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ARE GOVERNMENT TRANSFERS EFFICIENT?
PROBLEMS IN TESTING THE EFFICIENT REDISTRIBUTION HYPOTHESIS

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ABSTRACT

Previous testing of the ERH has neglected (i) simultaneous use of policy instruments, and (ii) to differentiate between the effects of market elasticities on total versus marginal dead weight losses. Results are (iii) improper conclusions about the consequences of market changes on transfers, and (iv) inadequate testing of the ERH.

<center>Are Government Transfers Efficient?
Problems in Testing the Efficient Redistribution Hypothesis</center>

I. Introduction

The ERH: Central in Models of the Political Economy of Government Transfers

It is an apparent paradox that politicians get elected by promising to cut government "waste," yet enact distortionary income transfer programs that lead to large "dead weight" losses. In a seminal article Becker (1983) hypothesizes that though existing transfer programs may lead to "social losses," these losses should be small "relative to the millions of programs that are too costly to muster enough political support" (p. 381). Gardner (1987, p. 233) refers to Becker's claims as the efficient redistribution hypothesis (ERH).

The ERH is a key assumption in much recent theoretical and applied research on the political economy of government transfers.[1] Many of the models used in this research assume that government decision makers maximize some political preference function (PPF),[2] subject to some income (or welfare) transfer constraint. As shown in Figure 1, the ERH implies that in political equilibrium, the income transfer constraint will bind, as at point A, where the welfare transfer constraint is tangent to a PPF level curve. According to the ERH, if the policy that takes the political economy to point A is an equilibrium policy, then there is no policy that will take the political economy to a point Pareto superior to A. By assuming the ERH, these models can derive theoretical conclusions about the

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[1] Two types of political economy models of government income transfers have prevailed in recent literature; these principally differ in how they model government preferences. In the first type of model, government preferences are modeled explicitly as functions of interest group welfare, policy instruments employed, and the welfare levels of government officials. (See Peltzman; Rausser and Freebairn; Rausser and Irwin; Rausser, Lichtenberg, and Lattimore; Rausser and Foster; Oehmke and Yao; Gardner (1983).) In the second type of model, policy emanates from the political struggles of opposing interest groups. (See Becker (1983, 1985); (Reference withheld to preserve anonymity).) All of these models rely on optimization of some objective function subject to some constraint for the derivation of their comparative static results. Though the optimizing agents (either "the government" or individual members of pressure groups) differ across these models, the constraints faced by the optimizers are similar. Becker shows how changes in the slopes of these constraints (which he refers to as changes in marginal dead weight losses) change equilibrium income transfers. Gardner (1983) derives surplus transformation curves for various government programs that transfer income between consumers/taxpayers and producers of agricultural commodities, in order to make explicit the income transfer constraint implicit in the Becker model.

[2] Unfortunately, various names for the PPF appear in the literature. "Political preference function" is the term used by Rausser, Lichtenberg, and Lattimore. See also Peltzman; Gardner (1983, 1987); Rausser and Irwin; Rausser and Foster; Oehmke and Yao; Johnson, Mahé, and Roe.

<center>1</center>

effects of changes in political power and market conditions upon the shapes and positions of the PPF and the income transfer constraint, and thereby upon equilibrium income transfers. (Peltzman; Gardner (1983, 1987); Rausser and Foster; **Reference withheld to preserve anonymity**) If the ERH does not hold (that is, if governments are not always at points like A in Figure 1), then such comparative static results cannot be derived.

