A critical assessment of the political preference function approach in agricultural economics

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ABSTRACT

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The policy preference function (PPF) approach has become popular with economists seeking to explain the origin of government policies. In this paper, a distinction between positive and normative work with the PPF concept is made. Positive work is shown to suffer from a variety of shortcomings including the misspecification of traditional PPFs and the failure to consider the importance of institutions, constraints and the interaction between different commodity policies. These weaknesses are reflected in the counter-intuitive results of a simple PPF model designed to reflect the interaction between the EC's wheat and barley policies. Furthermore, it is demonstrated that PPF weights change as a result of both political preferences and market parameters. Hence, changes in PPF weights cannot be attributed to changes in preferences alone. Tests of the axioms of revealed preference theory are used to demonstrate that even though PPF weights derived for the EC's wheat and barley markets have fluctuated considerably since the early 1970s, we are not able to conclude that there has been a shift in political preferences. The paper concludes with some comments about the use of PPFs in a normative framework. The underlying assumption that policy-makers optimise seems, not surprisingly, often to lead practitioners to the conclusion that observed policies are not so bad after all. Economists should also beware of the tendency to overlook possible differences between the PPF and the social welfare function.

1. INTRODUCTION

Government intervention on agricultural markets takes many forms, many of which are highly inefficient. Economists have pointed this out for decades but have failed to convince sufficient numbers of the right people

that free markets are a feasible alternative to prevalent forms of interven-
tion (Frey, 1986). This has led to the suggestion that economists could
increase their influence by "...setting their policy studies in an historical
and institutional context, by showing awareness of political factors, by
sometimes incorporating these factors directly into their analysis, and
generally by addressing a broader range of considerations than economists
usually do" (Nelson, 1987, p. 51). Some economists insist that "...our
research paradigm *must* expand if we wish to make a significant difference
in actual policy analysis, selection, and implementation" (Rausser, 1982, p.
832, italics mine).

The economic profession has responded to this challenge in a number of
ways. One strategy has been to incorporate political considerations into a
broad neoclassical political economics paradigm. According to this strategy,
the form and extent of government intervention is determined in a political
market. On the demand side, various groups within society push for
policies that will improve their welfare, subject to the costs of generating
political support. On the supply side, policy-makers implement policies
with a view towards maximising their own utility – represented, for exam-
ple, by the probability of being reelected – subject to constitutional and
budgetary constraints. This approach presumably appeals to many eco-
nomists for two reasons. Firstly, it broadens the scope of economics a great
deal; economists can claim to understand not only the impact but also the
origin of policies. Second, it allows economists to continue using the
neoclassical tools (optimisation and marginal analysis) that have proven
themselves in other areas, and in which much time and effort have been
invested.

One branch of this new political economy is the political preference
function (PPF) approach. [1] The PPF approach is based on the assumptions
that a group's voting behaviour is related to its economic well-being and
that policy-makers are primarily concerned with attaining and/or maintain-
ing power. Hence, policy-makers adjust policy instruments so as to create
welfare distributions which maximize political support. Expressed mathe-
matically, it is assumed that policy-makers maximise a PPF in which some
measures of producer, consumer and taxpayer utilities appear as argu-
ments. Producer and consumer surplus and budget expenditure, respec-
tively, are typically used as proxies for these utilities.

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[1] PPF analysis can be traced to work in the early 1960s on government decision-making
(Theil, 1964), and first appears in the agricultural economics literature in the mid-1970s
(Josling, 1974).

In the first best world usually taken as a point of departure in policy analysis, government intervention inevitably leads to deadweight loss. It is well known that such intervention is, nevertheless, commonplace. Hence, if governments are vote maximizers, it must be possible to gain more votes by engineering transfers to certain groups than are simultaneously lost due to the extraction of these transfers from other groups, and the associated deadweight loss. Mathematically, this means that the arguments in the PPF must be weighted. Drawing on the interest group, rent seeking and theory of regulation literature (see, for example, the references in Rausser, 1982), plausible explanations for unequal preference weights can be derived. Typical factors which might explain a group's relative weight are, inter alia, group size and homogeneity, the costs of lobbying and the size of the transfer in question relative to the group's welfare (Balisacan and Roumasset, 1987; de Gorter and Meilke, 1985).

A considerable literature based on the elaboration and estimation of PPF models has accumulated (Oehmke and Yao, 1990; Paarlberg, 1983; Rausser and Freebairn, 1974; Riethmuller and Roe, 1986; Sarris and Freebairn, 1983; Zusman and Amiad, 1977), and the PPF has become an increasingly common conceptual tool in agricultural economics (Gardner, 1987a, 1989; Rausser and De Gorter, 1991; Rausser and Foster, 1990). One can distinguish between normative and positive elements in the literature on PPFS, although much work combines both aspects. The positive approach is based on ex post attempts to determine the characteristics of a PPF which can explain observed policies. Examples of positive PPF analysis are provided by Sarris and Freebairn (1983) who estimate PPF weights for wheat policies in a set of 21 countries and regions, and Oehmke and Yao (1990) who derive a PPF from observed U.S. wheat policies. In both examples – and in related contributions (Vanzetti and Kennedy, 1988; Zusman and Amiad, 1977) – a revealed preference approach is employed. The key to this approach is the assumption that the observed vector of policy instrument levels has been chosen by a government which has maximised its PPF. Formally, the first derivatives of the PPF with respect to n policy instruments are assumed to equal zero at the observed levels of these instruments. Given a functional form for the PPF, the resulting system of n first-order conditions, combined with a normalization equation, can be solved for the values of $n + 1$ PPF weights.

The normative approach involves applying standard cost-benefit analysis to compare the welfare effects of different policy measures given a PPF. Gardner (1987a), for example, compares the distributive efficiencies of production controls and producer price subsidies, given a PPF in which producers have a larger weight than consumers and taxpayers. Becker and Labson (1991) compare the distributive efficiencies of deficiency payments

and export subsidies under various assumptions concerning the relative PPF weights of consumers and taxpayers.

