Chapter 2: Economic Organization and Efficiency

The problem of designing and managing efficient economic organizations

• Economic organizations are created entities within and by which people interact to reach individual and collective economic goals.

• The economic system consists of a network of people and organizations, with lower-level organizations linked together through higher-level organizations.
Economic organizations: a perspective

*The highest-level organization is the Economy as a whole.*

This perspective emphasizes that:

- a) the economic system is a human creation;
- b) many of the problems faced by smaller, more formal organizations do exist at the economy-wide level as well;
- c) also the overall performance of an economic system should be evaluated vs its alternatives.
Formal Organizations

- A key characteristic of Formal Organizations (e.g., firms, unions, universities, government agencies, churches) is their independent legal identity, which enables them:
  - 1) to enter binding contracts and
  - 2) to seek court enforcement of those contracts in their own name.
Organization as a **nexus of contracts** I

- A view, first proposed by Armen Alchian & Harold Demsetz (1972), suggests that a firm can be regarded as a set of *(simple, bilateral)* contracts between its individual members and its trading partners (suppliers, customers, investors, workers and managers) and such an organization itself.

- This **contracting approach** emphasizes the **voluntary nature** of people’s involvement.
Organization as a **nexus of contracts II**

- It is then natural to consider the possibility of *rearranging contractual terms* (leading to the possibilities for reform, redesign and abandonment of the organization).

- This also accounts for the fuzziness of organizational boundaries: **markets** and **hierarchies** just being two extreme forms of organization, marked respectively by *voluntary bargaining* and *strict lines of authority*. 
Beyond the legal aspects I: “corporate culture”

- A full description of *organizational architecture* involves many more elements than its legal aspects:
- The patterns of resource and informational flows, the authority and control relationships, the distribution of effective power, the allocation of responsibilities and decision rights, organizational routines and decision-making processes, the methods for attracting and retaining members and trading counterparts, the means of generating and spreading new knowledge (learning), the expressed objectives and the strategies and tactics employed, and so on …
Beyond the legal aspects II: *functional autonomy*

- The legal approach can even be misleading.
- Consider **Sony**, a Japanese multinational conglomerate corporation active everywhere in the world and in many business.
- Legally, it is made by many subsidiary corporations. However, by looking in terms of the smallest unit that is functionally autonomous in that it is largely free form intervention by outside parties and enjoys broad internal discretion, one recognized that Sony does constitute a single organization.
Transactions

• A transaction is “the transfer of goods or services from one subject to another”.
• It is the most fundamental unit of analysis in economic (organization) theory.
• The way it is organized largely depends on certain of its characteristics.
• E.g., for frequent transactions people develop routines, while for unusual transactions parties may need to bargain about its terms.
Individuals

• The ultimate participants in transaction are **individual human beings**, and their **interests** and **behaviour** are of fundamental importance for understanding organizations.

• They are the indivisible **decision makers** and **actors** who create and manage the organizations, and it is upon their **welfare** (need, wants and goals) that any ethical and/or economic judgement has to be formulated.
Efficiency I: preferences

- We adopt the position that people will seek to achieve efficiency at a systemic level, in the design, management and governance of the organization they create.

- This approach requires that we ascribe preferences to individuals, indeed well-defined welfare measures ("utility functions").
Efficiency II: scarcity

• Scarcity implies that trade-offs, also among individuals, have typically to be made.

• How do we measure economic performance of groups when there is a possible conflict of interest?

• (Pareto) Efficiency: a choice is efficient if there is no other available option that everyone in the relevant group likes as least as much and at least one person strictly prefers.
Efficiency III: Pareto improvement

• That is, a choice is **inefficient** when there is an alternative possible choice that would help one person without harming any other (i.e., if a so-called *Pareto improvement* is available).

• Note that the efficiency criterion can **never** be applied to resolve ethical questions about “distribution” (when it is justified to help one person at another’s expense).

• Also notice that the concept of efficiency depends on the sets of *available* choices and *relevant* individuals.
Allocative Efficiency I

• An allocation of resources (an outcome) A is **inefficient** if there is some other available allocation B that everyone concerned likes at least as A and that one person strictly prefers.