Some researchers have attempted to estimate the marginal trade-offs that governments face when transferring income between groups (Rausser and Freebairn; Oehmke and Yao; Johnson, Mahé, and Roe). By assuming that the ERH holds, these authors can claim that when they measure this "slope" of the income transfer constraint, first-order conditions imply that they are also estimating a government's marginal rate of substitution between groups' welfare levels (the "slope" of the PPF), which reflects the relative political power of interest groups. (Gardner (1983, 1987); Johnson, Mahé, and Roe.) Thus, assuming the ERH holds, these unobservable political relationships can be estimated using (more-or-less) observable income transfer trade-offs. If the ERH does not hold, the slopes of the PPF contours and the income transfer constraint cannot be assumed equal in equilibrium, and therefore measurements of political power cannot be obtained from knowledge of the constraint.
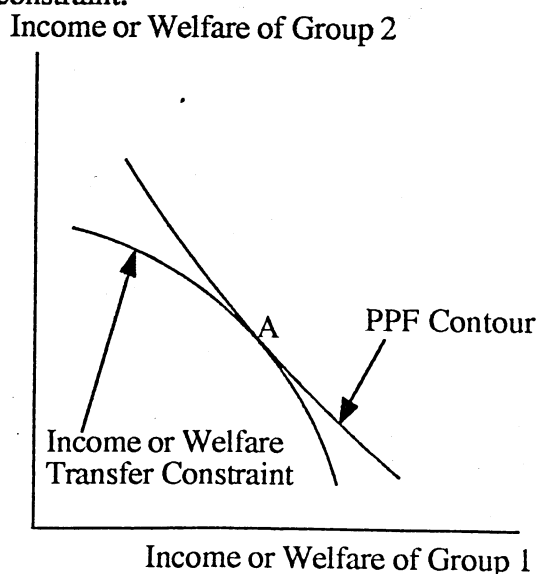
Income or Welfare of Group 2

Figure 1. A typical political equilibrium.

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Previous Testing of the Efficient Redistribution Hypothesis

Given the centrality of the ERH in recent research on the political economy of government transfers, proper testing of the ERH is important. Gardner (1987) has so far made the only effort to test the ERH. Though his research is impressive, in this paper I argue that it (i) has neglected that different policy instruments can be used simultaneously, and (ii) has neglected to adequately differentiate between the effects that changed market elasticities have on total dead weight losses (and so the "position" of the income transfer constraint), as opposed to the the effects changed market conditions have on *marginal* dead weight losses (and so the "slopes" of the income transfer constraint). I argue that these two theoretical shortcomings have led to (iii) possibly improper theoretical conclusions about the comparative static consequences that these parameter changes have on income transfers, and therefore (iv) inadequate testing of the efficient redistribution hypothesis.

II. The Income Transfer Constraint and Simultaneous Use of Multiple Policy Instruments

The surplus transformation framework has been used in various studies (c.f., Gardner (1983, 1987); Rausser and Foster) to examine the effects of policy changes on interest group welfare levels. An important limitation in the surplus transformation framework is that it does not explicitly consider possibilities of simultaneous use of different policy instruments.[3] One consequence of this limitation can be understood with reference to Figure 2 below, parts of which replicate parts of Figure 4 of Gardner (1983). In Figure 2, PS shows producer surplus on the vertical axis, and CT shows consumer/taxpayer surplus on the horizontal axis. The represented country is assumed to export the commodity in question in the absence of government intervention. Point E' shows non-intervention PS and CT. The welfare consequences of government programs

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[3] Rausser and Foster do consider that different policy instruments (which they categorize as "PERTs" and "PESTs") can be used simultaneously. But the surplus transformation curves they derive in their analysis are derived by assuming that one of these instruments is held constant at a particular level, while another instrument's level is varied. (See their Figure 1.) As I show in this paper, a more correct derivation of the government's welfare transformation constraint can be obtained by tracing out transformation surfaces while allowing policy instruments to be varied simultaneously.

that use separately either a production control or an export control (an export quota or an equivalent export tax) are shown by curves STC^{PC} and STC^{EC}, respectively. If the government implements production controls, world prices are raised, and the government can drive (CT, PS) to any point that runs through STC^{PC}. Similarly, the government can use export controls to drive (CT, PS) to points along STC^{EC}. Gardner explains that if a very simple PPF (one with linear contours) represents government preferences, then multiple equilibria, like R and T, can result. He maintains that this framework might therefore explain why in the early 1970's, in response to skyrocketing grain prices, the U.S. swithched from controlling production to limiting exports (p. 231).

