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ON THE USE OF THE REPRESENTATIVE DECISION-MAKER METHODOLOGY: A REPLY TO PROFESSOR KEMP

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Abstract: This paper defends my argument for subsidizing child-bearing and the widely used representative decision-maker methodology against the recent criticism of Kemp (2005) that the assumption of identical decision-makers is incompatible with the assumption that each decision maker takes the choices of others as given. In the real-world, decision makers are clearly heterogeneous. But the assumption that they are identical allows simplicity and focussing on the essential points. Even at the level of abstract theory, identical decision-makers may still takes the choices of others as given. A simple experiment to test this is suggested but not done.

Keywords: Representative firms, representative agents, methodology, population, externality.
JEL Classification Number: B41, D60, D62, J10.

1. INTRODUCTION

I contributed a paper (Ng 2002) to a volume in honour of Professor Murray Kemp. I am glad that this paper attracts the full attention of Kemp (2005) himself. However, Kemp questions my case for subsidizing child-bearing. His argument is related to the use of the representative decision-maker methodology.[1] Thus, this paper serves both as my defence of my argument and as a note on the representative decision-maker methodology which has been widely used in economic analysis.

My argument for subsidizing births may be summarized thus: Even assuming constant returns, perfect competition, absence of any real external effects, perfect knowledge and rationality, a competitive equilibrium is not Pareto-optimal as everyone could

Acknowledgements. I am grateful to Prof. Murray Kemp for commenting on the first draft of this paper, According to him, I 'set a world record for clearing up misunderstandings' in my revision and/or email clarification and that 'we are now in full agreement'.
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[1] An alternative name is representative agent or actor. However, I always think of an agent in the sense like a real-estate agent who acts for the principal, not for herself. I also tend to think of an actor as someone performing on stage, not someone acting in real life.

be made better off by subsidizing more births. The larger population decreases the marginal product of labour but makes asset owners better off by a larger amount. This is so as all the additional people earn only their reduced marginal products while the total addition to the total product, being the area under the downward-sloping marginal product curve, is larger. Viewed differently, the trading (in the wider sense including employment, investment, etc.) opportunities of pre-existing people are increased by having more people to trade with. From the viewpoint of pre-existing people as a group, it thus pays to subsidize more births. If the welfare (assumed positive) of the additional people enters positively into the objective function, an additional case for subsidizing births is present. (See Ng 2002 for the detailed arguments).

For simplicity, I follow Kemp in ignoring the possibly more controversial case where the welfare of additional people may be relevant and look at the problem purely from the viewpoint of existing people. As pointed out by Kemp, I undertook

- (a) static and comparative static analysis only, ignoring the complications of dynamic transition;
- (b) use the representative decision-maker methodology by assuming that all families are identical;
- (c) 'In choosing their family size, each pair of parents takes as given the number of children in other families' (Kemp 2005, p. 70).

Kemp has no objection to (a) and concedes that, 'Taking these assumptions to be mutually compatible, Ng is able to demonstrate that the decision of any pair of parents increases the work force, raises the productivity of the collectivity of all pre-existing factors, and thus creates a positive externality accruing to other families. The existence of this externality justifies the subsidization of child-rearing' (p. 70). Thus, Kemp does not question my logical argument based on these three assumptions. Rather, he questions the compatibility of these assumptions, between (b) and (c) in particular.

Kemp (p. 70) argues that 'it is implausible to suppose that a repetitive game can be played by identical households without ever suspecting that they are identical. It seems more reasonable to assume at the outset of the analysis that each household is aware that all households are identical. However, if that is done, we must recall a result of Kemp and Shimomura (1995): Identical households which know that they are identical will understand that, behaving non-cooperatively, all households will make the same choices and therefore will further understand the advantage of cooperating to make choices which, in the aggregate, are socially optimal. That is, identical households, aware that they are identical, will not behave in the manner indicated by assumption (c).'

Kemp's criticism does not only affect my argument but virtually all arguments based on the representative decision-maker methodology and/or the identical/symmetrical individuals/households/firms assumption. To my knowledge, all such analyses (at least for cases where the number of individual decision-makers is large) adopt assumption (c) or something similar, i.e. each decision maker is assumed to take the aggregate variables or the decisions of others as beyond her own control/influence. Thus, the issue

involved is not just the acceptability of my argument in my 2002 paper, but rather the acceptability of the representative decision-maker methodology. The stake involved in very big indeed.

