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LIMITS TO THE THIRD THEOREM OF WELFARE ECONOMICS

Jaime Sempere

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Limits to the Third Theorem of Welfare Economics

JAIME SEMPERE

C.E.E., El Colegio de México

Camino al Ajusco 20, México 01000 D.F., México

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Abstract

The paper introduces historically the *Third theorem of welfare economics*. Then its most relevant limits caused by incentive constraints, non-convexities, and incompleteness of markets are discussed.

1 Introduction

The two “basic theorems of classical welfare economics” give theoretical foundations to assertions about the role of competitive markets as efficient allocators of resources. The first one claims that any competitive equilibrium is Pareto efficient. Even though this one shows its restrictiveness given that the efficient outcome of the market could be perfectly compatible with slavery (Bergstrom (1971)) and starvation (Coles and Hammond (1991)), the second theorem could come to the rescue of the free market advocates, by claiming that any Pareto efficient allocation could be achieved as the result of a competitive equilibrium if adequate (non-distortionary) income redistribution is implemented. This theorem is criticised because it relies on lump-sum taxes to redistribute income.

The propositions concerning gains from market integration and other market liberalizing supply-side policies form what could be called *the third basic theorem of welfare economics*. Based on this theorem, “neoclassical” policy recommendations have tended to favour indiscriminate market liberalization. This point of view was grounded in economies without market failures in which the only sources of market imperfection were the ones that were going to be eliminated by means of the supply-side reform. The idea behind the theorem was that, even though market liberalization could harm some people, the greater aggregate real income made available by the reform would make possible a demand-side reform, i.e. a redistributive policy, so that every one could be made better off. The benefits would extend to everybody eventually.

The idea comes from far away in the history of economic thought. Already Ricardo had concluded that autarkic nations can participate in competitive international trade to mutual advantage. Samuelson (1939) provides a logical argument based on the theory of index numbers to show gains from international trade for a small economy unable to affect its terms of trade. He shows the superiority of free trade over autarky assuming constant returns to scale in production, that nobody is big enough to affect prices, and an ordinal preference scale satisfying non-satiation for each consumer. He also specifies that “although it cannot be shown that every individual is made better off by the introduction of trade, it can be shown that through trade every individual could (by lump-sum taxes) be made better off”. Kemp (1962) and

Samuelson (1962) extended Samuelson's (1939) earlier argument to cover the case of economies of any size. The argument was to show that the consumption frontier corresponding to the free trade regime lies uniformly outside the autarkic frontier, even though the countries involved are able to affect their terms of trade. Kemp (1964) was able to show gains in the more interesting case of a group of countries forming a customs union where the pre-reform allocation could have positive amounts of international trade. Grandmont and McFadden (1972) provided the first version of the theorem for a fully specified general equilibrium model with many agents. They were able to prove the existence of a free trade equilibrium relative to a transfer system for which every consumer was made better off. Kemp and Wan (1976) reformulated the gains from market integration in customs unions in terms of the latter, and Grinols (1981) adapted the Grandmont and McFadden compensatory mechanism to show Pareto gains in a fully specified General Equilibrium model.

2 Incentive Constrained Improvements

Here we discuss results from Hammond and Sempere (1992). We examine the conditions needed for these classical propositions to hold in a standard Arrow-Debreu economy with complete state contingent markets. The first criticism relies on the lump-sum character of the compensatory policies needed to implement the Pareto gain. To ensure Pareto gains in first best economies, the transfers would have to provide each consumer with enough income to afford the net consumption which would have been demanded in absence of the supply-side reform. The feasibility of this policy requires the knowledge of the contingent consumption processes, depending on contingent feasibility constraints that would have happened if the reform were not carried out. For instance it would require the knowledge of the labour plans each consumer would make for the rest of his life if the economy had remained unreformed. This implies the knowledge of each individual's private characteristics. As Feenstra and Lewis (1991) claim, each individual would have incentives to express more damage from the liberalizing policy than what they actually suffer.