PS

Pareto frontier obtained from simultaneous use of different policy instruments

STC^{PC} R   E   B
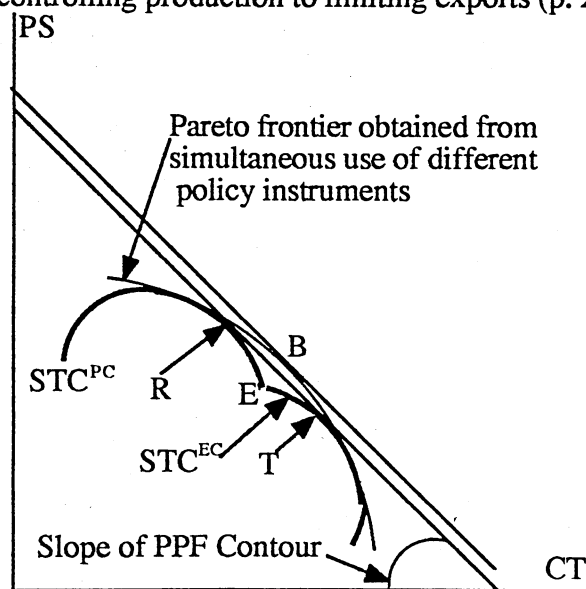
STC^{EC} T

Slope of PPF Contour

CT

Figure 2. Multiple Political Equilibria when Policy Instruments Used Separately.

Given a PPF with linear contours, any such radical changes in policy due to small changes in the slope of the PPF contour could only come about because the "feasible set" of welfare combinations is not strictly convex. Since the Gardner analysis does not allow that production controls and trade restrictions be used simultaneously, the boundary of the "feasible set" of welfare combinations is formed by the two surplus transformation curves. As is clear from Figure 2, this "feasible set" can be non-convex. But there seems to be no technical reason why production controls and trade restrictions could not be employed

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simultaneously. As is shown elsewhere ((**Reference withheld to preserve anonymity**)), the boundary of the feasible set of welfare combinations when policy instruments can be used simultaneously must form the envelope of all the surplus transformation curves. As depicted in Figure 2, it is possible that this envelope (here called the "Pareto frontier") forms a boundary of a strictly convex set[4] of feasible welfare combinations. Under the ERH, the government would use all available policy instruments simultaneously, and drive (CT, PS) to a point like B on the Pareto frontier. Then, small changes in the slope of the PPF contours, or in supply and demand parameters that determine the shape of the Pareto frontier, might not explain large changes in government policy. Clearly, failing to consider the simultaneous use of multiple policy instruments can lead to an incomplete view of a government's true welfare transfer possibilities. This can lead to improper theoretical expectations about how changes in market conditions will effect government transfers, and thus lead to improper testing of the ERH.

III. The Theoretical Relationship between Market Elasticities and Government Transfers

Gardner (1987) makes predictions about the relationship between the elasticities of supply and demand, and income transfers that should be expected to come out of the political process.[5] He then tests the efficient redistribution hypothesis by testing whether actual transfers[6] made to U.S. agriculture from U.S. consumers and taxpayers tended to be greater when the supply and demand elasticities were smaller in absolute value. His

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[4]I do not contend here that the feasible set of welfare combinations under simultaneous instrument use necessarily strictly convex. Rather, I contend that strict convexity of this set is a possibility.

[5] He writes,

> The main efficiency difference between policies leading to (9) and (10) is that in (10) redistribution is more costly, the greater the elasticity of supply and the less (nearer zero) the elasticity of demand, whereas elastic supply and inelastic demand increase the efficiency of production controls. Thus, given that the choice of policy approach is open, the prospects of relatively efficient redistribution increase when either the supply or demand elasticity is near zero, and, given this minimum, the further from zero is the other elasticity. (p. 293)

In the preceding quote, "(9)" refers to a production quota program for agricultural commodities, and (10) refers to a price support (a target price/deficiency payments) program.

[6]Estimates of actual transfers to U. S. agricultural are difficult to obtain. Gardner uses "an estimate of producers' price gains generated by farm programs as a percentage of observed market price for the commodity" (pp. 301-302).

empirical results show that smaller elasticities tend to be accompanied by larger actual government transfers to U.S. agriculture. In this section, I will use demonstrate theoretically that lower elasticities of supply and demand need not lead to larger equilibrium transfers from consumers/taxpayers to agricultural commodity producers.

Let b be a vector of parameters that describe market conditions that underlie a hypothetical government's income redistribution constraint.[7] In all three panels of Figure 3, F_0F_0 represents the Pareto frontier which is determined when b takes on the value b_0. E is the non-intervention (CT, PS) combination implied by b_0.[8] As in Gardner (1983, 1987), the PPF has linear contours, the slopes of which are $-\theta$. ΔPS_0 is the extra surplus that producers receive from government intervention under b_0 .[9] In each of the panels, lower elasticities imply a change in b_0, and are assumed to push the Pareto frontier "out" to F_aF_a, F_bF_b, and F_cF_c, as well as changing the non-intervention point from E to E_a, E_b, and E_c in panels 3a, 3b, and 3c.[10] The different elasticities bring about "transfers" to producers equal to $\Delta PS_a > \Delta PS_0$, $\Delta PS_b < \Delta PS_0$, and $\Delta PS_c > \Delta PS_0$. Clearly, that lower elasticities may push the Pareto frontier "out," need not imply that farmers will receive larger transfers during years of low elasticities.