In this paper I deal primarily with positive or revealed PPF analysis, although points are raised which have a bearing on normative work with the PPF concept. The purpose of this paper is to argue that the PPF approach suffers from serious shortcomings. In Section 2 of this paper a simple PPF model is outlined and estimated. The results of this simple model are then used to illustrate that the PPF approach is flawed in two important respects. Firstly, even if we accept the structure of the basic PPF model, its results are difficult to interpret. As discussed in Section 3, the policy preference weights which are produced with PPF models are not the result of forces on the demand side of the market for government intervention alone. Overlooking the supply side of this market can lead to misleading conclusions, and it is difficult if not impossible to separate supply and demand side effects. Second, there are a number of reasons for questioning the structure of the PPF model itself, some of which are explored in Section 4. The treatment of government behaviour and the high level of aggregation employed suggest that PPF models are misspecified. Furthermore, the policy-making process depicted in PPF models does not consider the constraints facing policy-makers and the discrete nature of institutional change. Finally, PPF work to date has not dealt with the interaction between commodity policies. An attempt to construct a simple model that accounts for policy interaction fails because the corresponding PPF is not concave. Section 5 closes with a summary and some conclusions regarding the normative use of the PPF approach.

2. STRUCTURE AND ESTIMATION OF A SIMPLE REVEALED PPF MODEL

A simple illustration of the revealed PPF approach (Sarris and Freebairn, 1983) begins with the linear supply and demand equations:

$$S = -a + bP_s \tag{1}$$

and

$$D = c - dP_d \tag{2}$$

where the producer price P_s and the consumer price P_d are policy instruments, and a, b, c and d are coefficients. A small country is assumed for simplicity, but terms-of-trade effects can be incorporated (Vanzetti and Kennedy, 1988; Sarris and Freebairn, 1988). These equations are used to derive the standard quadratic surplus measures of welfare, consumer surplus (CS), producer surplus (PS) and government expenditure (G) (Just, Hueth and Schmitz, 1982), and these, in turn, are substituted into the PPF:

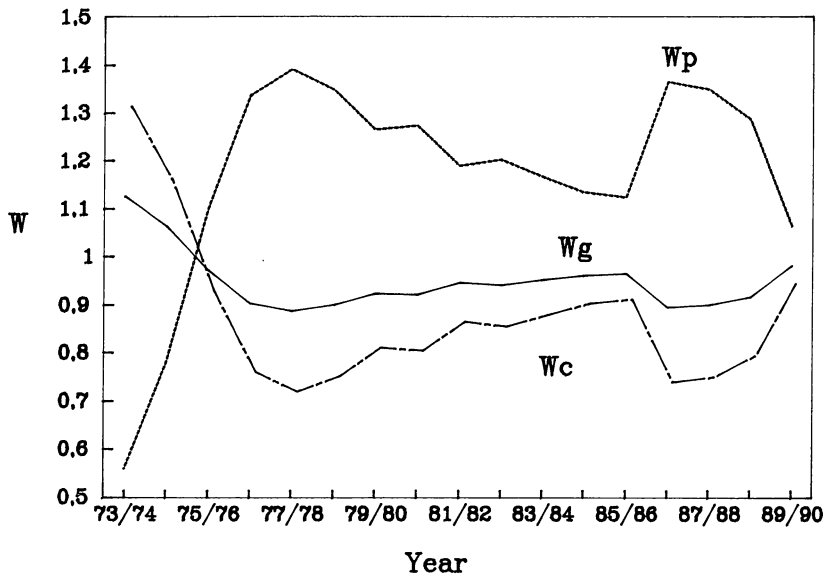$$PPF = (\omega_c \, CS) + (\omega_p \, PS) + (\omega_g G) \tag{3}$$

Fig. 1. Revealed PPF weights for wheat in the EC (1973/74–1989/90). Source: own calculations using Deutsche Bundesbank (various issues); International Wheat Council (various issues); Toepfer (various issues); ZMP (various issues).

in which ω_i is the PPF weight of the ith group (consumers, producers and taxpayers, respectively). Differentiating this PPF with respect to P_s and P_d results in the following two first-order conditions for a maximum:

$$\partial\text{PPF}/\partial P_s = -\omega_p a + \omega_p b P_s - 2\omega_g P_s b + \omega_g a + \omega_g b P_w = ! \ 0 \tag{4a}$$

$$\partial\text{PPF}/\partial P_d = -\omega_c c + \omega_c d P_d - 2\omega_g P_d d + \omega_g c + \omega_g d P_w = ! \ 0 \tag{4b}$$

where P_w is the world market price of the commodity in question. If the coefficients of the supply and demand equations are known then the addition of a normalisation equation such as:

$$\omega_c + \omega_p + \omega_g = 3 \tag{5}$$

creates a system of three linear equations – (4a), (4b) and (5) – which can be solved for the three unknown ω_i's. Depending on the type of intervention that is being studied, equations (4a) and (4b) can be simplified: under the EC's variable levy system, for example, P_s is – transaction costs aside – identical to P_d.

In Fig. 1, PPF weights for producers, consumers and taxpayers estimated using EC wheat market data from 1973/74 to 1989/90 are presented. To generate these estimates, supply and demand coefficients were synthesised using annual EC production and consumption data, intervention and world
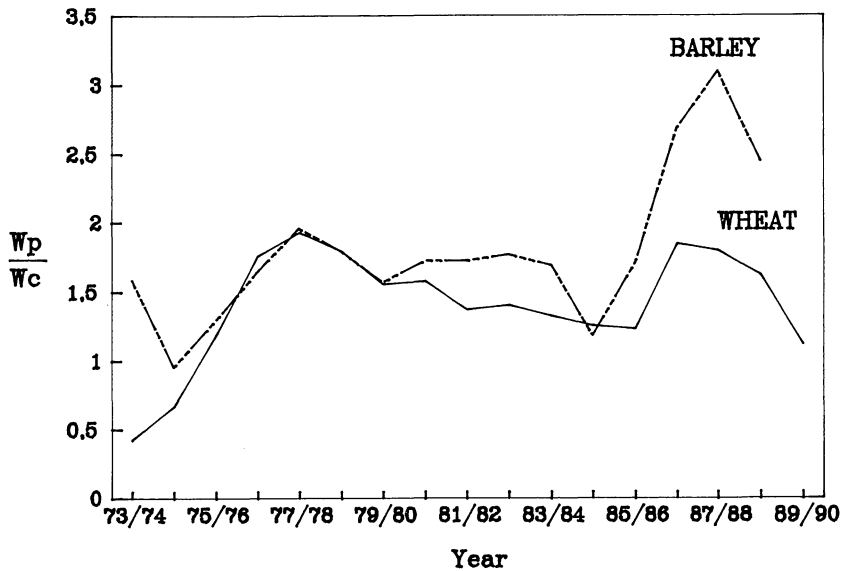
Fig. 2. Relative revealed PPF weights in the EC: wheat and barley (1973/74–1988/89).
Source: see Figure 1.

market prices, and estimates of the elasticities of supply and demand in the
EC (elasticities of 1.5 and -0.5 respectively are assumed [2]). As illustrated
in Fig. 1, revealed PPF weights for producers have generally been higher
than those for consumers, with the ratio of the two for the most part falling
between 1 and 2.

