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

by

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Selected Poster prepared for presentation at the Agricultural & Applied
Economics Association's 2013 AAEA & CAES Joint Annual Meeting,
Washington, DC, August 4-6, 2013

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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.

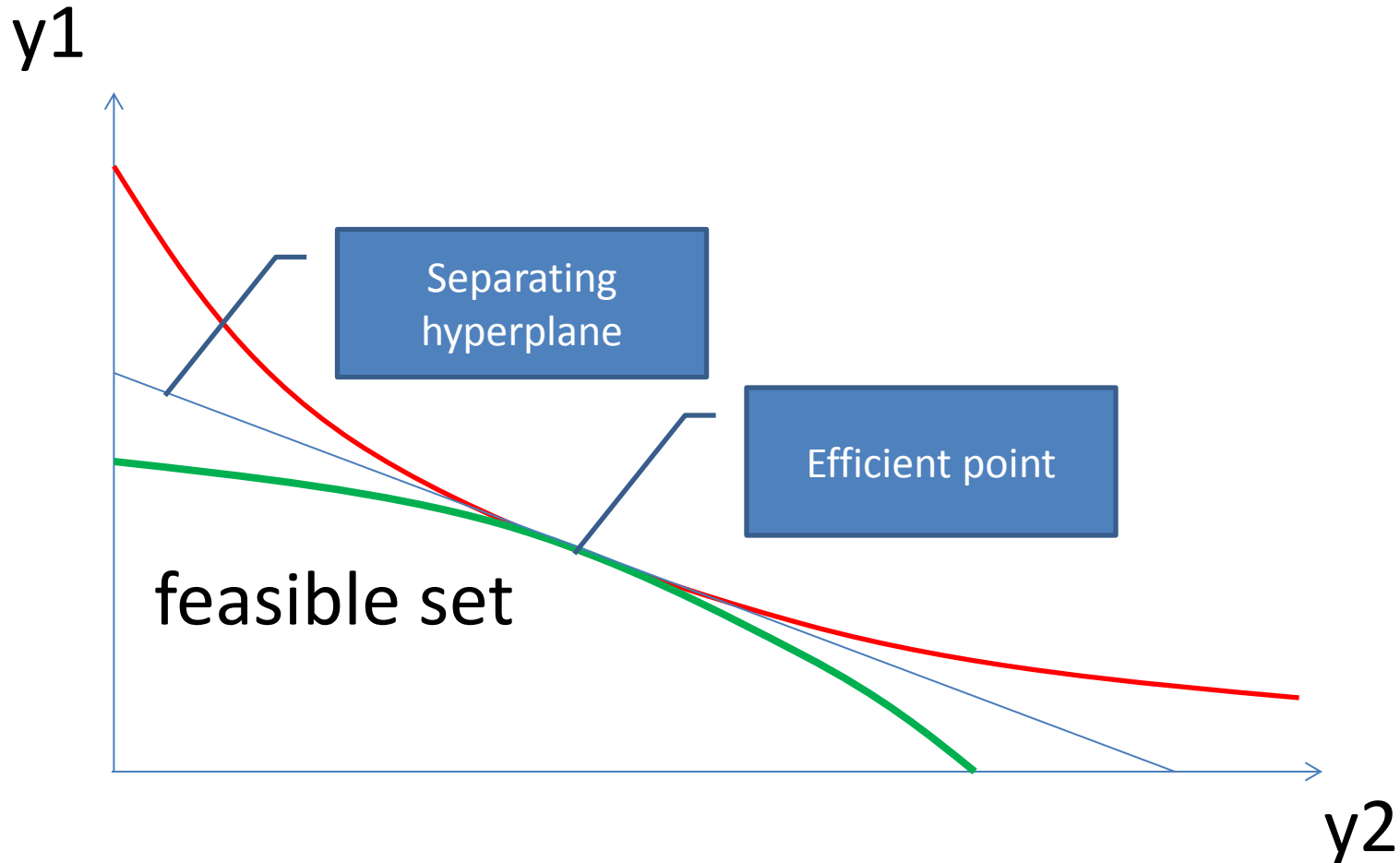
Efficiency

- **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)