The results in Figure 3 imply that simple proxies of the parameter vector b, may not be adequate for testing the efficient redistribution hypothesis. The principal variable that Gardner employs to proxy the position and shape of the Pareto frontier is $\max\{1/|\eta|,$

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[7]Vector b describes the characteristics of supply and demand in the domestic economy, as well as characteristics of foreign supply and demand, and policies of foreign governments.

[8]The country depicted in Figure 3 is assumed to trade enough of the analyzed commodity to have influence on the world price. Since foreigners can be exploited by certain domestic policy choices (as in the optimal tariff literature), the sum of domestic surpluses can be increased through domestic policy. Thus, the Pareto frontier F_0F_0 will lie to the northeast of non-intervention point E.

[9]ΔPS_0 shows the vertical distance between E and A, where a level curve of the PPF and F_0F_0 are tangent.

[10]Since more elastic demand tends to make income redistribution through a target price/deficiency payments program more efficient, and since more elastic supply tends to make income redistribution through a production quota program more efficient (Wallace), it is not at all clear that less elastic supply and/or demand will in general push the Pareto frontier "out." In assuming that the Pareto frontiers shift out, I am being consistent with Becker's claim that less elastic supply and demand make income redistribution more efficient (p. 383), and with Gardner's (1987) use of $\max\{1/|\eta|, 1/\varepsilon\}$ as a proxy for income redistribution efficiency.

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$1/\varepsilon$}, where η and ε are the demand and supply elasticities, respectively, of different commodities in different years. Gardner regresses a measurement of producer price gains generated by farm programs as a percentage of observed market price upon this variable, finds a significant positive sign, and argues that this supports the ERH. But Figure 3 shows why the ERH implies that there is no *a priori* reason to expect a particular sign to come out of a regression of actual transfers upon elasticities, without first accounting for how changes in market parameters affect not only the "position," but also the "slope" of the income redistribution constraint , and the non-intervention welfare levels (points E).
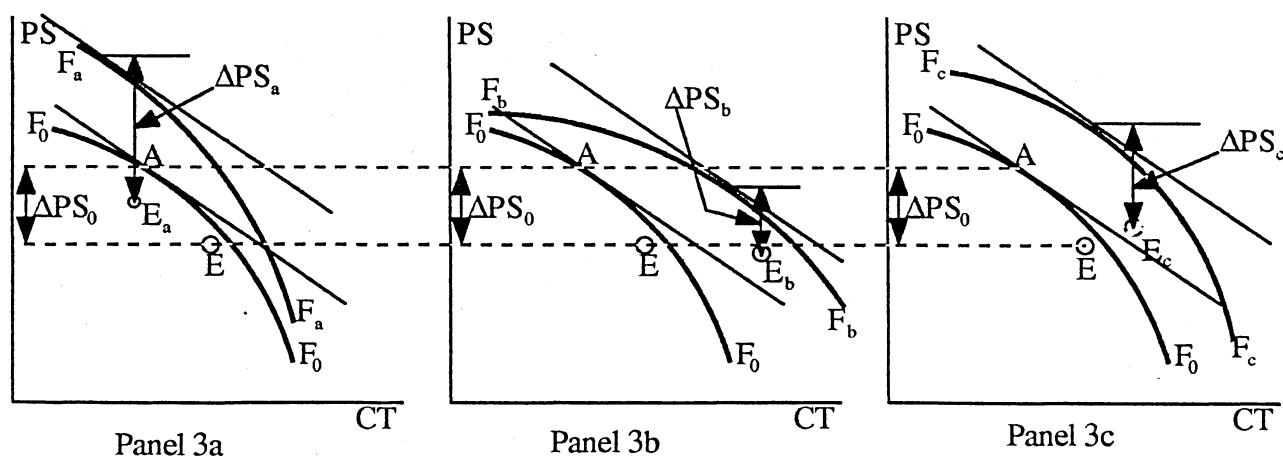

Figure 3. Lower elasticities need not imply larger transfers to producers.