In Fig. 2, the development of the ratio ω_p/ω_c for both wheat and barley
in the EC between 1973/74 and 1988/89 is displayed. The data in Fig. 2
were generated using a slightly modified model in which consumers and
taxpayers are treated as a single group with a common PPF weight. This
model allows us, without loss of generality, to consider the interpretation of
PPF weights in two dimensions and is the basis of the following discussion.

3. INTERPRETATION OF PPF WEIGHTS

The absolute values of ω_p/ω_c in Fig. 2 are consistent with the observa-
tion that agricultural policies in developed countries tend to a favor

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[2] No attempt is made to estimate the necessary elasticities or to glean the most plausible
estimates from the literature. Different values were tested and found to generate qualita-
tively similar results. It is highly likely that these elasticities have changed over the period in
question.

producers at the expense of consumers (see Balisacan and Roumasset, 1987, p. 237 and the literature cited therein). However the variability of the weights and ratios in Figs. 1 and 2 may seem somewhat surprising. Furthermore, ω_p/ω_c has not always been greater than one and policy-makers seem to value producers relative to consumers differently depending on the crop in question. Barley producers have a higher value with respect to consumers than wheat producers which may seem odd because both commodities are produced by the same farmers in much of the EC.

Changes in ω_p/ω_c have been interpreted to mean that policy-makers' preferences have changed over time. Oehmke and Yao (1990, p. 637), for example, interpret a change in the ratio of producer to taxpayer weights from 1.43 in 1977 to 1.26 in 1985 to mean that "...the relative importance of producers fell" over this period. Rausser and Foster (1990, p. 647–648) demonstrate that relative PPF weights are functions of the relative costs of political activity, which in turn depend on factors such as group size and homogeneity. As these factors change, so will policy-makers' relative revealed preferences.

Analogous arguments can be proposed to explain the difference between the weights accorded to wheat and barley producers relative to consumers and taxpayers. Figure 2 seems to suggest that barley producers have generally been more preferred than wheat producers, which may be attributable to differences in the costs of lobbying, etc.

These considerations are well-founded, but incomplete in a way which can lead to the misinterpretation of PPF results. As discussed above, the PPF approach is based on the concept of a market for government intervention. It is misleading to consider only the demand side of this market by attributing changes in PPF weights exclusively to shifts in political prefer-
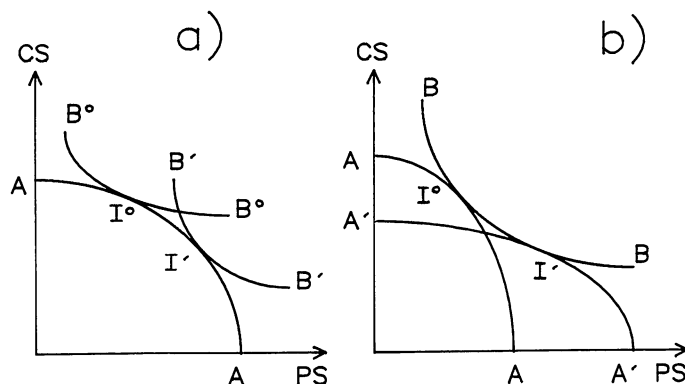

Fig. 3. Interpretation of changes in PPF weights.

ences. (Consider Fig. 3a.) The surplus transformation curve (STC) AA is the locus of all pareto-optimal combinations of producer and consumer surplus which policy-makers can generate through the choice of P_d and P_s. This curve represents the supply side of the market for intervention; its shape and location depend on the underlying supply and demand functions, and the world market price of the product in question. The demand side of the market for intervention is represented by $B^0 B^0$ and $B' B'$, which might be called political indifference curves (PICs). PICs can be derived as implicit functions by totally differentiating the PPF and setting d(PPF) equal to 0. The slope of the PIC at any point ($\partial CS / \partial PS$) is the policy-makers' marginal rate of substitution between consumer and producer surplus – in other words, the maximum amount of consumer surplus which policy-makers are willing to forfeit in order to generate an additional unit of producer surplus.

Policy-makers maximize their political utility at points such as I^0 and I' where the PIC is tangential to the STC. Assume that the superscripts ^{0} and $'$ refer to an initial and a subsequent period respectively. If, as depicted in Fig. 3a, the STC is stationary, then a change from I^0 to I' must be the result of a shift in political preferences alone. However, a change from I^0 to I' can also occur in the complete absence of demand side shifts as illustrated in Fig. 3b. Here the STC moves from $A^0 A^0$ to $A' A'$ – for example due to a change in world market prices – while the PIC remains stationary at BB. Observed changes will generally be the product of both supply and demand effects. Since both market parameters and political preferences can change simultaneously, practitioners of the PPF approach are confronted with an identification problem.

Identification can sometimes be forced by imposing restrictional. One way to restrict the problem at hand is to specify a functional form for the PPF. The PPF function utilised in Section 2 is linear, as are most PPF functions in the literature. In this case, the resulting PICs are linear with a constant marginal rate of substitution equal to the negative ratio ω_p / ω_c. The economic interpretation of linear PICs is that policy-makers are prepared to orchestrate a given transfer from one group to another regardless of the initial distribution of welfare. This has the consequence that all changes in ω_p / ω_c must be due to changes in political preferences; shifts in the STC alone will influence neither the marginal rate of substitution nor the revealed PPF weights.

However convenient they may be, linear PICs are at best local approximations, and the resulting identification is likely spurious. Citing Peltzman (1976), Gardner (1987a, p. 295) suggests that "...as a favored group gets richer, the political appeal of further redistribution to it declines." Declining marginal political preference implies convex PICs such as those in Fig.

3, with the consequence that we cannot attribute all changes in ω_p/ω_c to changes in political preferences alone.