• In such a case A is *Pareto dominated* by B (B is *Pareto superior* to A) and it is clearly **wasteful** from a society point of view.

• Otherwise A is said to be *Pareto efficient* (or *Pareto optimal*).
Allocative Efficiency II

• Notice that to give all resources to a single insatiable and completely selfish individual would be efficient.

• Moreover, there are typically many efficient allocations for a given collection of resources.

• Thus, the efficiency criterion may be weak on ethical grounds and as a predictor of outcomes.
Allocative Efficiency III

• However, actually achieving efficient allocations can be extremely demanding:

• think of a large economy in which all outputs should be produced at the minimum cost and at the right mix, with the correct level of investment and saving, and ensuring that all people involved do their part in bringing about the result!

• In particular, some agents may prefer a specific inefficient outcome to a specific efficient result and be able to effect it!
Efficiency of Organizations

• An organization is efficient if it “always” (under all circumstances) produces an efficient outcome.

• This outcome-by-outcome comparison is quite demanding, because it might be very difficult to find alternative organizations which do consistently better. Accordingly, possibly too many organization would be considered efficient.

• A refined criterion would just ask a “superior” organization for doing better “on average”.

Positive Efficiency

• Efficiency is not only a normative concept, i.e., a criterion for group decision.

• It may be a **positive concept**, with explanatory and predictive power, *if people* (perhaps by trials and errors) *seek out and then settle upon efficient choices*.

• Indeed, since efficient choices are less vulnerable, we should expect *inefficient arrangements being supplanted over time, while efficient ones survive*. 
The Efficiency Principle

• *If people are able to bargain together effectively and can effectively implement and enforce their decision, then the outcomes of economic activity will tend to be efficient (at least for the parties to the bargain).*

• Most of the economic analysis of organization is based on the idea that changes in organizations are *efficiency-enhancing responses* to changes in the environment.
Effective bargaining, enforcement and implementation

• However, many interesting economic analysis instead focus on the cases in which there exist conditions that impede an effective bargaining (or its enforcement / implementation), and actual arrangement are then inefficient, at least for the individuals whose interests are not being taken into account by the agreement possibly reached by others.
Coordination and Motivation

• The fundamental principle of comparative advantages suggests that people gain from specializing and trading.

• This raises the need for coordination in modern economies.

• Approach: formal organizations and their structures, policies and procedures reflect attempt to achieve efficiency in coordination and motivation.
Specialization

- Since Adam Smith’s *pin factory example* (the various manufacturing stages were carried out by different people, each of whom specialised in a different task) economists know that specialization increases productivity.

- And requires coordination: time and efforts of specialists are wasted unless a) they can be sure about the fact that the others specialists in the manufacturing are doing their part; and b) they will be able to buy on the market what is necessary for their daily needs.
The Need for Information

- A key problem in achieving coordination and adaptation is that relevant information (concerning individual tastes, technological opportunities and resource availability) is typically not freely available to everybody but localized and dispersed throughout the economy.
Information solutions

- In principle, two polar “solutions” are possible:
  - A) transmission to a centralized planner (with costs and lags of communication and computation)
  - B) autonomous decentralized decisions (with the problem of achieving consistency and coordination).

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Organizational Methods I

- We have already seen at work alternative “solutions”:
  1. HBC was originally overly centralized, and decisions were untimely;
  2. GM was initially overly decentralized, lacking coordination;
  3. A. Smith’s pin factory solved the problem by a single firm whose owner-manager specialized in providing coordination.
Organizational Methods II

• Alternatively, the pin factory might have been owned by a cooperative.

• On the contrary, individual craftsmen would sacrifice gains from specialization but reduce the need for coordination.

• Finally, each stage of the production might have been realized by independent firms interacting through a market (Toyota?).
Organizational Methods III

• The last alternative is genuine. It is just the second option in the familiar business question “make-it or buy-it?”.

• Indeed, the use of internal “transfer prices” by modern corporations just mimics the market solution in many ways.
Coordination by markets and prices

• A thoroughgoing use of the market is actually one possible solution to the problem of coordinating economic activity.