Even without using lump-sum transfers, Diamond and Mirrlees (1971)

were able to show that efficient production was desirable. They assumed enough possibilities of commodity taxation so that consumer prices could be independent from production ones, that firms did not make profits, the existence of a commodity either sold by someone and not purchased by anyone or purchased by someone and offered by nobody, and free disposal in the public sector. A mechanism to produce the Pareto gain from improving production efficiency could start by in freezing consumer prices by commodity taxation; this, together with the increased production efficiency, would create a surplus for the government. The following step is to use this surplus to improve someone without damaging anyone by differential changes in the price of the commodity whose existence was assumed. Finally the government could balance the system by buying the excesses of supply and freely disposing them. Based on this argument, Dixit and Norman (1980 and 1986) could prove that lump-sum compensation was unnecessary to get Pareto gains from market integration (their paper is also discussed in Wong (1991)).

In Hammond and Sempere (1992), we extend these mechanisms. To ensure that no consumer is harmed by changes in prices or dividends, consumer prices q and unearned income m are frozen at their original levels by means of commodity and income taxation. The surplus in government's budget caused by this policy and by the improvement in productive efficiency is distributed in form of a uniform subsidy. Then the budget constraint of each agent would be

$$B(s) = \{x \in X \mid \bar{q}x \leq \bar{m} + s\}$$

where \bar{q} , \bar{m} and s are, respectively, original levels of consumer prices and unearned income and a poll subsidy. With this mechanism we allow firms to make profits, though dividends will be frozen. We do not need the existence of a positive direction of commodity tax reform because we distribute the gains in the form of a poll subsidy (this obviously requires less information), and we do not use any sort of free disposability in our analysis. Furthermore, following the procedure of Grandmont and MacFadden (1972), we prove existence of competitive equilibrium in the reformed economy. Apart from the analysis of the third theorem of welfare economics, we also provide a general cost-benefit test for projects to increase production efficiency and so to generate the potential for Pareto improving tax reforms (Hammond (1986)). We show the validity of the claim that border prices should be used as shadow prices for traded goods, and producer prices for non-traded goods, under

weaker conditions than usual for the case of a small open economy.

3 Non-Convexities

Assuming convexity in consumer feasible sets in international trade models implies that either it is impossible or that it is costless to migrate from one country to another. This is clearly counterintuitive. In real economies we observe phenomena of migration but it is hard to supply labour at several different places simultaneously.

The assumption of convexity also excludes the possibility of a subset of the population facing chances of starvation. On the relationship between international trade and famines there is not a definitive conclusion. As pointed out by Drèze and Sen (1989), on one hand we have the idea that when the scarcity of food shows up, the increase of needs would be partly balanced by more international trade which would also reduce food prices serving as a mean of entitlement protection. But it is also observed in the history of famines that there have often been exports from famine affected areas. Sen (1981) suggests introducing the survival question into general equilibrium models by bringing in social security transfers preventing starvation or minimum entitlements transfers. The work of Coles and Hammond (1991) shows that famines and starvation can occur as a consequence of the inequalities derived from the market mechanism without any reference to market failures. All those works assert the importance of also consider the possibility of starvation in international trade models.

In Sempere (1992b) the theory is extended to cover non-convex consumption sets and preferences. This allows us to consider economies where consumers can migrate from one country to another or even within their own country, where there are different sets of non-traded goods. We also analyse the third theorem when the assumption of full survival of the population, classical in general equilibrium theory, gets relaxed. In either case we could define the consumption sets as a union of "local" consumption sets, each one giving the feasible consumptions in each of the situations (having migrated or not to any of the countries, or life or death, respectively).

As in Hammond and Sempere (1992), compensatory mechanisms that allow people harmed by the reform to get fully compensated by who gained

from it are designed. We have two types of compensatory mechanism: the first uses lump-sum transfers, and the second is an extension of the one devised in Hammond and Sempere (1992) that is incentive compatible. The technique used to tackle non-convexities involves the use of a model with a continuum of traders, as in Aumann (1964), with a non-atomic measure distribution of people's characteristics. This ensures, with other standard assumptions, the existence of upper hemicontinuous and convex compensated demand correspondences.