Indeed, it may even be that EC policy-makers' preferences were constant over the period depicted in Figs. 1 and 2, and that all observed changes in ω_p/ω_c can be attributed to shifts in the STC as depicted in Fig. 3b. This hypothesis can be studied using nonparametric tests proposed by Varian (1982). These tests use the Weak and Strong Axioms of revealed preference theory to determine whether a series of i observed bundles of n goods:

$$x^i = \left\{ x_1^i,\ x_2^i, \ldots, x_n^i \right\} \tag{6}$$

demanded at prices

$$p^i = \left\{ p_1^i,\ p_2^i, \ldots, p_n^i \right\} \tag{7}$$

could have been generated by a consumer (or group of consumers) maximising a stable utility function. To carry out these tests, (6) and (7) are combined to create a matrix Z of dimension i by i in which:

$$Z_{jk} = \sum_{m=1}^{n} \left(p_m^j x_m^k \right) \tag{8}$$

In other words, (8) is the bundle consumed in period k valued at the prices prevailing in period j. If $Z_{jk} \leq Z_{jj}$ then bundle x^j is directly revealed preferred to bundle x^k because although x^k was less expensive at period j prices, x^j was actually chosen. Z is used to generate a matrix M in which M_{jk} is equal to 1 if x^j is directly revealed preferred to x^k, and equal to 0 otherwise. The Weak Axiom is violated if bundles j and k are simultaneously revealed preferred to one another, i.e. when $M_{jk} = M_{kj} = 1$. The Strong Axiom states the revealed preferrences must be transitive and is tested by computing the transitive closure T of the relations in M (Varian, 1982, p. 949). If $M_{jk} = 1$ (x^j is directly revealed preferred to x^k) and $M_{km} = 1$ (x^k is directly revealed preferred to x^m), then $T_{jm} = 1$ (x^j is transitively revealed preferred to x^m). Violations of the Strong Axiom occur when $T_{jk} = T_{kj} = 1$. A violation of the Weak Axiom implies a violation of the Strong Axiom, but the opposite is not true. [3]

In the context of the PPF model, consider EC policy-makers who choose to 'consume' – indirectly in the form of political support – a combination of producer surplus, consumer surplus and taxpayer burden at prices given by the policy preference weights. Hence, for our purposes:

$$x^i = \left\{ \text{CS}^i,\ \text{PS}^i,\ \text{G}^i \right\} \tag{6'}$$

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[3] See Burton and Young (1991, p. 141) for an agricultural application.

and

$$p^i = \left\{ \omega_c^i, \omega_p^i, \omega_g^i \right\} \tag{7'}$$

where $i = 1, 2, \ldots, n$ years, and the vectors x^i are deflated (1973 = 100).

Applying the tests described above to the data generated by the PPF model in Section 2 reveals only one violation of the Weak Axiom for wheat (out of 136 cases) and no violations of either Axiom for barley (out of 120 cases). The single violation involves a very slight contradiction between the surplus amounts chosen by policy-makers in 1975/76 and 1978/79. Labelling the former period j and the latter k, $Z_{jk}/Z_{jj} = 0.9937$ and $Z_{kj}/Z_{kk} = 0.9927$. Since both ratios are very close to unity, bundles j and k have very similar values at the weights prevailing in periods j and k. Burton and Young (1991, p. 142) discuss a test of the significance of such violations, but this test is difficult to implement and is not attempted here. Nevertheless, it seems likely that the observed violation is within the range of error that is to be expected given the quality of the data and the estimates used to generate the PPF weights being tested. Thus, we can conclude that each of the two data sets generated by the PPF model in Section 2 could be rationalized by a continuous, concave and monotonic PPF function (Varian, 1982, p. 946). Of course, the possible existence of such a function does not prove that political preferences for surplus redistribution on wheat and barley markets did not change in the EC between 1973/74 and 1988/89. However, the hypothesis that these preferences remained constant cannot be rejected, despite the fluctuations in the preference weights depicted in Figs. 1 and 2.

Indeed, the complexity and inherent rigidity of the EC agricultural policy-making process are such that we might be surprised to find that preferences have shifted often or by large amounts. The relationship between producer and consumer surplus shown in Fig. 4 provides some hints about the sort of stable PPF that might rationalise the data in equations (6') and (7'). For simplicity, the results of the simplified two-group (producer and consumer/taxpayer) model for wheat are depicted; results for barley are similar.

In Fig. 4 it can be seen that the ratio of consumer to producer surplus is stable over the observed period whereas the marginal rate of substitution ($\partial PS/\partial CS = -\omega_c/\omega_p$) fluctuates considerably. One could hypothesise that EC policy-makers are predominantly interested in maintaining a certain surplus distribution and derive little utility from unbalanced increases in either group's surplus. [4] As a consequence, they have designed a policy

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[4] This corresponds to Corden's "conservative social welfare function" (Corden, 1974, p. 107).
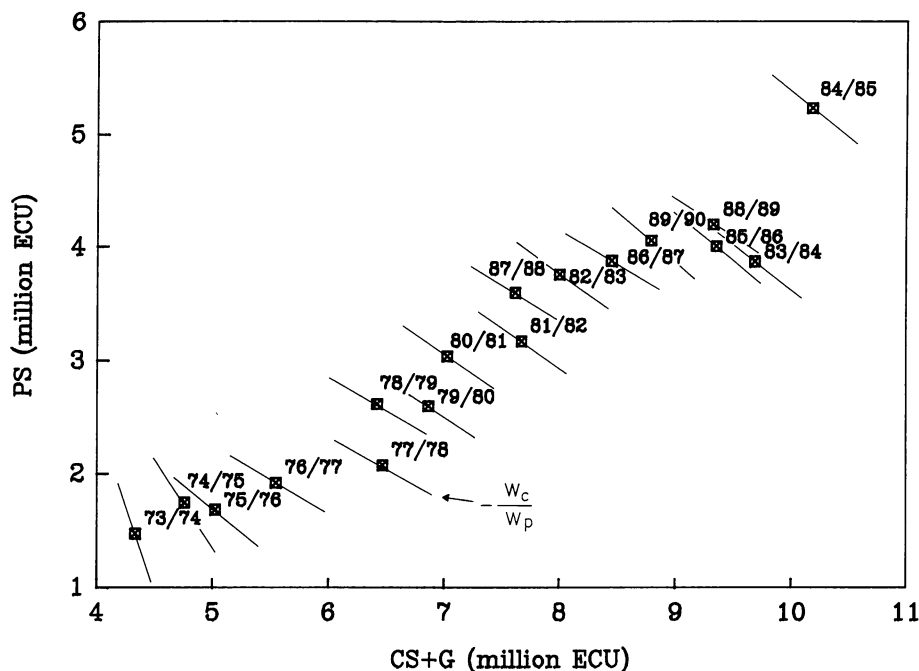
Fig. 4. Producer and consumer surplus for wheat in the EC (1973/74 to 1988/89). Source: see Figure 1.

which protects the desired balance by absorbing exogenous shocks. Formally, this implies a PPF characterised by a low elasticity of substitution between producer and consumer surplus, and sharply curved PICs. Against such PICs, relatively small shifts in the STC will cause relatively large changes in $\partial PS/\partial CS$.

