Optimal Commodity Taxation with a Representative Agent

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Abstract

It is argued that the task of describing the optimal vector of commodity taxes is trivialized by the common assumption of a representative agent; that, in particular, the assumption of a representative agent ensures that the optimal vector is null.

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I. Introduction

Ramsey's path breaking article of 1927, on optimal commodity taxation, was based on the implicit assumption of a representative agent, according to which there is either a single price-taking agent or a set of price-taking agents who are identical in all respects[1]. In his exposition of Ramsey's views, Pigou (1947) relied on the same assumption; however in Pigou's account the assumption was quite explicit and was justified on the ground that it freed the analysis of irrelevant (but unspecified) complications. Finally, in his extension of Ramsey's analysis, Samuelson (1951) chose to retain the price-taking representative agent but justified the choice on the more specific ground that it permitted a clear focus on the relationship between commodity taxes and allocative efficiency.

In more recent times, most contributors to the field, even those who have recognized the desirability of eventually considering the optimality of commodity taxation in a context of heterogeneous agents, have maintained an interest in economies inhabited by price-taking representative agents; similarly with those whose focus has been limited to the *reform* of commodity taxation. One thinks in particular of Diamond and Mirrlees (1971) and Stiglitz and Dasgupta (1971), of the textbooks of Atkinson and Stiglitz (1980) and Myles (1995), and of the recent survey by Chari and Kehoe (1999). Diamond and Mirrlees (1971, p.10) offered what has become the standard defence of representative-agent analysis of optimal commodity taxation:

> … we shall consider the use of commodity taxes when lump sum taxes are not permitted to the government, not for the intrinsic interest of this question in a one-consumer economy, but as an introduction to the many-consumer case.

The assumption of a price-taking representative agent has been convenient. It has yielded a first-generation body of propositions which are widely accepted and which might have been extended by simply adding to the number of disparate agents. However the convenience of the assumption is illusory for, without exception, those working in the field have ignored important implications of the assumption, implications which are inconsistent with their central propositions. Thus either the agent is unaware that he is representative or he is aware of the fact. If he is unaware of the fact, he must soon learn better as he engages in a repetitive game; and, once he becomes aware, he ceases to be a price taker. If he is a singleton, he will recognise that he controls not only his own household but also each firm and therefore that he can achieve an efficient allocation of his resources without resort to commodity taxes. On the other hand, if all agents are identical and each agent is aware of the fact then each agent will understand that, in any equilibrium, all agents will behave in the same way. Based on that understanding, each agent will make the same *socially optimal* decision. Thus, in effect, the several identical agents will cooperate, behaving like a single agent to achieve both an efficient allocation of resources and a uniform distribution of income. In short, if there is a representative agent and this is known to each agent then the unique optimal allocation of resources emerges without the intervention of government and, in particular, without the imposition of commodity

taxes. The question posed by Ramsey, Pigou and Samuelson is an important one but their solutions are incompatible with their assumption of a representative agent.

II. Analysis

This possibly startling conclusion hardly needs formal demonstration when the representative agent is a singleton. I therefore focus on the less transparent case in which there are two or more agents, all identical in the sense that they are biological and economic clones, identical in their preferences and in their capacity to acquire and store information and, in addition, identical in their endowments of resources (including information).

Suppose that there are n $(n>1)$ identical agents and that each agent knows that all agents are identical so that, in the dictionary sense but not necessarily in the sense of the theory of games, the fact that they are identical is "common knowledge". Each agent therefore will appreciate that if all agents choose the same household and business strategies then all will receive the same utility pay-off. Each agent will also appreciate that, in view of the convexity properties of the Ramsey model, there is a unique strategy that maximizes the pay-off. Hence each agent will choose the unique strategy which, if all other agents choose the same strategy, maximizes the pay-off and, in particular, achieves an efficient production. They will not choose to play a competitive or other non-cooperative game. In effect they will enter into an enforceable agreement and, in the sense of Harsanyi and Selten (1988, Section 1.2), will play a cooperative game. No intervention by government is needed.

