

Global Optimization of Economic and Social Policy

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INTRODUCTION

While neoclassical economic theory assumes that all decision-makers arrive at optimal decisions, current events on the world stage (massive unemployment, financial unrest) invite us to allow for the possibility that some global policy-making units (PMUs) make decisions that fall short of optimum. Similarly, noting the pervasive presence of hunger, disease, and warfare, one must sadly conclude that the economic and social policy of nations often falls short of optimum. The rational response to such observations is not to discard neoclassical theory but to take a broader view, recognizing the possibility of less-than-optimal decision making. The idea of global optimization needs to accommodate both the attainment of optimum and optimum failures. An analytical format that allows both for the observation of equilibrium and of positions off equilibrium is provided by the mathematics of data envelopment analysis (DEA), see the original work by Charnes, Cooper, and Rhodes (1978). PMUs reaching equilibrium are being ascribed an effectiveness ratio of 100 per cent, while PMUs falling short of equilibrium are ascribed a ratio of less than 100 per cent. Building on earlier work by Golany and Thore (1997a, b), the present paper surveys the possibility of extending the mathematical and data processing machinery of DEA to the analysis of economic and social policy of nations.

BACKGROUND

The U.N and its various agencies have during the last decades been heavily involved in the formulation of goals of economic and social policy (such as the millennium goals, see the UN, 2000) and the design of policy aiming at realizing such goals. In order to meet them, many countries are adjusting their energy policy, educational policy, and environmental policy.

There was a time when economists thought that global optimization of economic and social policy could be accomplished by the stratagem of maximizing some over-arching global “utility function.” This was the approach of Jan Tinbergen, who wrote a classical treatise on the subject in the 1950s. Fortunately, our understanding of economic and social policy has advanced considerably since then. International organizations do no longer insist on the assumptions of economic equilibrium that hampered Tinbergen’s efforts. Indeed, the International Labor Organization (an arm of the United Nations head-quartered in Geneva) explicitly recognizes that the goals of “decent work” that the ILO itself has formulated are certainly not always attained. Instead, ILO has called for the calculation of the shortcomings of the various countries from this (equilibrium) ideal (see ILO, 2001).

The present paper draws attention to a recent extension of data envelopment analysis that permits the presence of a convex social welfare func-

tion of all outputs (all policy goals), see Cooper, Thore, and Tarverdyan (2010). The new approach seems to meet the call by Jan Tinbergen for the construction of a model of economic policy that is empirically implementable, and that delivers a numerical assessment of the success of policy. Starting out from Tinbergen's work, the paper gives a mathematical account of the new model. While neoclassical equilibrium is still possible, the new idea is to allow for the possibility of non-achievement of the equilibrium ideal. Neoclassical equilibrium is viewed as a matter that needs to be tested. In the case of optimum failure, the deviation from equilibrium will be computed.

LOOKING FOR NEW METRICS EVALUATING THE ACHIEVEMENTS OF ECONOMIC AND SOCIAL POLICY

Tinbergen's Theory of Economic and Social Policy Briefly Reviewed

Appointed after the war as director of the newly established Central Planning Bureau for the Netherlands, Jan Tinbergen was expected to forecast the effects of economic policy and to advise the government on related matters. It led to the writing of two key tracts on the theory of economic policy (Tinbergen, 1952, 1956).

Tinbergen begins by explaining the nature of the model to be used. It contains four types of quantified entities: targets (goals), instruments, other variables of the economic system and data. In the 1956 work he uses the notation (see *ibid.*, p. 53):

$x_i, i=1,2,\dots,I$ economic variables that are not targets
 $y_j, j=1,2,\dots,J$ economic variables that are targets
 $z_k, k=1,2,\dots,K$ instruments controlled by a policy-maker
 $u_l, l=1,2,\dots,L$ given data

and writes the equations of the model

$$\varphi_n(x, y, z, u) = 0, n=1, 2, \dots, N \quad (1)$$

where x, y, z, u are vectors as defined a moment ago. When the number of instruments equals the number of targets $K = J$, the model may possess a well-defined and unique solution. Tinbergen's models were large systems with as many as 50 relations and 70 variables; these included many variables that could be considered as "instruments" of policy, like financial aggregates, interest rates and data on the government budget.

When the number of targets exceeds the number of instruments, however, solution requires the presence of a social welfare function, say

$$\omega(y, z) \quad (2)$$

(see *ibid.*, p.56). The problem at hand then is one of maximizing $\omega(y, z)$ subject to the side conditions (1).

The social welfare function (2) that Tinbergen had in mind could include targets as diverse as international peace, maximum real expenditure per capital, and the distribution of income over social groups and countries. The constraints (1) would include restrictions imposed by technology, the presence of resources and to some extent even political feasibility.

The obvious difficulty with postulating a social welfare function like (2) is that it becomes next to impossible to carry out the maximization in empirical terms. To this day, Tinbergen's ideas have remained a lofty but unattained ideal of calculation. It is rather ironic that we should have to complain on this score since few economists of his generation have done more than Tinbergen to introduce empirical calculations in economics and to subject economic assumptions to empirical testing. When Tinbergen and Frisch were selected as the very first recipients of the Nobel prize in economics in 1969, it was precisely because they were (rightly) considered to be the fathers of the science of econometrics. And yet we have inherited from Tinbergen a stark abstract theory of economic policy, an intellectual toy that up to now stubbornly has refused to adapt to the real world.

Work by Samuelson (1952) and Takayama and Judge (1971) offers the possibility of calculating

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