In addition we need almost no consumer to be stuck at the lower boundary of a "local consumption set". To obtain this requirement, we impose on our compensatory mechanisms the property of *dispersed compensation*. The distribution of the transfers has to be dispersed conditional on the local consumption sets. Then we show that the set of people being stuck at a cheapest point of any "local" consumption set has null measure and so the compensated equilibrium is walrasian.

When we remove the assumption of full survival of the population, Pareto gains are compatible with a set of the population starving. In these cases we believe it to be desirable to use the gains in productive efficiency to increase the number of survivors, even if those who are far from the margin of survival are made worse off.

4 Incomplete Markets

Here we comment on the results presented in Sempere (1993a). We discuss conditions for the validity of the theorem in a economy with incomplete financial markets. Based on negative results on the effects of opening new markets like Hart's (1975), Helpman and Razin (1979) deny the possibility of deriving general conclusions about the topic. Newbery and Stiglitz (1984) have an example in which free trade could be Pareto inferior to autarky in one economy without any possibility of risk sharing. Their example is based on risk averse individual producers and on the autarkic demand having unit elasticity and so giving perfect insurance to the producers. When autarky is replaced by free trade, expected profits are the same but they now incorporate a greater variance. The risk that was originally borne by consumers is now transferred to producers. For some values of the degree of risk aversion

of producers, everyone is worse off in the free trade regime. The idea is that, when markets are incomplete, policies also have an extra risk redistribution effect, and we have to take this into account at the time of doing the evaluation. When some possibilities of risk sharing appear results can be different. When there is a stock market, Grinols (1987) shows gains from a reform which replaces autarky by free trade when there is only one representative agent in each of the countries and the balance of capital is positive.

In Sempere (1993a), Grinols's result is extended to cover the case of a multi-agent economy. With more than one consumer three kinds of problems appear in the course of showing Pareto gains. The first, also present in economies with a complete set of markets, is that supply-side policies make some people better off but they can also harm some individuals. Thus getting Pareto gains implies finding a compensatory mechanism so that losers can be compensated by the winners.

The second problem, related to the properties of the compensatory mechanism, is that with incomplete markets, the government with extensive use of state contingent lump-sum transfers could make the economy produce an allocation equivalent to what it would have produced with a complete set of security markets. The lump-sum redistributive policy would produce a trivial efficiency gain without the necessity of any other reform. This, apart from the usual reasons based on incentives, explains why the compensatory mechanism should avoid generalized state contingent lump-sum compensation, since that relies on the unrealistic assumption that market structure constraints do not bind for the government. The government would be able to transfer wealth freely among different states of nature independently of asset markets structure. Instead, our redistributive mechanism will be *market structure compatible*.

The third of our problems is that, with incomplete financial markets, the present value coefficients with which consumers discount income are generically different (see Geanakoplos, Magill, Quinzii and Drèze (1990)) and so the policy maker does not have unambiguous discount factors to evaluate the reform unless additional assumptions are made. The government would need to have unanimity of consumers in the ex-ante evaluation of the reform. If this condition does not hold, and with enough people dissatisfied, there could exist a coalition of consumers who would vote to overthrow the government and return to the status-quo. In this case the reform would not have

credibility.

The conditions needed to ensure unanimity of consumers in the evaluation of the supply-side reform are an extension of the ones needed to assure unanimity of shareholders in the objective of present value maximization and so will be called *spanning*. In our paper, the compensatory policies should not change the insurance opportunities which were provided by financial markets before the reform was implemented. Having this condition satisfied, we are able to show ex-ante Pareto gains from market liberalizing policies, using a compensatory mechanism based on the one devised in the Hammond and Sempere (1992) and a condition of ex-ante improved production efficiency. The latter implies that, for each country, the ex-ante present value (valued following some consumer criterion) that national production sectors would make in the liberalized economy is bigger than the present value which firms would make without adjusting their production plans. The implications of this assumption are very close to the ones of the assumption about the balance of capital used in Grinols (1987). The compensatory mechanism had also to compensate people for the possible changes in capital gains. Given the clear impossibility of asset markets clearing with asset prices frozen, it requires the knowledge of what the capital gains would have been for each individual in absence of the reform. Capital gains would depend on net demand for assets. This characteristic makes it depend on private information.