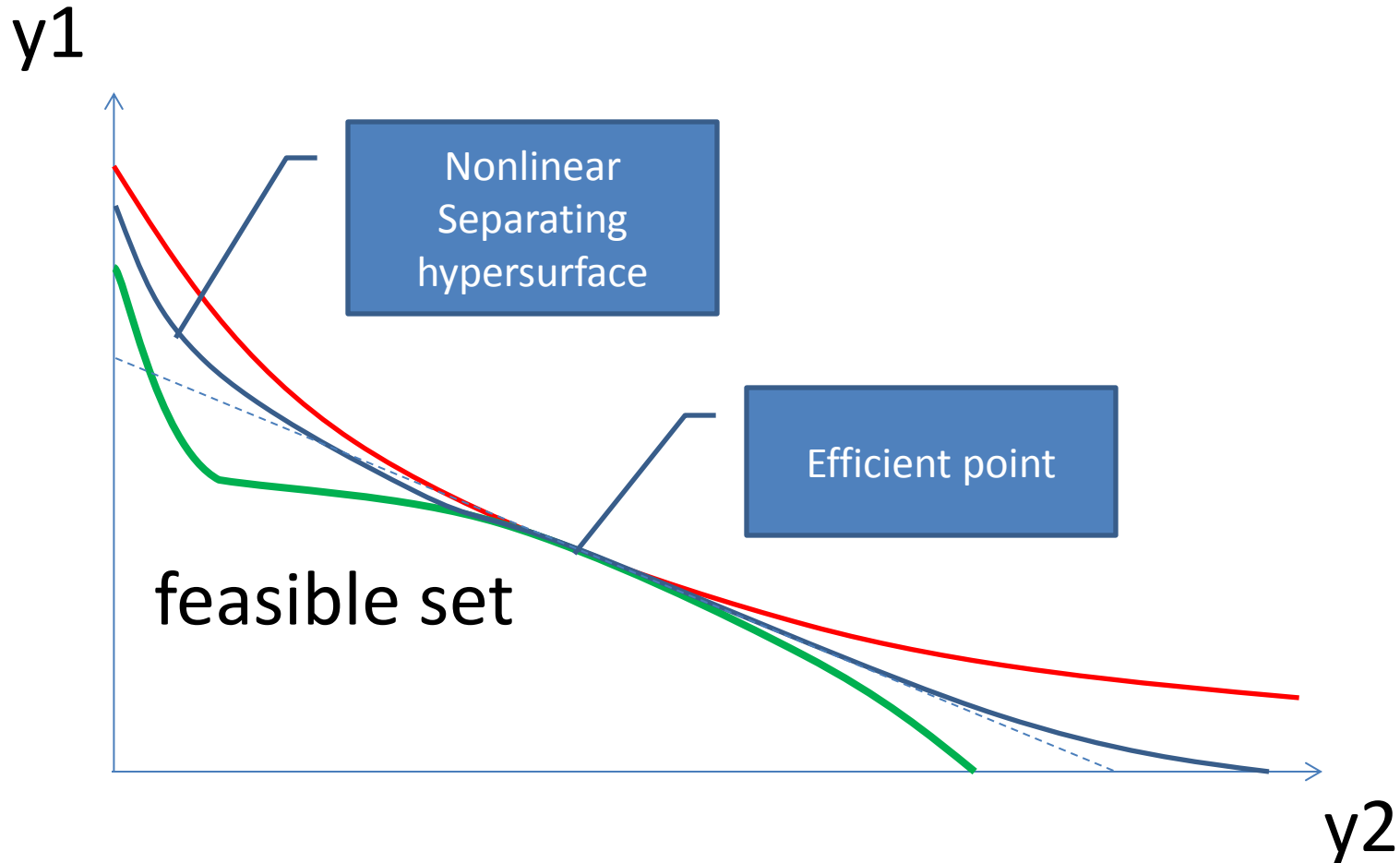
Dual Approach to Efficiency

- 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



Non-convex technology



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.