IV. Market Elasticities and Government Transfers: Simulation of the Political Economy of the EC Wheat Market

The model presented here adapts some of the "bargaining solution" ideas of Gallagher to the surplus transformation framework. A set of Pareto optimal policy instruments is found, which is used to derive a Pareto frontier similar to the one in Figure 2. Two policy instruments are considered here, a per-unit production tax/subsidy t, and a domestic price P, which domestic consumers pay for wheat, and domestic producers receive. Following Gallagher, I specify supply and demand for wheat in the EC in 1986 as (where quantities are in millions of metric tons, and prices are in ecu),

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$$(1) \qquad Q^s = 40.67 + .14036(P - t)$$

$$(2) \qquad Q^d = 81.59 - .15043P.$$

De Gorter and Meilke report an excess demand elasticity of approximately -4.5 for EC wheat. Linearizing, I specify excess demand for EC wheat as a function of world price,

$$(3) \qquad Q^{ed} = 57.75 - .460077896p^w.$$

Producer surplus is the welfare measurement used for producers:

$$(4a) \qquad PS(P,t;b) \equiv \int_0^{P-t} Q^s(u;b)\,du,$$

where u is a variable of integration, and **b** is the vector of the various intercept and slope parameters in (1)-(3). CT is consumer surplus, plus net revenues from the production tax/subsidy, minus net government expenditures needed to maintain the wedge between the world price and the support price:

$$(4b) \qquad CT(P,t;b) \equiv \int_P^\infty Q^d(u;b)\,du + tQ^s(P,t;b) - (P - p^w)(Q^s(P,t;b) - Q^d(P;b)).$$

If a particular (P, t) combination maximizes L in (5),

$$(5) \qquad L(P,t,\lambda,b,CT^0) \equiv PS(P,t;b) - \lambda(CT^0 - CT(P,t;b)),$$

and λ and $(CT^0 - CT(P,t; b))$ show complementary slackness, then that (P, t) is a Pareto optimal policy (Dixit, chapter 7; **(reference withheld to preserve anonymity)**).

Assuming supply, demand, and excess demand took forms (1), (2), and (3), respectively, I derived various Pareto optimal (P, t) combinations by choosing various values for the consumer/taxpayer welfare constraint CT^0 in (5), then finding the (P, t) that solved the complementary slackness condition (6)[11], and the necessary first-order conditions[12] (7) and (8)[13], given each chosen value of CT^0.

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[11] At all these optimal solutions, it was found that $\lambda > 0$. Therefore, equation (6) is necessary.

[12] For linear supply, demand, and excess demand curves and instruments (P, t), it is proved in the appendix of **(Reference withheld to preserve anonymity)** that first-order conditions are sufficient.

[13] Equations (7) and (8) are linear in P and t. Gallagher shows that these equations imply $P = p^w - (Q^s - Q^d)/\beta_s$, and $t = (1 - 1/\lambda)Q^s/\beta_s$, where β_s is inverse of the slope of the supply curve, assumed equal to .14036 in the derivation of $PS^*(CT, \epsilon_1, \eta_2)$ in Figure 4. But Q^s, Q^d, and p^w are all functions of P and t, and therefore Gallagher's method does not solve for the choice variables as functions of the parameters. But also using (6), P and t may be solved for as functions of the parameter vector b. Finding the solution for (6)-(8) is made more difficult by the fact that (6) is not linear in P and t, so simple linear algebra techniques will not lead to a solution. I solved (6), (7), and (8) numerically to obtain the results in Figure 4.

(6) $$CT^0 - CT(P, t; b) = 0.$$

(7) $$\frac{\partial PS(P,t;b)}{\partial t} + \lambda \frac{\partial CT(P, t; b)}{\partial t} = 0$$

(8) $$\frac{\partial PS(P,t;b)}{\partial P} + \lambda \frac{\partial CT(P, t; b)}{\partial P} = 0.$$

Substituting these optimal (P, t) values back into (4a) and (4b), various points on the Pareto frontier were found. This Pareto frontier is labeled $PS^*(CT, \varepsilon_1, \eta_2)$ in Figure 4.