• At the extreme, all transactions could be between separate individuals on an arm’s-length basis.

• The opposite extreme would be complete elimination of the price system, under a regime of explicit central planning within a single organization.
The capitalist economic system

- No economic system can centralize all the decisions (the communist economies left many decisions to consumers facing prices).
- The market economies feature firms that interact through markets but within which activities are explicitly coordinated by plans and hierarchical structures. And they appear a remarkably effective mechanism for achieving coordination (the Fundamental Welfare Ths!).
Incentives in markets

- Moreover, the outcome produced by a market is achieved accepting individually self-interest behaviour (and channelling it towards efficiency).
- At least, under the assumption that perfect competition is ubiquitous, agents have no market power, and all significant goods are traded.
- In real market, however, large firms set prices, markets are missing (or affected by externalities) and informational asymmetries prevent perfect competition from establishing.
Incentives in organizations

• Similar problems affect organizations, which devote ingenuity and resources to align individual self-interests to the collective goals.

• Examples are provided by the introduction of a stock ownership scheme in SB, or by the several “reforms” attempted by the Eastern Europe communist countries.
Transaction Cost Analysis I

- If markets are so efficient, why do firms exist?
- This question (what determines which transactions are mediated through markets or within a formal organization?) was first posed by Ronald Coase (1937).
- His answer was that transactions have costs which depend on their nature and the way they are organized, and that the organizational mode tends to minimize them (an application of the efficiency principle).
Coase’s idea has shaped the research agenda in the economics of organization.

In particular, a large attention has then been devoted to the origin and the nature of transaction costs.

In fact, they are the costs of running the system, i.e., essentially the costs of coordinating and motivating.
Types of Transaction Costs I

- **Coordination Costs**
  - In a market system, these are the costs of determining prices and other contractual details, and to spread information about the characteristics of potential traders (think of any Stock Exchange working).

- Specific costs involve advertising and marketing expenses, consumer search costs, and the opportunity cost of missed efficient trades.
Types of Transaction Costs II

• In a hierarchical system, these are the costs of transmitting up information, centrally computing a plan and communicating it down to those responsible for implementation.

• Specific costs involve lags in communication, and maladaptation due to insufficient or inaccurate information.
Types of Transaction Costs III

• Motivation Costs

• 1) Informational incompleteness and asymmetries.

• In these cases not all the relevant information is available to the parties of a potential trade.

• As a consequence, efficient trade might not occur, or costly arrangement have to be made to protect parties against opportunistic behavior.
Types of Transaction Costs IV

• 2) **Imperfect commitment.**
• In these cases parties are unable to bind themselves to follow through on optimal threats and promises which they may later like to renounce.
• As a consequence, efficient plans might not be credible, or resource must be devoted to achieve commitment.
Dimensions of Transaction

1. **Specificity** of required investments
2. **Frequency** and **duration** (period of time over which they are repeated)
3. **Complexity** and **uncertainty** of the required performance
4. **Difficulty** of measuring performance
5. **Connectedness** with other transactions
Asset Specificity I

- Transactions are different according to the *specificity* of the required investments.
- An investment is *specific* according to the amount that would be lost outside the transaction.
- To protect the investor against *opportunistic renegotiation* of the transaction terms by the counterpart special clauses or practices might be required.
Asset Specificity II

• Examples:

1. No specific investment is involved in daily purchase of bread by a bakery.

2. Temporary employee should be reluctant to invest (train) into on-job firm-specific knowledge, and to achieve such an investment the firm may find necessary to sustain special costs.
Frequency and Duration I

- *Una tantum* trade (house purchase) are likely to involve a *standard form contract*, with disputes to be resolved in court.
- Frequent transactions tend to be dealt with informally, with the use of *low-cost routines* which are adapted to the specific case and almost never brought to court in the case of dispute.
Frequency and Duration II

• In particular, parties involved in long, close interaction have many opportunities to learn about the reciprocal behaviour and enforce trustful relationships, since they can reward faithful partners and punish untrustable ones by actions in the future.