Of course, this interpretation is ad hoc and subject to criticism. Since the mid-1980s, both the policy tools used in the EC and their implementation have changed. The introduction of instruments such as milk quotas and set-aside, and the adoption of a less inflationary price policy than prevailed during the 1970s may reflect a shift in political preferences. The point is, however, that revealed PPF weights tell us little about such shifts. The use of linear PPFs blurs the distinction between local and global weights and leads to tempting but misleading conclusions about the nature of political preferences. Based on the results of the simple PPF model used above, we are not in a position to conclude that political preferences for redistribution on wheat and barley markets in the EC have changed since the early 1970s.

4. A CRITICAL LOOK AT THE PPF APPROACH

Up to this point, the revealed PPF approach has been studied and applied without scrutiny and has been found to generate results which are difficult to interpret. In this section I take a closer look at some aspects of the PPF approach itself and argue that it is based on an inadequate view of the optimisation problem facing policy-makers. Note that I do not question whether policy-makers are rational, informed and credible optimisers in the first place, although the PPF approach could also be criticised in this vein by drawing, inter alia, on the concept of bounded rationality (Rabinowicz, 1991, p. 507). I also do not address a variety of issues that arise in the case of the EC, where prices are not equal in all member states, and the taxpayer burden is distributed unevenly due to the principle of financial solidarity. These issues cast doubt on the usefulness of PPF weights that are derived for the EC as a whole, but could, in theory, be addressed in a more complex model. The following thoughts are meant to illustrate that the results of PPF analyses would be of questionable value even if these hurdles were cleared.

4.1 *Specification of the PPF and the choice of policy tools*

There are grounds for believing that the standard consumer / producer / taxpayer PPF is severely misspecified. Recent debates on reform of the EC's Common Agricultural Policy (CAP) have been highlighted by claims that 20% of the EC's farmers are responsible for 80% of its agricultural production and thus receive a corresponding proportion of the Community's support (Agra Europe, 1991). Distorted price ratios and administrative loopholes created by the CAP have fostered entire industries in areas such as grain substitutes, surplus storage and the creative use of export restitutions. In connection with an analysis of U.S. sugar policy, Lee (1989, p. 188) notes that nearly 20 groups were involved in the formulation of those aspects of the 1985 Farm Bill that pertain to sugar. This suggests that agricultural policy-makers cannot be concerned solely with the benefits that producers alone derive from agricultural policy. Hence, what appears to be a political preference for EC grain farmers in general may actually reflect a preference for a relatively small and influential group of large grain producers, stockpilers and exporters. These considerations imply that PPFS which are formulated in terms of highly aggregated surplus measures may be misspecified because a variety of groups which are influenced by the policy in question are omitted or incorrectly subsumed under very broad headings.

A further misspecification involves the treatment of government in PPF models. Of the various types of government behavior postulated in the new political economy literature (Meier, 1990, p. 185ff), practitioners of the PPF approach have focused primarily on passive behavior according to which governments simply reflect interest group desires. Ideas based on the concept of a predatory government concerned with manipulating these desires and generating rents for itself have not been incorporated (Gardner, 1989, p. 1168), an omission that is perhaps one of the most fundamental shortcomings of the PPF approach.

Consider the *budget maximising bureaucrat* (Niskanen, 1971). The PPF approach is based on the assumption that policy decisions are made *as if* by a single, informed and optimising policy-maker. This overlooks the importance of bureaucracy – for example the EC's Management Committees – in taking administrative decisions and in collecting, filtering and passing on vital information to political decision-makers. Since a bureau's output – for example farm income support – is often difficult to define and measure, and since bureaucrats rarely have a direct incentive to supply their output as efficiently as possible, they have some freedom to pursue a variety of other goals such as high salaries, prestige, and the quiet life. Niskanen makes the crucial assumption that these goals are positively related to the size of the bureau's budget and concludes that bureaucrats will thus have an incentive to maximise this budget.

The idea that policy-makers themselves – in other words political decision-makers and the bureaucracy that serves them – have goals which could appear as arguments in the PPF has important implications. It is conceivable, for example, that policy-makers display preferences for policy tools as well as the levels at which these tools are set. Proponents of the CAP often point with pride to its smoothly-running self-financing quota scheme for sugar. From the politician's point of view, quotas are attractive because they limit surpluses and the need for embarrassing surplus disposal. Combined with co-responsibility levies, they do not result in any significant *visible* burden. From the bureaucrat's point of view, quotas require a great deal of routine administration, thus providing secure employment at the Community and national levels. These considerations may, ceteris paribus, lead EC policy-makers to prefer a quota scheme to other forms of intervention. Indeed, supply management was extended to milk in 1984 and has been repeatedly proposed as a solution to the EC's problems on other agricultural markets.