Equations (4)-(8) imply that as conditions underlying the shapes of the supply and demand curves change, income redistribution possibilities change.. The derivation of $PS^*(CT, \varepsilon_1, \eta_2)$ assumes that (1) and (2) describe supply and demand. But alternate functional form assumptions are plausible:

(1′) $$Q^s = 47.55 + .1000(P - t)$$

(2′) $$Q^d = 72.9943032 - .1000 P.$$

Supply is less elastic in (1') than in (1), and demand is less elastic in (2') than in (2).[14] Pareto frontier $PS^*(CT, \varepsilon_{1'}, \eta_2)$ in Figure 4 was obtained by assuming supply takes the form of (1'), and demand takes the form of (2). Similarly, (1) and (2') generate $PS^*(CT, \varepsilon_1, \eta_{2'})$, and (1') and (2') generate $PS^*(CT, \varepsilon_{1'}, \eta_{2'})$. Note the effect of a lower supply elasticity on the Pareto frontier: $PS^*(CT, \varepsilon_{1'}, \eta_2)$ lies everywhere to the northeast of $PS^*(CT, \varepsilon_1, \eta_2)$. Less elastic demand causes $PS^*(CT, \varepsilon_1, \eta_{2'})$ to lie everywhere northeast of $PS^*(CT, \varepsilon_1, \eta_2)$. Also, $PS^*(CT, \varepsilon_{1'}, \eta_{2'})$, which reflects less elastic supply *and* demand, lies everywhere northeast of both $PS^*(CT, \varepsilon_{1'}, \eta_2)$ and $PS^*(CT, \varepsilon_1, \eta_{2'})$.

It is clear (at least in this simple example using this simple model--see footnote 10) that lower elasticities push the income redistribution constraint "out." But the effect that

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[14]Of course, given the assumed linearity of supply and demand, elasticities are not constant along the entirety of the curves, but depend on quantities. In 1986, the actual EC support price (intervention price) for wheat was 170.47 ecu per metric ton, and the per-unit production tax was negligible. Call $(P^*, t^*) = (170.47, 0)$ the *status quo* policy, which led to the quantities supplied and demanded actually observed in the EC in 1986. Plugging (P^*, t^*) into (1), (1'), (2), or (2') will lead to the *status quo* quantities supplied and demanded. Thus, supply and demand are less elastic in (1') and (2') at the *status* quo quantities supplied and demanded, respectively. I do not attempt to summarize the affects of all possible change in the parameter vector b upon the Pareto frontier. Instead, I aim only to show that a particular very simple parameter change does not necessarily lead to policy change predictions consistent with statements in the literature.

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these lower elasticities should be expected to have on actual transfers between consumers/taxpayers and farmers is less clear for at least two reasons: (1) to calculate transfers, the initial non-intervention ($CT^e(\mathbf{b})$, $PS^e(\mathbf{b})$) must be calculated. But this point can change when market parameters (vector $\mathbf{b}$) change. (2) Even though lower elasticities push the Pareto frontier "out" in this example, it is less clear how they affect the *slope* of the Pareto frontier, which reflects the *marginal* welfare trade-off that the government faces.
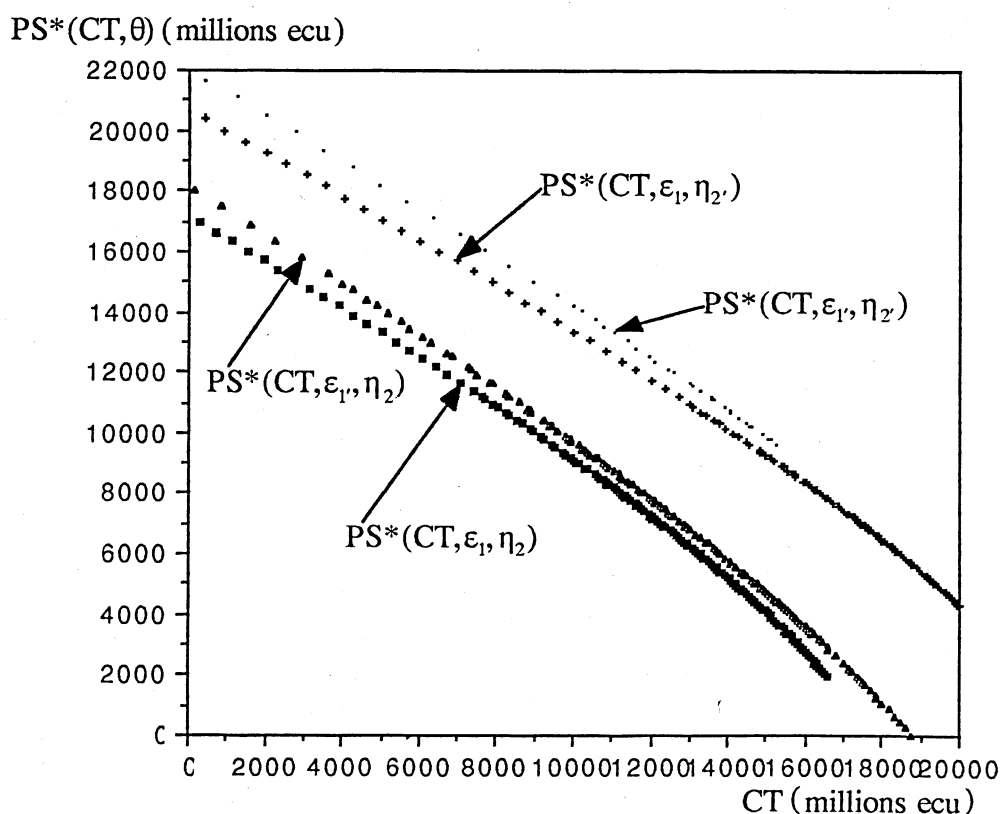