I will answer Kemp's criticism at two levels, the real-world and policy-relevant level, and the abstract theoretical level. For the former, I view the simplifying assumptions, including the representative decision-maker methodology, used by economists, as serving to make our analyses simple and allow us to see the central relationships that we want to focus clearly. We realize that the real world is not 100% the same as described in our simplified analysis. For concreteness, consider the public bad problem of pollution. We are of course aware that the real-world individuals and firms are not identical. However, for the general problem of pollution, we want to focus on the public-bad or external-cost aspect of the problem and are not interested in the different amounts of pollutants, different values of the damages, benefits, etc. of different individuals/firms. Hence, by taking all decision-makers as identical, we simplify the analysis. In this simple analysis, we can more clearly see that, if the particular act of pollution by an individual imposes a cost on herself of say $100x and a benefit (possibly just the convenience of not having to carry some plastic bags) of $1,000x. Then, assuming the maximization of net benefit for oneself, she will choose to pollute (possibly just using up more plastic bags), even if that pollution imposes a cost on the rest of the world by $6,000,000,000x ($x per head for the whole world). Even if the cost on herself is much higher (100 times in the example above) than the average cost on others (due say to the proximity to the source of pollution), it may still be a tiny fraction of the aggregate external costs on the rest of the world. The benefit of polluting (at the margin) may well be many times the cost on oneself but only a tiny fraction of the total costs on all. It may well be socially optimal to ban free plastic bags or at least to impose a tax on them. We know that the benefits and costs of all individuals are not the same. But the point we want to emphasize is the big difference between the small cost on oneself and the possibly huge external costs on all individuals in aggregate. This point is the same for all individuals. Thus, adopting the more realistic assumption that costs and benefits differ between individuals does not change the main point but just complicates the analysis. In the real world, we do see that individulas and firms pollute excessively from the social viewpoint such that some form of control is desirable/necessary. Thus, at the level where our simplified analysis is meant to give insights and guidance to the real world, it is clear that we wish to use assumption (b) for simplicity and to assume (c) for realism. The two assumptions, used by most economists, cannot be said to be mutually incompatible. Thus, my argument for subsidizing child-bearing as well as virtually all arguments based on the representative decision-maker methodology, are valid for the real world despite Kemp's criticism.

However, my above defence does not really affect the validity of Kemp's criticism as he intends it. This is so because Kemp, as I understand him, deals at the second level of abstract theory as such. He is of course entitled to deal with the problem at this level. This is particularly so as my 2002 paper discusses the problem mainly using an abstract model. Kemp is also very emphatic that, whatever assumptions one adopts, the full logical implications of them must be strictly accepted. It is along this spirit that Kemp

and Shimomura (1995) argue, in effect, that assumptions (b) and (c) are incompatible. Strictly speaking, I do not have to answer Kemp's criticism at this level of abstract theory, as I am also free to deal mainly at the real-world level. All my papers/analyses, including abstract models, are meant, directly or indirectly, to provide insights and/or guidance for the real world. For my 2002 paper at issue, the fact that I had the real world in mind may also be seen. In that paper, I gave a very rough empirical guestimate of the likely magnitude of the appropriate birth subsidy for Australia and noted that it is "a significant sum and orders of magnitude larger than the 'milk money' (child endowment) paid in Australia" (p. 62). I am obviously much more of a realist (or being much more naïve in believing in the real-world or policy relevance of my papers) and much less of a theoretical perfectionist than Kemp is. If assumptions (b) and (c) serve to reach the correct conclusion that self-interested individuals my over-pollute from the social point of view, I will be happy to continue using them and not worry too much about their compatibility at the abstract theoretical level, as long as they are compatible at the real-world level. However, just for the sake of argument, let us also consider the validity of my argument, the validity of Kemp's criticism, the acceptability of the representative decision-maker methodology, and/or the compatibility of assumptions (b) and (c) at the abstract theoretical level.

This is really a challenging exercise, since we have no experience/knowledge of how self-interested but identical decision makers will behave, since decision makers are always heterogeneous in the real world. Consider yourself to be one of these identical individuals/households. You calculate that, for your own household, having the third child involves higher costs than benefits. However, if all households decide to have the third child, every household will be better off. Nevertheless, even if all other households decide to have the third child, it is still best for your household to have just two children. Under independent decision making with no coordination, will you have the third child? The answer of traditional economic analysis (including but not confirning to the representative decision-maker methodology), emphasising the self-interest and independent decision aspects, is clear. Not having the third child is the dominant action. Every household having the third child, even though Pareto-optimal, is not a Nash equilibrium. Even starting from that situation (ignoring the irreversibility of having the third child, if already born; just consider prospective possibilities), every household has the incentive to deviate to the action of just two children. From this perspective, we would predict that, even in a world of identical individuals, we will still have excessive pollution in the absence of taxes on pollution or other forms of control. This is supported by what has been happening in the real world. Though individuals are heterogeneous in the real world, the point regarding tiny pollution damages on oneself and huge aggregate damages on all individuals is in fact identical to all individuals. The point that, if all individuals refrain from excessive pollution, every individual will be made better off, is still true for all individuals. Yet, where plastic bags are freely available from shops, we seldom see people carry previously used plastic bags to reuse them. (The present writer is a rare exception!)

