  - on the agents' risk aversion,
  - on the stochastic structure of the production shocks (determining the correlation between wages and returns to capital),

under which the introduction of the different types of pay-as-you-go transfer systems is welfare improving.

- What is then the optimal design of a PAYGO system?
- And how big are the welfare gains from the optimal reform of such system?

• Gottardi, Kubler (2011)

on a somewhat different line:

## (vii) Financial Linkages, Risk Sharing and Contagion

- - Financial linkages among financial institutions (exchange of assets, credit lines, exchange of deposits, etc.) are common arrangements to improve sharing of risks among them.
  - But such linkages also constitute channels through which those shocks can spread the risk of contagion in the system.

Trade-off between risk sharing and contagion.

- Focus on two dimensions of the network structure (financial architecture, describing pattern of such financial linkages):
  - The degree of segmentation of the network into disjoint components.
  - The tightness of the connections within each component (e.g. completely intraconnected structure - where mutual exposure is uniform - or ring structure - where degree of mutual exposure decays with distance).
- Maximal risk sharing is attained in the largest, most connected structure. But this also exposes system to maximal risk of contagion.
- Study optimal financial architecture, which minimizes expected defaults.  
See how it varies with the probability structure of shocks  
Compare it with equilibrium structure, resulting from firms' choices
- What if firms are of different size? Is it better for larger firms to form linkages with other large firms, or rather with small ones?

· Cabrales, Gottardi and Vega Redondo (2017).

## 2. Competitive Markets with Asymmetric Information

Private information over idiosyncratic sources of uncertainty  
(individual states)

- Agents face incentive problem (private information, limited commitment,...)
- If they can trade in markets, this will affect their incentives.
- Information over the agents' trades in the market is important to evaluate their incentives

Prices of contracts and allocations determined in equilibrium



E.g.: moral hazard:

agent's income:  $y_H, y_L$  in individual states  $s_H, s_L$   
 $\Pr \{s^i = s_H\}$  depends on (unobservable) effort:  $e^i$

- consumer may get an insurance contracts, but  
*can also trade in competitive markets*: a riskless bond/contingent claims
- consumers' trades observable: hence the prices of the insurance contract and of the contingent claims will depend on such trades (reflecting the effect of different levels of trade on anticipated effort level):  $p_s(\theta^h)$ , contracts are exclusive
- consumers' trades not observable: prices cannot depend on the level of such trades (linear),  $p_s$ , contracts are non exclusive.
- \* What are the properties (efficiency, risk sharing, ..) of equilibrium allocations in the two cases?
  - Bisin, Gottardi (1999, 2003, 2006, 2009)
  - Bisin, Geanakoplos, Gottardi, Minelli, Polemarchakis (2011)
  - Gottardi, Jerez (2007)

(i) What is the form of the optimal managerial compensation when the manager can hedge the risk in his compensation by trading in the market?

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- But this correlation exposes managers to risk and creates an incentive for the manager to trade in financial markets to hedge their compensation against poor performance of the firm.
- Market for executive hedging appears sizeable, various concerns for managers' hedging activity expressed in legal profession and financial press

- *Question:*
- What does optimal incentive compensation look like when:
  - manager can hedge his compensation in financial markets,
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  - manager's portfolio can be monitored, at some cost, and
  - there are limited possibilities for legal action by shareholders?
- What we find:
  - Monitoring of manager's portfolio optimally occurs only when firm's performance is poor.
  - Incentives are always steeper (variability of the manager's compensation is higher) when cost of monitoring is higher
  - What are the consequences of financial development, of the developments of new financial instruments?
  - Bisin, Gottardi, Rampini (2008)

(ii) Optimal Taxation (of Capital and Assets): *Questions*:

- in this environment (with markets for non exclusive contracts), if the government has the same or even less information as insurance firms on agents' actions and trades, can linear (distorting) taxes on asset trades (Ramsey) be beneficial?

(ii) Optimal Taxation (of Capital and Assets): *Questions*:

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- When is the optimal tax on capital positive?

Answer depends on:

(i) instruments available to government (is govt. able to observe individual shocks and hence provide insurance via state contingent lump sum transfers?)

(ii) severity of moral hazard (has the map  $e \rightarrow \pi$  full support? If not private insurance markets cannot exist)

what is the optimal design of taxes on asset trades? and what is their effect on the level of incentives and agents' risk sharing which can be sustained in equilibrium?

Taxes (distortionary) on trades are there to enhance incentives

- Gottardi, Pavoni (2014).



### (iii) Effects of Securitization

- Borrower/lender relationship, where the lender must exert some costly monitoring effort to discipline the borrower.
- Securitization allows the lender to sell (part of) the loans on its balance sheet.

Such sale may be beneficial for the lender as it may allow risk diversification/lower capital requirements, ...

But it may also weaken the lender's incentives to monitor.

- Does securitization improve the efficiency of the system or actually make it worse?

The answer crucially depends on whether the level of sales made by the lender is observable by third parties.