It should be noted that this conclusion does not rest on any particular division of the commodities into "private" and "public."[2]

I know from experience that the above conclusions will be resisted. Typically, it is objected that the conclusions are valid only for small populations, that in sufficiently large populations each identical agent will take the actions of other agents as given and ignore the possibility of cooperation. However this objection is based on a misunderstanding of my argument. The latter rests on the observation that if all agents are identical and are aware of the fact then each agent will understand that, in any equilibrium, all agents will behave in the same way. The observation is as well founded for large populations as for small. It does not require that agents consciously seek to cooperate.

III. Final remarks

The argument of Section II rests on the assumption that all agents are aware of their own preferences and of the technical possibilities with which the economy is endowed. The assumption is extreme and perhaps implausible. However it merely transfers to individual agents information which earlier authors ascribed to the "government". Moreover, if all agents are identical then the representative agent *is* the government. Thus the assumptions of Section II are neither more nor less onerous than those of Ramsey and of later authors who have built on the foundations laid by Ramsey.

The argument of Section II relies on the assumption that all agents are identical. It should not be supposed that it remains valid when agents are not identical or even that

it remains “approximately valid” when agents are “almost identical”. Nor should we expect that, if agents are approximately identical, agents would behave in a completely independent or non-cooperative manner, à la Nash. Game theory in its present state of development seems unable to handle the case of almost identical agents.

Endnotes

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[1]The Marshallian 'representative firm' is not a representative agent in this sense; nor is the more modern 'representative consumer' who shares an indirect utility function of Gorman polar form.

[2]The reasoning of this section is amplified in Kemp and Shimomura (1995). See also Kemp and Long (1992) and Kemp and Shimomura (2000).

References

Atkinson, Anthony B. and Stiglitz, Joseph E. *Lectures on public economics*. London: McGraw-Hill, l980.

Chari, Varadarajan V. and Kehoe, Patrick J. "Optimal Fiscal and Monetary Policy." In Taylor, John B. and Woodford, Michael, eds, *Handbook of Macroeconomics*, vol. 1, 1671-1785. Amsterdam: Elsevier, 1999.

Diamond, Peter A. and Mirrlees, James. "Optimal Taxation and Public Production." *American Economic Review* 61 (March and June 1971): 8-27 and 261-78.

Harsanyi, John C. and Selten, Reinhard. *A General Theory of Equilibrium Selection in Games*. Cambridge, Mass: MIT Press, 1988.

Kemp, Murray C. and Long, Ngo Van. "Some Properties of Egalitarian Economies." *Journal of Public Economics* 49 (December 1992): 383-7.

Kemp, Murray C. and Shimomura, Koji. "Endogenous Growth: Fragile Foundations." Sydney: Australian Graduate School of Management, 2003.

Kemp, Murray C. and Shimomura, Koji. "The Apparently Innocuous Representative Agent." *Japanese Economic Review* 46 (September 1995): 247-56.

Kemp, Murray C. and Shimomura, Koji. “Increasing Returns and International Trade.” *Review of International Economics* 8 (November 2000): 614-8.

Myles, Gareth D. *Public economics.* Cambridge: Cambridge University Press, 1995.

Pigou, Arthur C**.** *A study in public finance,* 3d ed. London: Macmillan, 1947.

Ramsey, Frank P. “A Contribution to the Theory of Taxation.” *Economic Journal* 37 (March 1927): 47-61.

Samuelson, Paul A. “Theory of Optimal Taxation.” Unpublished memorandum for the U.S. Treasury. Finally published in the *Journal of Public Economics* 30 (March 1986): 137-43.

Stiglitz, Joseph E. and Dasgupta, Partha S. “Differential Taxation, Public Goods and Economic Efficiency.” *Review of Economic Studies* 38 *(*April 1971): 151-74.