• This can substitute for detailed formal agreement and save a lot of contractual costs.
Uncertainty and Complexity I

• Consider the *contract to build a nuclear power plant*. Given the span of time (more than 10 years) involved, and the complexity of the object, many events cannot be fully predicted in advance, and many decisions (the way to proceed, and even whether to finish at all the project) are left to *successive negotiation*, or the right to decide is assigned to one of the parties.
Uncertainty and Complexity II

• This is typical. Uncertainty and complexity make the contract naturally incomplete (not all the contingences are predetermined), and it specifies rights, obligations and procedures rather than an outcome in terms of performances (relational contracts).

• For example, a party might be given the right to decide the amount to be exchanged, given a pricing formula.
Difficulty of Performance Measurement

- In many cases (team work, legal or medical assistance), the performance actually obtained is difficult to assess.
- In similar cases, arrangements are made to reduce the need for accurate measurement.
- For example, the fixed part of a taxi tariff is due to the need to provide incentives to taxi drivers to reduce the duration of a single service.
Connectedness

- Transactions might be connected with other transactions involving different people.
- This could generate several instances of coordination failure.
- Think of the need of coordination for computer components (and software): failure to match design tolerances can be extremely costly.
- This suggests the use of central coordination mechanism, or the reduction of the agents involved (vertical integration?).
Limits of the Transaction Costs Approach I

• I) Transaction costs are not always distinguishable from production cost.
• For example, the “second sourcing” practice in the semiconductor industry (integrated circuit), where there are increasing returns to scale and very important learning curve effects, was motivated by achieving commitment to a fair commercial behaviour.
• Are the related costs of a transaction type?
Limits of the Transaction Costs Approach II

- II) Do Institutions minimize transaction costs?
- Why, for example, should employer bother to minimize the transaction costs bear by their employees?
- One possible (but limited) answer is competition among employers, but this would weaken considerably the analysis, because based on external factors not always at work.
- However, this problem disappears if there are no wealth effects (i.e., if behaviour does not depend on wealth).
Value Maximization

• For a given set of alternatives, the behaviour of a decision maker exhibits **no wealth effects** if:

1. for any two alternative decisions, \( y_1 \) and \( y_2 \), there exists a finite amount of money \( \Delta x^* \) that would be sufficient to compensate her for the switching;

2. \( \Delta x^* \) does not depend on her wealth \( x \);

3. she is rich enough to possibly absorb the payment of \( \Delta x^* \) (i.e., \( x > \Delta x^* \)).
Wealth effects

• It seems clear that wealth effects usually do arise (at least for relevant money transfers).

• However, they might not apply to specific choices in many of the most common kinds of business decisions, in which the money transfers are small enough not to change the personal living conditions of the individuals involved. Or they can be safely ignored.
No Wealth Effects

• If there are no wealth effects, the utility function of an agent can be written:
  \[ U(x,y) = x + v(y) \]

• where \( x \) is her money wealth, \( y \) denotes all the other characteristics of her choice and \( v(y) \) is its cash equivalent value.

• \( x + v(y) \) is called “value index” and is a welfare measure in money terms.

• The compensating value is \( \Delta x^* = v(y_1) - v(y_2) \).
The Value Maximization Principle (VMP)

• *If there are no wealth effects, an allocation is efficient (if and) only if it maximizes the total value of the affected parties.*

• *Moreover, for any inefficient allocation, there exists another that all parties strictly prefer.*

• On the contrary, with Wealth Effects there might exist a Pareto efficient allocation which does *not* maximize total value, and for an inefficient allocation it might *not* exist a Pareto superior one which all parties *strictly* prefer.
Example

• 2 agents and an *investment* decision, y, with
  \[ U_i(x_i, y) = x_i + v_i(y), \ i = 1, 2 \]

• For the sake of simplicity, we *ignore* the “initial wealth” \( x_i \), so that the “final wealth” \( x_i = \Delta x_i \) (instead of \( x_i = x_i + \Delta x_i \));

• \( P(y) \) is total *cash* outlay, with \( P(y) = \Delta x_1 + \Delta x_2 = x_1 + x_2 \), and \( v_i(y) \) is “cost” sustained by \( i \).