Theoretically, the PPF could be expanded to include arguments which reflect the policy-maker's own goals; according to Niskanen's suggestion, for example, the size of the budget. However, the size of the budget already appears in traditional PPFs as an argument that is negatively related to the

taxpayers' welfare. Furthermore, not every benefit that a policy-maker might wish to extract from his office is positively correlated with the size of the budget (Mueller, 1979, p. 163). Unfortunately, it is difficult to quantify goals such as prestige and job security which might influence policy-makers. Nevertheless, the difficulty associated with modeling policy-makers' own goals has important implications for the interpretation of PPF results. In Fig. 3b, for example, the STC $A'A'$ might represent the set of surplus distributions that policy-makers could generate using a quota system while A^0A^0 represents the choice set using variable levies. Given a PIC such as BB, different PPF weights will be revealed depending on the policy tool used. Observed PPF weights will therefore not only reflect preferences for producers as opposed to consumers, but will also reflect the policy-makers' pursuit of their own goals, expressed here in the choice of one policy instrument over another. [5]

Similarly, consider the concept of *fiscal illusion*, "...the impact of alternative degrees of complexity in the revenue structure upon the stock of taxpayer knowledge concerning tax-prices of public output" (Wagner, 1976, p. 45). Transfers to agricultural producers in the EC flow both directly from the CAP budget and indirectly via high consumer prices. It is very difficult for EC consumers and taxpayers to determine what the CAP costs them, and the issue is further confused by the different national prices arising from the green money system combined with the indirect transfers induced by common financing. It is often argued that the high costs of gathering information that face consumers and taxpayers contribute to the revealed political preference for producers. However, these costs need not be high; a system whereby each shopping bill and annual tax return would include an explicit 'CAP-surcharge' is not inconceivable. Under these conditions, consumers and taxpayers would be much more aware of the costs of the CAP, and could be expected to exert more pressure on the market for protection.

Farmers interested in maintaining a highly complex system will, of course, resist any attempt to reduce fiscal illusion. Farmers' unions in the EC have traditionally opposed replacing price support with direct income transfers because the latter would result in highly visible – and vulnerable – entries in national and Community budgets. This implies that shifting from one policy tool to another will change consumers' and taxpayers' awareness of the burdens they bear (Findlay and Wellisz, 1986, p. 239) and

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[5] As is discussed below, not only policy-makers will have preferences for specific policy tools. Findlay and Wellisz (1986), Mayer and Riezman (1987), MacLaren (1991) and Rodrik (1986), among others, discuss the endogenous choice of trade restriction regimes.

thus change the underlying PPF weights, even if the final distribution of welfare remains unchanged. This has important implications for normative work with the PPF concept, ie. attempts to derive optimal policies on the assumption that PPF weights are given. If, as a result of fiscal illusion, PPF weights are a function of the chosen policy tool, then static comparisons with fixed weights could be misleading.

4.2 Institutional change and constraints

According to the PPF approach, policy-makers each year choose the optimal level of a given policy tool. As discussed above, the choice of this policy tool may be an important determinant of observed PPF weights. Once a particular policy tool has been chosen, it generally can only be changed with a great deal of effort and in a limited number of ways (Rabinowicz, 1991, p. 507). Petit et al. (1987) study the process leading to the decision in 1984 to implement milk quotas in the EC and note how an acute sense of crisis and a package of flanking measures were needed to make this decision possible. This implies that preferences in favor of milk producers which may have existed before 1984 could not be expressed until sufficient pressure for a major institutional change had developed.

The discrete, as opposed to smooth and continuous, nature of institutional change (Frey, 1990, p. 445) implies that observed changes in PPF weights may be misleading. Consider the example of New Zealand's agricultural liberalisation in 1984. A look at PPF weights for New Zealand would probably reveal that policy-makers' preferences for producers dropped sharply in 1984. In reality, it is likely that a consensus developed over a number of years, eventually generating enough momentum to force a major institutional change. If this were the case, then the problem facing policy-makers in 1983, for example, would be better interpreted as one of constrained optimisation: policy-makers would have been better off if they had been able to choose some unattainable point on the STC.

In Fig. 5 it is assumed the the STC is cut off at point A' by a constraint. Imagine that the CAP budget is exhausted and that the proportion of value-added tax revenue that member states are required to surrender to the Community is, after tortuous negotiations, not slated to increase until next year. Consequently, the scope for price increases is limited and points on the STC to the southeast of A' are not attainable. Policy-makers have preferences indicated by the PICs B^0B^0 and $B'B'$. If not for the constraint, policy-makers would set prices so as to generate the welfare distribution represented by point A^0, and this point will, ceteris paribus, be realised next year. The solution to the constrained optimisation problem is found at point A'. If we fail to recognise that this solution is forced by a binding
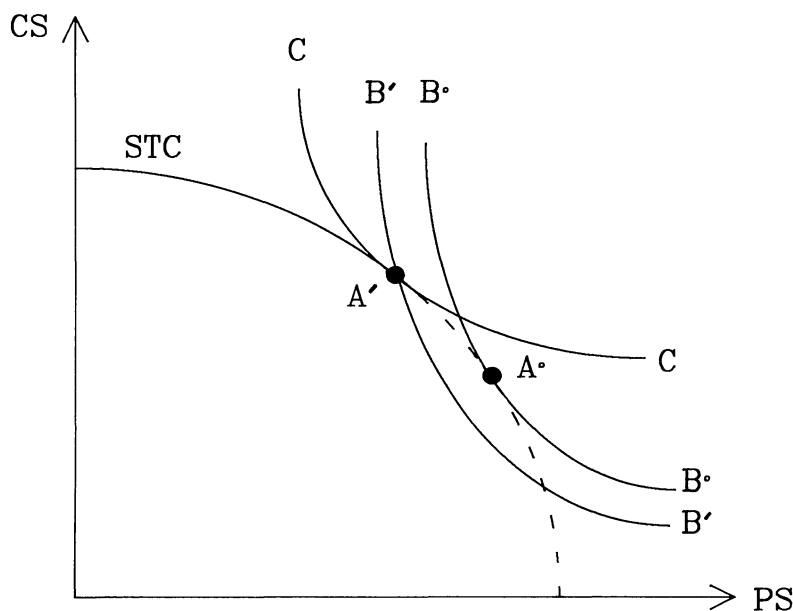
Fig. 5. Relationship between constraints and revealed PPF weights.

constraint we will reason that policy-makers' preferences must be repre-
sented by a PIC such as CC. The consequence will be erroneous conclu-
sions regarding relative PPF weights.

4.3 Policy interaction

The simple model in Section 2 – like most PPF models in the literature –
is based on the assumption that policy-makers choose optimal prices
separately for each commodity without regard to the interactions between
different markets. Wheat prices are used to generate a politically optimal
distribution between wheat market participants, barley prices are used
analogously on the barley market, and so on. It seems rather heroic to
assume such strict policy separability – especially in the case of the EC
where a *package* of prices is negotiated annually – and it might be more
realistic to assume that policy-makers are aware that different policies
simultaneously influence overlapping groups. [6]

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[6] Oehmke and Yao (1990) and Rausser and de Gorter (1991) address policy interaction in
the PPF framework, but they model the linkages between commodity policy on the one hand
and research and extension policy on the other, rather than the relationship between two or
more commodity policies.