5 Final Remarks

Supply-side reforms will favour some people, but may also harm some others. Therefore getting Pareto gains requires finding a compensatory mechanism so that losers get compensated by the winners. This paper discusses the difficulties to find that compensatory mechanism in some non-classical environments characterized by the existence of incentive constraints, incomplete markets, and non-convexities.

The conclusions are pessimistic. It turns out to be very difficult the achievement of Pareto gains. Governments do not have enough information to be able to use the proposed compensatory mechanisms. They also face other institutional constraints. In the case of economies with incomplete financial markets there is an impossibility of getting incentive constrained

Pareto gains. The required mechanism implies the knowledge of what the net demand for assets would have been for each consumer in absence of the reform. This depends on private information and if a revelation mechanism were instituted to discover it there would always be an incentive for the consumers to cheat about its amount.

References

- R. AUMANN (1964), "Markets with a Continuum of Traders", *Econometrica* 32, 39-50.
- T. C. BERGSTROM (1971), "On the Existence and Optimality of Competitive Equilibrium for a Slave Economy", *Review of Economic Studies* 38, 23-36.
- J. COLES AND P. J. HAMMOND (1991), "Walrasian Equilibrium without Survival: Existence, Efficiency, and Remedial Policy", European University Institute Working Paper ECO No. 91/50.
- P. DIAMOND AND J. MIRRELES (1971), "Optimal Taxation and Public Production, I and II", *American Economic Review* 61, 8-27 and 261-278.
- A. DIXIT AND V. NORMAN (1980), *Theory of International Trade*, Welwyn, Herts.: James Nisbet.
- A. DIXIT AND V. NORMAN (1986), "Gains from Trade without Lump-Sum Compensation", *Journal of International Economics* 21, 99-110.
- J. P. DRÈZE AND A. SEN (1989), *Hunger and Public Action*, Clarendon Press, Oxford.
- J. M. GRANDMONT AND D. MCFADDEN (1972), "A Technical Note on Classical Gains from Trade", *Journal of International Economics* 2, 109-125.
- R. FEENSTRA AND T. LEWIS (1991), "Distributing the Gains from Trade with Incomplete Information", *Economics and Politics* 3, 21-40.
- J. GEANAKOPOLOS, M. MAGILL, M. QUINZII AND J. DRÈZE (1990), "Generic Inefficiency of Stock Market Equilibrium when Markets are Incomplete", *Journal of Mathematical Economics* 19, 113-151.
- E. GRINOLS (1981), "An Extension of the Kemp-Wan Theorem on the Formation of Customs Unions", *Journal of International Economics* 11, 259-266.

- E. GRINOLS (1987), *Uncertainty and the Theory of International Trade*, Harwood Academic Publishers.
- P. J. HAMMOND (1986), "Project Evaluation by Potential Tax Reform", *Journal of Public Economics* 30, 1-36.
- P. J. HAMMOND AND J. SEMPERE (1992), "Limits to the Potential Gains from Market Integration and Other Supply-Side Policies", European University Institute Working Paper ECO No. 92/79.
- O. HART (1975) "On the Optimality of Equilibrium when the Market Structure is Incomplete", *Journal of Economic Theory*
- M. KEMP (1962), "The Gains from International Trade", *Economic Journal* 72, 803-819.
- M. KEMP AND H. WAN (1976), "An Elementary Proposition Concerning the Formation of Customs Unions", *Journal of International Economics* 6, 95-97.
- D. NEWBERY AND J. STIGLITZ (1984), "Pareto Inferior Trade", *Review of Economic Studies* 51, 1-12.
- P. SAMUELSON (1939), "The Gains from International Trade", *Canadian Journal of Economics* 5, 195-205.
- P. SAMUELSON (1962), "The Gains from International Trade Once Again", *Economic Journal* 72, 820-829.
- J. SEMPERE (1993a), "Potential Gains from Integration of Incomplete Markets", Documentos de Trabajo CEE, El Colegio de México, Forthcoming.
- J. SEMPERE (1993b), "Potential Gains from Market Integration with Individual Non-Convexities", Documentos de Trabajo CEE, El Colegio de México, Forthcoming.

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