• **Total Value** (social welfare) is: \( TV = U_1(x_1, y) + U_2(x_2, y) = P(y) + v_1(y) + v_2(y) \).
Example: *continuation*

- 1) Consider an allocation \((y^*, x_1^*, x_2^*)\) (with \(P(y^*) = x_1^* + x_2^*\)), and suppose \(y^*\) maximizes total value.
- Then it cannot exist an allocation \((y', x_1', x_2')\) which *Pareto dominates* \((y^*, x_1^*, x_2^*)\).
- Suppose the contrary, then \(x_i' + v_i(y') \geq x_i^* + v_i(y^*), i = 1,2\) with *strict* inequality for at least one agent.
- Adding up: \(TV(y') > TV(y^*)\), which is a contradiction.
Example: continuation

- 2) Suppose now \((y', x_1', x_2')\) does not maximizes total value.

- Consider \(y^\circ\) such that \(TV(y^\circ) > TV(y')\).

- \(\Delta TV = TV(y^\circ) - TV(y') > 0\) is the total-value increase moving from \(y'\) to \(y^\circ\).

- Define \(x_i^\circ = x_i' + (v_i(y') - v_i(y^\circ)) + \Delta TV / 2\).

- Clearly, \(x_1^\circ + x_2^\circ = P(y^\circ)\) and \(x_i^\circ + v_i(y^\circ) > x_i' + v_i(y')\), \(i = 1,2\).

- That is, \((y^\circ, x_1^\circ, x_2^\circ)\) “strictly” Pareto dominates \((y', x_1', x_2')\).
The utility/value frontier

• With no wealth effects the “value frontier” is **linear** (*total value is independent of distribution*), and only depends on \( y \).
Applying Value Maximization

• When the value maximization principle applies, the efficiency of the allocation \((x, y)\) does depend only on \(y\) being the total value maximizer, and it does not depend on the distribution of the value, given by \(x\) (the so-called Coase theorem).

• While this separation between the distribution of value and how it is created does not always apply, it greatly simplifies the analysis.

• Notice that the model is very general, depending on the interpretation of \(y\).
Exercise no. 1-2, p. 53.

• Suppose that 4 owners have a *common* property. Improvements have a **cost** of $y$ and are worth $v_1(y) = v_2(y) = 5y - y^2/2$, $v_3(y) = 7y - y^2/2$ and $v_4(y) = 4y - y^2$.

• Which is the efficient level of expenditure $y$?

• Total value is ($P(y) = -y = \Sigma_i x_i$):

  • $TV(y) = \Sigma_i U_i(x_i, y) = 20y - 5y^2/2$. 

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Exercise: *continuation*

- Since $TV'(y) = 20 - 5y$, $TV''(y) = -5 < 0$,
- then $y^* = 4$. 

![Graph showing TV as a function of y with a maximum at y = 4]
Exercise: continuation

• Show that if the expenditure is to be shared equally, family #4 will be unwilling to agree to the implementation of the efficient level.

• Indeed, $U_4(-1, 4) = -1 < U_4(0, 0)$.

• What is the largest expenditure level, $y$, that family #4 would accept under a “equal cost sharing rule”?
Exercise: continuation

- Writing $U_4(-y/4, y) = 15y/4 - y^2 = U_4(y)$,
  $U_4'(y) = 15/4 - 2y$, $U_4''(y) = -2 < 0$,
- then $y = 15/4$. 

![Graph showing $U_4$ vs $y$ with $y$ values of 15/8 and 15/4.]
The Coase Theorem (CT)

• If there are no wealth effects and parties bargain to an efficient agreement (for themselves), the value-creating activities agreed upon are determined only by efficiency.

• Bargaining power and initial endowments by the parties affect only decisions about how the cost and benefits are to be shared.
The Coase Theorem: continuation

- CT, which is properly not a “theorem”, but rather an implication of the assumptions of no wealth effects and effective bargaining, is the foundation of the Transaction Cost Approach (TCA) to the theory of economic organizations.

- In particular, if we think of transactions costs as all the costs of managing the transactions (including the costs of writing contracts, supervising workers, enforcing contracts, and resolving disputes), then the efficient organization is the one that minimizes them.
Alternative Views

1) TCA is alternative to the Marxian Approach, which look at the organizational arrangements as a reflection of the underlying power relationships and class interests. Ex: labor-managed firms in Yugoslavia.

