Coase Revisited:
Economic Efficiency under Externalities, Transaction Costs and Non-Convexity

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Motivations

• Ronald Coase received the Nobel Prize in economics in 1991 for two of his papers:
  – his 1937 Economica paper, which stresses the importance of transaction costs to explain the nature and limits of firms,
  – his 1960 paper in the Journal of Law and Economics, that examined economic efficiency in the presence of externalities (where one agent’s decision has direct effects on others).

• The objective of this paper is to integrate Coase’s two main contributions by examining economic efficiency under both transaction costs and externalities.
Overview

• Economic efficiency is examined:
  – Under **externalities** (where one agent’s decision has direct effects on others)
  – Under **transaction costs** (reflecting resources used in the process of exchange among agents)
  – Under **non-convex technology** (e.g., allowing for fixed costs).

• This paper makes three contributions.
  – It shows that the Coase theorem (stating that the efficient management of externalities is consistent with aggregate profit maximization) holds under general conditions.
  – It shows how the minimization of transaction costs is an integral part of efficient allocations.
  – It shows that these results apply under non-convex technology, provided that we allow for non-linear pricing.
Efficiency

• **Pareto efficient allocations** are allocations that maximize aggregate benefit subject to feasibility constraints (Propositions 1 and 2).

• This result applies
  – under *externalities* (where one agent’s decision can have direct effects on others)
  – under *transaction costs* (defined as resources used in the process of exchange among agents)

• And it applies under any economic institutions (markets as well as non-market institutions)
Dual Approach to Efficiency

• The maximization of aggregate benefit (subject to feasibility constraints) has a **dual formulation** that corresponds to a saddle-point of a (generalized) Lagrangian (Proposition 3).

• Under convexity, the saddle-point problem identifies a “separating hyperplane”
  – measuring aggregate values
  – with slopes equal to the market prices supporting an efficient allocation (as stated in Welfare theorems).

• Under a non-convex technology (e.g. due to fixed costs), we work instead with a “separating nonlinear hyper-surface” measuring aggregate value, but allowing for non-linear pricing.
Convex technology

Separating hyperplane

Efficient point

feasible set
Non-convex technology

Nonlinear Separating hypersurface

Efficient point

feasible set
Implications

• Proposition 4: Under efficient allocations,
  – Consumers minimize expenditures (eq. 16)
  – Production firms maximize aggregate profit (Coase theorem) (eq. 17)
  – Trade firms minimize aggregate transaction costs (eq. 18)
  – Prices (possibly non-linear) clear the markets and provide proper incentives for firms to produce and trade (eq. 19).
The Coase theorem

• The Coase theorem applies under very general conditions (including income effects, transaction costs and non-convexity)
  – The efficient management of externalities must be consistent with the maximization of aggregate profit.
  – In the presence of externalities, this cannot be totally decentralized.
  – Non-convexity (e.g. due to fixed cost) can imply non-linear pricing, each agent facing possibly different prices.
The role of non-convexity

- Non-convexity arise in the presence of fixed costs.
- Non-convexity can imply non-linear pricing.
- Price discrimination then becomes an integral part of implementing an efficient allocation.
- Who decides the price discrimination scheme?
  - This is no longer the “invisible hand” of prices that just “clear the market”.
- Aggregate values also depend on the price discrimination scheme.
The role of transaction costs

• Minimizing transaction costs is an integral part of economic efficiency.
• There can be externalities in exchange.
• There can also be non-convexity in transaction technology (e.g., fixed cost in exchange).
  – This can also motivate non-linear pricing.
• This analysis can be used to identify efficient economic institutions:
  – Efficient institutions minimize aggregate transaction cost
  – Example: the case of vertical integration.
Implications for decentralization

- Economists like markets that allow decentralized decision-making supporting an efficient allocation (welfare theorems).
- Both externalities and non-convexity require some form of coordination schemes to implement efficient allocations.
  - Coasian contracts can be “privately” negotiated among the agents affected by an externality.
  - But transaction costs are likely to rise with the number of agents, which would limit the scope for Coasian contracts.
  - When the number of agents is large, some form of centralization is likely required.
  - In this context, our analysis provides a framework to evaluate the efficiency of governance structures.