On the other hand, Kemp (and presumably Shimomura) emphasises the aspect that all households are identical. He reckons that a household in such a situation would reason that, if my household do not have the third child (or do not refrain from excessive pollution), other households, since they are identical to mine, will also not have the third child. If I have the third child, they will also have the third child. Obviously, it is better for all to have the third child than for all not to have it. Thus, my household should choose to have the third child.

I regard such reasoning for the case of the real world as the fallacy of attribution, attributing what all decision makers can do together to a single (even if representative) decision maker. For the case of a large number of decision makers (the only case concerned in the whole debate) and in the absence of coordination/collusion/influence, a single decision-maker must assume that what other decision makers are doing is independent of her own action. However, since Kemp deals not with the real world but at the abstract theoretical level, we cannot accuse him of committing the fallacy of attribution, though he says that he and Shimomura are happy to accept the status of committing the 'fallacy'.

Thus, it appears that the issue at the abstract theoretical level is still unsettled; it depends on whether we emphasise the self-interest, no-coordination, independent actions aspects, or the aspect of identical decision makers. I am inclined towards emphasising the former. Even if decision makers are identical, they are identical only in the sense of being the same/similar; they are not identical in the sense of being the same decision maker. Thus, even at the abstract theoretical level, I am still inclined towards the compatibility of assumptions (b) and (c). However, I am prepared not to be dogmatic about this. Being a realist, I am prepared to accept the final test of the real world. However, is this not an impossibility!? How could we settle issues at the abstract theoretical level (especially with identical decision makers) by tests in the real world (where decision makers are heterogeneous)? While seemingly impossible, I propose the following test.

While individuals in the real world are heterogeneous, we may construct experiments where all the relevant individuals are identical with respect to the **relevant** decisions. An example is this. Get N individuals (realistically assumed to prefer to have more money than less) to do the following simultaneous game, where N is preferably a large number (but I think 50 will probably be sufficient). (Preferably, these individuals should remain largely anonymous and do not know each other and the individual choices should remain confidential to avoid picking up some irrelevant social effects, such as trying to show that one is more socially minded than one really is.) Each person is given a sum of money, say \$200. (Preferably a significant sum to ensure that the self-interest effect is not overwhelmed by possibly some expressionistic effect such as the desire to show one's social concerns.) Each person i is then told to keep the first half of this sum (\$100) to herself and has the freedom to divide the second half of this sum (also \$100) between a non-negative amount x^i she keeps for herself (on top of the first half of \$100) and a non-negative amount (\$100$-x^i$) that she gives back to the experimenter. After the division of all individuals are made **independently**, the sum of all amounts kept (counting only the amount x^i, not counting the first \$100) by the N individuals

$\sum x^i$ is then calculated. (But the individual values of x^i should remain confidential.) Then, each and every individual has to pay the experimenter the amount of $2\sum x^i/N$. This procedure is made known to all right at the beginning of the game. Thus, the sum of money each individual i will end up with is $\$100+x^i - 2\sum x^i/N$ and this is known by all individuals. This is identically the same for all individuals. Thus, for the decision on how to divide the sum of $100, each and every individual faces identical opportunities (assuming that we can design the experiment such that the social concern effects mentioned above are absent). For this decision, they are identical individuals.

If every individual chooses to keep the full amount of the second $100 (chooses $x^i=\$100$), each individual will end up with the figure of zero. If every individual chooses to keep none of the second $100 (chooses $x^i=\$0$), each individual will end up with the figure of $100. Thus, every one choosing $x^i=\$0$ is clearly Pareto superior to every one choosing $x^i=\$100$. However, given whatever the choices of other individuals, it increases the final payoff of any individual to keep the full amount. Thus, assuming no social or expressionistic effects, the action $x^i=\$100$ is a dominant action for each and every individual and $x^i=\$100$ for all i is a Nash equilibrium for this game. Most economists including myself would be inclined to predict this outcome, in the absence of some form of coordination. Kemp's argument suggests that he would predict the outcome of $x^i=\$0$ for all i even in the absence of coordination. This is a simple experiment not difficult to conduct.[2] However, I will leave it to independent and qualified experimental economists to do this decisive experiment that may verify the validity of the conjecture of Kemp and Shimomura. Before such experiments, I remain open to both possibilities.

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[2] A possible problem is this. If an individual chooses $x^i=\$0$ while all other individuals choose $x^i=\$100$, she will end up with a negative net sum of $-\$100$. Thus, to avoid the possibility that some individuals may end up with some negative sums, funding permitting, the experimenter may wish to start by allocation $300 to each, with the first $200 kept to begin with.