Figure 4. Pareto frontiers derived from simple EC wheat market model.

The envelope theorem implies that the λ that solves (5) is (the absolute value of) the slope of the Pareto frontier at the particular CT^0 that constrains the maximization problem. The locus of points marked $\Delta PS^*(\theta, \varepsilon_1, \eta_2)$ in Figure 5 was obtained by assuming supply takes the form of (1), and demand takes the form of (2). Then, assuming various values for λ, equations (6)-(8) were solved for P, t, and CT^0. Since at the politically optimal (CT, PS), under the ERH the slopes of the Pareto frontier and the PPF contours must be

equal, maximizing values of (P, t) could then be substituted back into (5) to find $PS^*(\theta, \varepsilon_1, \eta_2)$, where $\theta = \lambda$. $PS^e(\varepsilon_1, \eta_2)$, non-intervention producer surplus (given supply and demand take the forms of (1) and (2), respectively), was found by solving (1)-(3) for the non-intervention equilibrium world price, and substituting this price into (4a) and (4b). The politically optimal transfer is $\Delta PS^*(\theta, \varepsilon_1, \eta_2) = PS^*(\theta, \varepsilon_1, \eta_2) - PS^e(\varepsilon_1, \eta_2)$. $\Delta PS^*(\theta, b)$ is plotted in Figure 5 for various levels of θ, while allowing b to take on the same four values used to generate the Pareto frontiers in Figure 4. As is seen in Figure 5, a less elastic supply and/or demand does not necessarily cause greater politically optimal transfers to producers. *Note that under which elasticity regime politically optimal transfers to producers are greatest depends on the assumed slope of the PPF contour.* For $\theta < 0.812$, politically optimal transfers are smaller for the the relatively elastic supply and demand regime (ε_1, η_2) than for the regime where supply alone is less elastic $(\varepsilon_{1'}, \eta_2)$, than for the regime where demand alone is less elastic, $(\varepsilon_1, \eta_{2'})$, and than for the regime where supply and demand are both less elastic, $(\varepsilon_{1'}, \eta_{2'})$. For $0.812 < \theta < 0.913$, the relatively elastic supply and demand regime (ε_1, η_2) implies greater politically optimal transfers to producers than the regime in which only demand is less elastic $(\varepsilon_1, \eta_{2'})$. For $0.913 < \theta < 0.986$, the relatively elastic regime (ε_1, η_2) implies greater politically optimal transfers to producers than do regimes $(\varepsilon_1, \eta_{2'})$ and $(\varepsilon_{1'}, \eta_{2'})$. Finally, for $0.986 < \theta$, the relatively elastic regime (ε_1, η_2) implies greater politically optimal transfers than do all three of the relatively less elastic regimes. Clearly, no judgment about the signs of $\partial \Delta PS^*(\theta, b)/\partial \eta$ and $\partial \Delta PS^*(\theta, b)/\partial \varepsilon$ should be made without prior knowledge of the value of θ, even if the efficient redistribution hypothesis holds. Therefore, it may not be adequate to test the ERH by examining if observed behavior in political-economic markets is consistent with a particular expected sign of $\partial \Delta PS^*(\theta, b)/\partial \eta$ and $\partial \Delta PS^*(\theta, b)/\partial \varepsilon$. Also, econometric measurement of the value of θ cannot be made without adequate knowledge of the market parameters contained in b, since these parameters determine the shape of the Pareto frontier. Even if good measurements of market parameters are