(iv) Over the Counter Markets

study decentralized markets, with search

Auster Gottardi (2017), Maurin (2016), Fuchs Gottardi (2017)

### 3. Markets with Strategic Traders and Asymmetric Information

#### (i) Speed of Information revelation and market power

- Private information over aggregate sources of risk (e.g. returns of assets traded):  
if insiders use their private information to trade aggressively, this will have a - possibly - significant impact on equilibrium prices and allow non informed to learn from observed prices
- In a dynamic trading set-up, trade-off between immediate benefits of using info and future losses associated to shorter duration of superior information

Effect of insiders' trades on market performance

- In the set-up of a model of dynamic trading, find:
  - with only one seller (informed), only part of his information is revealed in the first period, and none at any later date.
  - with  $n$  sellers (a fraction informed):
    - with a highly transparent market (competition is intense), information is fully and immediately revealed in every equilibrium for  $n$  large, whatever the structure of the information.
    - otherwise, there are equilibria where information is never revealed.
- Thus the intensity of competition proves more effective than the non exclusivity of information in inducing full and immediate disclosure of information.

- Gottardi, Serrano (2005)

## (ii) Information Acquisition and Transmission

- acquisition of information relevant to trades in markets is typically costly
- information is often of common interest to traders
  - ⇒ incentive for arranging exchange/sale of information
- But: information has also often "rival" nature
  - ⇒ conflicts of interest: incentives for manipulating information
- Some motivating examples:
  - financial analysts
  - recent regulatory interventions to address their conflicts of interest

## **Objective:** to understand

- When is information traded in the market?
- If a market for information forms, what is the market structure? (Who trades in the market? how competitive is the market? which type of information is traded? and how truthful is the information transmitted?)
- Is the market outcome efficient? Under what conditions can efficiency be attained?
- In particular, are regulatory restrictions on who can sell information (e.g. Chinese walls) beneficial?

- Consider an environment where we have information acquisition, exchange of information and trade on the basis of information:
- all market participants can acquire relevant information, at a cost
- Agents who acquired information can sell reports over it to uninformed buyers
- Reports are pure "cheap talk" messages (conflicts of interests between buyers and sellers of information may affect truthfulness of reporting)

## Results:

- In equilibrium information is acquired by some trader who then sells it in the market
  - Market for information is typically a monopoly
  - Some, though not all the information available to the seller of information is transmitted to buyers: if seller of information is seller of the good, will hype declared quality, if buyer will depress it.
  - Monopolist sets a low price for information so that all the uninformed buyers (except at most one) purchase it.
  - Inefficiency, due to underinvestment in information acquisition.
  - Restricting access to the market for the sale of information only to "disinterested traders" makes inefficiency worse.
- Cabrales, Gottardi (2014)
- Cabrales, Feri, Gottardi, Melendez (2016): test findings in experiments



### (iii) Trade in networks

- Trade of an indivisible object among traders with private valuation
- Traders restricted to buy and sell only from their 'neighbours'  $\Rightarrow$  role for intermediation.
- At each round, seller makes take-it-or-leave-it offer to his neighbours.

#### **Results:**

- characterize equilibrium pricing strategies in terms of degree (number of possible buyers) of each seller. can serve as a simple rule of thumb for trading in networks.
- prices are nondecreasing along the equilibrium path
- determine intermediation rents and efficiency of trades.

Gottardi, Goyal (2014)

## 4) Information and Contracts

### (i) Fresh Start and Personal Bankruptcy

- In many countries, lenders are not permitted to use information about past defaults after a specified period of time has elapsed.
- Observe that differences in information-sharing regimes across countries are associated with differences in the provision of credit.
- Also, evidence on effects of such provisions on borrowers' behavior
  
- Optimal contracts dictate use of all available information on agents' past behavior. How can we rationalize institutions that impose limits on the availability of information on past failures by credit bureaus (also motor vehicle records, ...) ?
  
- How can we understand evidence above?

- Consider a model in which entrepreneurs must repeatedly seek external funds to finance a sequence of risky projects under conditions of both adverse selection and moral hazard:

each period the probability distribution of returns on the project depends both on effort exerted and type of borrower.

- contracts optimally chosen by lenders
- Reputation based on a borrower's past history of defaults

Erasing record of past defaults generates a tradeoff:

- weakens incentives, ex ante, by reducing the punishment for default.
- improves reputation, hence allows continued access to credit, and strengthen incentives - ex post - to retain such reputation

## Find:

- An appropriate amount of forgetting is welfare improving in some conditions (concerning impatience, strength of incentives, degree of adverse selection).
- Regulatory intervention needed for this
  - Elul, Gottardi (2014), Dari Mattiacci and Gottardi (2017)

## (ii) Flexible contracts/Delegation

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  - the principal can predefine/limit the set of actions/tasks available to the agent (extent of delegation).

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- Benefits of flexibility: agent can adjust choice of action on the basis of his privately acquired information
- Cost of flexibility: agency costs in delegating choice



- Determine the optimal flexible contract/organization and compare it to the optimal non discretionary one.
- Investigate how trade-off varies with agents' attitude towards risk, nature of future events, ambiguity aversion (with multiple common priors)
- compare effects of ambiguity aversion on contractual and bargaining outcomes.

• Gottardi, Tallon, Ghirardato (2016), Auster (2014)