Policy interaction greatly increases the potential complexity of the PPF model. Policy-makers no longer separately consider as many groups of producers and consumers as there are commodities, instead they are faced by a large number of different groups, each influenced by a weighted mixture of different measures. Policy-makers in the EC, for example, have to determine the mix of grain and sugar prices that maximises political support given that some crop farmers have sugarbeet quotas while others do not. This mix will be influenced by other crop prices and, inter alia, the EC's set-aside policy which has divergent impacts on crop farmers who own land as opposed to those who rent. Logically, policy-makers also have to consider the impacts of all other policies that influence producers and consumers of agricultural commodities. These range from sector-specific policies such as green exchange rates and special tax provisions for farmers, to general economic measures such as interest rates. At the limit, we have a model in which policy-makers determine the levels of all policy instruments simultaneously with a view to the political implications of their impact on each individual in society.

However, a model based on complete policy integration seems no more realistic – and certainly less tractable – than a model which assumes strict policy separability (Gardner, 1989, p. 1166). A useful compromise might be to assume a policy hierarchy in which first economy-wide, then sector-wide and finally individual commodity policies are determined. As noted by Petit (1985), however, the search for political compromise can lead to linkages between policies that might otherwise be totally unrelated. As a result, the policy hierarchy hypothesised above will likely be unstable. Nevertheless, to investigate the implications of policy interaction, consider the following simple extension of the single-market revealed PPF model. Assume that all wheat producers (consumers and taxpayers) are also barley producers (consumers and taxpayers), and vice versa. Hence, policy-makers are assumed to choose wheat and barley prices simultaneously so as to maximize a PPF that includes the sum of wheat and barley consumer surplus, the sum of wheat and barley producer surplus, and total taxpayer burden:

$$\text{PPF} = \omega_c(\text{CS}_x + \text{CS}_y) + \omega_p(\text{PS}_x + \text{PS}_y) + \omega_g(\text{G}_x + \text{G}_y) \tag{9}$$

where x and y refer to wheat and barley, respectively, and all other symbols are as defined in Section 2.

As in Section 2, supply and demand curves can be used to replace the surplus and burden measures in equation (9) by expressions in P_x and P_y. These expressions are more complex than in the one-market case because they include cross- as well as own-price effects. Recall that consumer and producer prices are identical under the EC's variable levy system. To derive the first-order conditions for optimisation, the derivatives of the PPF

TABLE 1

Revealed PPF weights for grain (wheat and barley) in the EC (1973/74–1988/89)

Year	ω_c	ω_p	ω_g	$\partial^2 \mathrm{PPF}/\partial P_x^2$	$\partial^2 \mathrm{PPF}/\partial P_y^2$
1973/74 **	1.52	1.47	0.01	+	+
1974/75 **	1.68	1.55	−0.24	+	+
1975/76 **	1.39	1.42	0.19	+	+
1976/77 ***	0.97	1.38	0.65	+	−
1977/78 *	0.79	1.40	0.81	−	−
1978/79 *	0.74	1.35	0.91	−	−
1979/80 **	2.32	1.58	−0.91	+	+
1980/81 *	−1.65	1.05	3.60	−	−
1981/82 **	1.98	1.44	−0.42	+	+
1982/83 **	3.10	1.43	−1.53	+	+
1983/84 **	3.18	1.84	−2.02	+	+
1984/85 *	1.13	1.16	0.71	−	−
1985/86 **	1.68	1.34	−0.02	+	+
1986/87 **	2.05	1.32	−0.37	+	+
1987/88 **	1.96	1.30	−0.26	+	+
1988/89 **	1.77	1.33	−0.10	+	+

 *, maximum;
 **, minimum;
 ***, saddle point.
Source: See Fig. 1.

with respect to P_x and P_y are set equal to 0. When combined with a normalisation equation, the result is a system of three equations in three unknown ω_i's – analogous to equations (4a), (4b) and (5). Solutions to this system generated with EC wheat and barley data for the period 1973/74 to 1988/89 are reproduced in Table 1. Own-price elasticities of supply and demand of 1.5 and −0.5 are assumed, as are cross-price elasticities of supply and demand of −0.1 and 0.1. [7] Because of the path dependency problem associated with the consumer surplus concept, one must specify the order in which P_x or P_y are changed, but the two sets of PPF weights which result are almost identical.

The weights in Table 1 are highly variable and in some cases negative. The interpretation of a negative weight is that policy-makers' utility increases, ceteris paribus, when the welfare of the group in question falls. Since most of the negative weights are relatively small and associated with taxpayer burden, one might conclude – with reference to the budget maximising bureaucrat – that policy-makers derive some utility from increasing the size of their budget. The corresponding second-order condi-

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[7] See Footnote 2.

tions, however, are sobering. As shown in Table 1, the wheat and barley prices chosen by policy-makers in the EC are compatible with PPF maximisation in only 4 of 16 years. In 11 years the chosen prices are only compatible with an unconstrained minimum, and in the remaining year they imply a saddle point solution; the PPF is increasing in one price and decreasing in the other.

Formally, the problem is that the PPF in equation (9) is not necessarily strictly (quasi-)concave in the variables P_x and P_y: its exact nature depends on the supply and demand coefficients and PPF weights that obtain in a given year. Hence we do not know ex ante whether the PPF has a global maximum and even the four maxima indicated in Table 1 could be local. This ambiguity is *not* simply the by-product of the specific two-market model which has been assumed here; it can easily be demonstrated that the simple one-market PPF analysed in Section 2 is also not necessarily strictly (quasi-)concave. In the one-market case, the condition for strict concavity is that the Hessian matrix:

$$\begin{bmatrix} d(\omega_c - 2\omega_g) & 0 \\ 0 & b(\omega_p - 2\omega_g) \end{bmatrix} \tag{10}$$

– which is constructed by taking the appropriate derivatives of equations (4a) and (4b) – be negative definite. This is the case when:

$$\omega_g > \omega_p/2 \tag{11}$$

and

$$\omega_g > \omega_c/2 \tag{12}$$

These restrictions are not very demanding and become even less so when the bordered Hessian is used to test for quasi-concavity (Arrow and Enthoven, 1961). Analogous restrictions for the two-market PPF in equation (9) are more complex and, as the results in Table 1 illustrate, not met in 12 of 16 years.