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obtainable, it is important to take into account that multiple policy instruments can be used

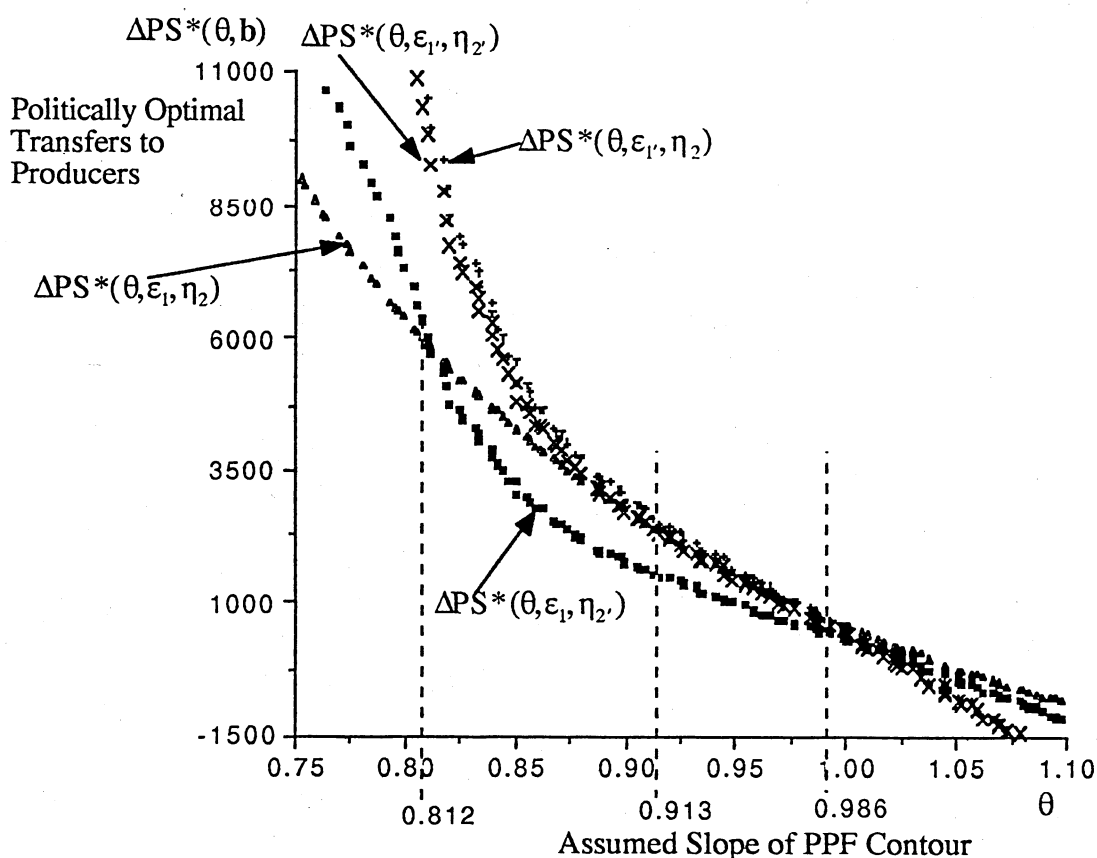simultaneously, in order to properly derive the Pareto frontier.

Figure 5. The impact of lower supply and demand elasticities on politically optimal
transfers depends on θ the slope of the PPF contour.

V. Conclusions

Conceptually, testing the ERH presents economists with problems similar to those

they face when testing the utility-maximization hypothesis of consumer theory. Since

political power is difficult to observe, and even more difficult to measure, the ERH must be

tested by examining whether changes in market parameters lead to changes in transfers

consistent with the predictions of the ERH. In this paper, I argue that Garner's (1987)

approach to testing the ERH is inadequate. I demonstrate that current models of

government income redistribution lead to no *a priori* expectations about the relationships

between market elasticities and actual income redistribution.

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