2) It suggests that business arrangements should be understood as attempts to increase total wealth (to be shared among the parties). Ex: resale-price maintenance clauses are seen by Harvard School of IO as attempts to increase market power rather than as a way to reduce inefficient free-riding among retailers concerning support services.
CT reconsidered

• It is important to realize that CT (and the VMP itself) depends on the possibility of using money as a “perfect” mean of distributing value across individuals, with no “liquidity constraints” for the parties.

• It would be likely a mistake to use it to explain the working of an underdeveloped countries (e.g., the slavery “institution” in the Ancien Régime in Europe and pre-Civil War American South).
Organizational Objectives

- Only when VMP applies is there an objective ("efficiency") that it can be ascribed to the organization.
- Otherwise the textbook treats organizational decisions as the outcomes either of strategic interplay among self-interested people responding to incentives designed to influence their behaviour, or of collective (or managerial) attempts to compromise the interests of the parties involved.
Profit Mazimization I

- It is standard in economics to assume that firms do maximize profit. This should actually be in the interest of the owners.

- However:

1. Owners may include firm’s employees (manager), customers and suppliers who disagree with that objective.

2. If the cash flow is inter-temporal and uncertain, owners may disagree on its expected discounted value (unless markets are competitive and complete and, at given prices, owners can actually shift income across time and events: see Chapter 3).
3. To the extent that owners/managers are not the only claimants on the returns, they may not be interested in maximizing the total returns. Ex: if there is owner limited liability, and some financing is via debt, they might prefer to take excessive risk with respect to the value of the firm (which includes the value of its debt as well as its equity). In fact, riskier investments shift some of the losses onto the debtors (see Chapter 5).
Other Goals

• Of course, profit maximization is not the goal of many organizations (ex: customer-owned cooperatives).

• However, to assume that those organizations attempt to serve their “owner” (e.g., employees) interests may be a useful assumption.

• But who does own a not-for-profit organization, e.g., a University? To act “in the public interest” actually means that there is a multiplicity of people whose interests are in conflict: students, employers, taxpayers.
Many Stakeholders?

• In general, even within firms, there are many apparently legitimate stakeholders other than the shareholders (including e.g. employees, suppliers, customers, the local community) to whose interests management is concerned: corporate social responsibility (the case of 100 major Japanese firms)?

• And the actual policies are going to represent a sort of political compromise mediated by management.

• That is, the assumption that organizations have well-defined goals should be made very cautiously.
Modeling Human Behavior

• In general, economic theory makes the (controversial) assumption that people do have well-defined preferences.

• However, a sufficient concern both for the well-being of others and for social approval could rationalize even extreme self-sacrifice (and certainly instances of non opportunistic behavior in organizations).

• In addition, organizations do deliberately attempt to change the preferences of individual participants toward desired behavior.
Rationality-Based Theory

• In any case, the textbook adopts the view that many institutions and business practices are designed as if people were amorally motivated solely by narrow self-interest, ready to ignore rules, breaking agreements and employing deception.

• This is a caricature, but with sharp testable predictions, and (hopefully) the predicted business practices are not very sensitive to it (think of bank guards and performance-pay systems).
Bounded Rationality

- At the same time, the textbook do not assume automatically that people are capable of instantaneous, unlimited, perfect and costless calculation, that they can forecast all possible eventualities, and that they optimise in all situations (bounded rationality).

- The contrary would be counterfactual and would prevent understanding of many important elements of organizations (as routines and organizational learning).

- *It would also deny the possibility of having an empirical basis for the theory: on the contrary, since people (and organizations) learn to make good decisions and adapt by experimentation and imitation, this provides a “fossile evidence” available for testing* (Nelson & Winter, 1982).
Medical Internships in USA: A Case Study

• M.D. degree holders take *internships* in hospitals: this provides them with practical training and the hospitals with cheap labour.

• Competition among hospitals in USA used to be intense (before the arrival of foreign graduates). Moreover, hospitals have preferences over groups of students (they pay attention to the mix), and interns have individual preferences.