This result can be interpreted in light of the two broad objections to the revealed PPF approach which are discussed in Sections 4.1 and 4.2. First, misspecification due to the omission or inappropriate aggregation of relevant objectives and groups in simple consumer/producer/taxpayer PPFS might lead to convex and other counter-intuitive, but spurious, functional forms. Alternatively, it might be argued that these PPFS are valid representations of the choice problem facing policy-makers, but that we have erred in neglecting the role of restrictions on policy-makers' choices. Given the right constraints, even a strictly convex PPF will have a global maximum. Of course both considerations are likely to apply to the results in Table 1:

what we see is what happens when the inappropriate conditions for an unconstrained optimum are applied to a misspecified PPF.

5. SUMMARY AND CONCLUSIONS

In the body of this paper I have argued that revealed PPF weights are far more complex and difficult to interpret than has been indicated in the literature to date. To begin at the end, there are grounds for being very sceptical about our ability to correctly specify a PPF and deduce its parameters. Firstly, it seems likely that the standard consumer/producer/taxpayer PPF is misspecified. The use of highly aggregated groupings such as 'producers', and the omission of other groups such as processors and traders is questionable. Furthermore, the PPF approach models the policy-maker as a passive transfer broker and ignores factors such as bureaucracy that might lead to the presence of other goals in the PPF. Second, the path-dependent and discrete, as opposed to continuous, nature of institutional change is glossed over by the use of calculus in PPF work. As a result, what might better be modeled as problems of constrained optimisation are treated as unconstrained. The counter-intuitive results – negative PPF weights and second-order conditions which indicate minima and saddle points in some years – of a simple model which incorporates the interaction between wheat and barley policies in the EC could be symptoms of these fundamental shortcomings. A third weakness is the issue of policy interaction itself which has received little attention in PPF work to date.

Furthermore, even if there were no reasons for doubting our ability to specify PPFs and deduce their parameters, the interpretation of PPF weights would remain difficult. STCs are constantly shifting in the real world so that changes in PPF weights cannot be attributed to changing political preferences alone. In this regard, the common use of linear PPFs may have led to some confusion between supply and demand-side effects on the market for transfer-inducing policies. In summary, empirical PPF weights are highly suspect, and even if they were less so, they would remain difficult to interpret.

If this is a fair assessment, then it is difficult to be optimistic about the prospects of revealed PPF analysis as part of a new research paradigm that will enable economists to "...make a significant difference in actual policy analysis, selection, and implementation" (Rausser, 1982, p. 832). Indeed, the weaknesses of the PPF approach seem to stem from the fact that it fails in many respects to break with the traditional economics paradigm. The PPF approach reduces a complex political process, replete with institutional constraints and incomplete, asymmetric information, to the (relative) simplicity of a textbook optimisation problem. Innovations from the field of

public choice are incorporated, but as argued in Section 4 this is done in a procrustean manner. Hence, the traditional paradigm is not changed, it is simply stretched to fit. While it might be argued that these shortcomings will be addressed as PPF techniques are refined, it seems clear that PPF models will have to become exceedingly complex if they are to have a hope of capturing the essence of a process as byzantine as the EC's annual price negotiations. Even if such models are eventually assembled, they will likely be precisely the sort of highly abstract, technical and assumption-laden contraptions that hamper, rather than aid, communication between economists and policy-makers.

Of course, to judge the value of the PPF approach solely on the basis of whether it represents the breakthrough that will make economists (more) relevant to policy-making is to set very high standards. Gardner (1989, p. 1165) argues that "Viewing politics as maximization may seem unreasonably austere and narrow, but it is what distinguishes the contribution of economics from that of political scientists or more general social observers." Seen in this more humble light, the PPF approach is simply the economist's way of viewing the policy-making process, a heuristic perspective that can be illuminating in some respects, and less so in others.

For example, the normative use of the PPF concept may continue to provide useful insights even if positive or revealed PPF work faces insurmountable obstacles. Given that producer welfare seems to weigh very heavily in the determination of how developed countries distribute their wealth, analysis based on the PPF concept can be used to evaluate different policies on the basis of how efficiently they generate desired transfers from consumers and/or taxpayers to producers. However, two nagging doubts concerning normative PPF analysis will certainly continue to be the source of controversy.

Firstly, the logic of the PPF approach – with its emphasis on unconstrained optimisation – seems to predispose economists to writing apologies for government policy (Rabinowicz, 1991, p. 508). Rausser and de Gorter (1991, p. 497), for example, argue that the impact of research and extension policies on farm incomes in the EC must be considered when commodity policies that transfer income to farmers are evaluated, because governments choose optimal levels of both so that the latter compensates for the effects of the former. [8] The interesting policy implication is that CAP price support may not be such a bad thing after all: a reduction in this support – negotiated, for example, under the GATT – could lead to cuts in

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[8] If true, this means that policy-makers can predict both the effectiveness of research expenditure and the rate at which new technology is adopted.

research expenditure, and, potentially, net welfare loss. The danger, however, is that this focus on the optimality of government policy may distract from the myriad inefficiencies that plague the CAP – in practical terms, the suspicion that it might be possible to maintain both farm incomes *and* agricultural research without dumping millions of tonnes of grain on world markets and feeding milk powder to lactating cows. Practitioners must also beware that it is tautological to deduce a set of PPF weights on the basis of the assumption that policy-makers optimise, and then to use these weights to demonstrate that observed policies are optimal. The assumption/conclusion that observed policies are optimal is especially barren when otherwise more efficient policies are all assumed to be infeasible (see, for example, Munk, 1989).

Second, there appears to be a tendency to overlook the distinction between political preference and social welfare in normative work with PPF While it is one thing to recognise that the unweighted sum of surpluses and burdens traditionally used by economists may not reflect social welfare, it is quite another to assume that the results of the policy-making process do (see, for example, Becker and Labson, 1991, p. 10). Clearly, there can exist a huge gulf between the preferences that are revealed by a government's choice of policy and the preferences held by society; politicians doing what is best for themselves may not be doing what is best for us. Hence, even if we could determine the true PPF – and there is much to suggest that we cannot – we would not necessarily have a social welfare function. Of course, each of us is free to define the social welfare function as he, or she, will, and the PPF that prevails in a representative democracy is arguably a better candidate than most. Moreover, economists who adopt the prevailing PPF may find that their influence in policy-making circles increases. This sort of influence, however, is not the only measure of economic work.

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