• The matching is not a trivial job.
Internships in USA hospitals I

• Over the years, several schemes have been tried.
• Initially, the system was similar to College admissions: first students applied, and then hospitals made offers by using waiting lists, followed by rounds of students acceptance (or wait) and new offers.
• But the hospital began competing by making offers earlier and earlier (up to half-way through the medical school studies), which was individually rational but socially a disaster (both hospitals and students did not have enough information).
Internships in USA hospitals II

• This lead medical schools to agree do deny information about students to hospital until the final year.

• But a problem arose with students waiting to reply to second-best offers and later trying to renege on their acceptances.

• Attempts were made by hospitals to agree on the earliest date for making offers, to short waiting time for acceptance (12 hours!) and to limit communication between them and the students.

• It did not work.
The National Intern Matching Program (NIMP)

• In the 50s a centralized scheme called NIMP was established. It required students and hospitals (after a period of information exchanges) to submit (“independently”) to a central office a rank of their possible matches.

• The central office used a specific rule (an algorithm) to provide a final match among students and hospitals.

• This ended the turmoil on the market for interns till the mid 70s, when an increasing number of married couples started looking for internships in the same vicinity.
NIMP at work I

• Suppose that each hospital looks for a single student, and that there are as many internships as students.
• At the initial round, each hospital is associated to the preferred student, on the basis of its rank (i.e., they make “single offers”).
• Then students are tentatively matched to the hospital they prefer on the basis of their ranks, and the other offers are cancelled.
• A new round then starts with “new offers” to the others (not yet offered by the same hospital) students.
NIMP at work II

- At each stage some student is moved up in the hospitals’ revised rankings: if they prefer the new offer the initial matching is broken and they move up to their personal ranking.
- The process continues until everyone is assigned.
- It can be proved that, even if there are multiple offers, the outcome produced by NIMP is efficient (no reassignment can improve the situation of one student or one hospital without hurting some other student or hospital).
- As a matter of fact, it was accepted by the vast majority of students and hospital (95%).
NIMP at work III

• Notice that no monetary transfers ("side payments") were involved, so that there was no value maximization at work (no compensation paid). This actually implies that the efficient outcome need not to be unique.

• However, the result can be proved to have a special property: stability. i.e., there will never be an alternative hospital-student pair such that the student prefers it to the one she was matched and such that the hospital also prefers her to some of the students it was associated.

• Thus, no recontracting between individual students and hospital can upset the NIMP outcome (a so-called CORE property)!

• That is, stability implies a sort of group efficiency.
NIMP at work IV

• There is no doubt that stability helps explaining the persistence of the Program.

• Moreover, one can prove that the scheme is quite ideal from the point of view of hospitals (and the opposite from students’ perspective).

• In fact, it gives to each hospital the $n$ students it ranks highest among all the students it might ever get at any stable assignment (and each student is assigned to the hospital she ranks lowest among all those she might be assigned by some stable match).
Misrepresentation at NIMP

- The previous results apply if students and hospital report truthfully their rank to NIMP.
- Indeed, NIMP claims that there is no reason to misrepresenting preferences. But this is true only for hospitals offering a single internship or for what concerns the most preferred hospital for students.
- In general, misrepresentation of preferences (see an example on p. 47), given behaviour of other agents, can allow individual improvements, and in fact, students are known to spend time and energy trying to learn about behaviour of the other students and hospital. However, this is difficult and it is quite possible that they eventually give up and report accurately.
Evolution and Persistence of Organizational Forms

- When arrangements are *unstable* in the sense we discussed, they are fragile and we should expect that pairs of agents find a way to subvert their workings.
- This is confirmed by the experience of UK, where there are 7 regional markets with similar problems.
- Over the years, several schemes have been tried, of which eight were formally studied. Two proved to be stable, and six not. Of these, the stable ones were still in use at the time the textbook was published, while four of the unstable had been abandoned.
The 2012 Nobel Memorial Price in Economic Science

- Was assigned to Alvin E. Roth and Lloyd S. Shapley "for the theory of stable allocations and the practice of market design".
