Simulating the Effects of Supply and Demand Elasticities on Political-Economic Equilibrium

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Comparative statics question that’s been bounced around in the literature: the effect of market elasticities on policy instrument choice and policy instrument level choice in political-economic equilibrium.
This idea has been discussed quite a bit in the literature, and I’m trying to write a paper that brings a lot of separate ideas together into a more comprehensive whole.
Early ag econ literature, Wallace (1962):
$s \uparrow \Rightarrow \begin{cases} \uparrow \text{prdn subsidy efficiency} \\ \downarrow \text{prdn quota efficiency} \end{cases}$
Think of the effects of a supply elasticity on the “costs” of a target price program:

When supply becomes more elastic, transferring the same amount of income to producers requires taking more away from consumers-taxpayers.
Let’s look at this in welfare space:

Less elastic supply brings more efficient target price program (Gardner 1983)

Producer welfare

STC(p_t, S_{less elastic})

STC(p_t, S_{more elastic})

PS*

45°

Non-intervention outcome

CT*

Consumer-taxpayer welfare
The Intuition is pretty clear...

- Why doesn’t the U.S. have a high target price for pumpkin production?
- Because the pumpkin supply is extremely elastic (can easily double, triple acreage)
- Pumpkins out the wahzoo...
- Demand price must drop dramatically for people to buy them all.
- Cost to government prohibitive.
The EU learned this the hard way

- In the 1960s, CAP price supports were not so burdensome.
- But by the late 70s, as supply became more elastic in the long run, got “mountains of butter,” etc.
Wallace (1962) recognized that the elasticity of supply has just the opposite effect on the efficiency of a production quota…

But if resources have poor alternative uses, Then when the are kicked out of agriculture, they don’t have a good place to go, and dead weight is large. (Think of old Norwegian dairy farmers.)

If resources have good alternative uses, they can easily leave the sector, and dead weight is small.
Less elastic supply brings less efficient production quota program.
And when demand becomes more elastic, transferring the same amount of income to producers with a subsidy requires taking less away from consumers-taxpayers:

Intuition: because demand is elastic, consumers readily eat the extra production--they easily substitute the subsidized good for other goods. So the demand price doesn’t have to drop much, and the tax increase is small.
But the elasticity of demand has just the opposite effect on the efficiency of a production quota...

If there are good substitutes, then the production quota will have to be very strict to get the good’s price up much. End up kicking lots of resources out of the sector.

Probably won’t see a production quota on medium grain rice.
Less elastic demand brings less efficient target price program.
Less elastic demand brings more efficient production quota program.
$d$ \Rightarrow \left\{ \begin{array}{l}
\downarrow \text{prdn subsidy efficiency} \\
\uparrow \text{prdn quota efficiency} 
\end{array} \right.$
Caveat: This gets trickier when we consider that governments can use multiple policy instruments simultaneously.
Becker (1983) tied *some* of these ideas into his famous political economy model:
PROPOSITION 2. *An increase in deadweight cost reduces the equilibrium subsidy.* (Becker 1983, p. 381)
CORROLARY. Political policies that raise efficiency are more likely to be adopted than policies that lower efficiency. (Becker 1983, p. 384)
Fascinating and ironic: The Chicago School arguing that government intervention is efficient!
... in the political sector ... investments in human or physical capital specific to a firm, industry, or even region reduce the short-run elasticity of supply, and the deadweight costs of “distortions” are lower when supply (and demand) is less elastic. (Becker 1983, p. 383)
Think: GM bailout
Grossman and Helpman (1994) made similar remarks in regard to trade policy:

… industries with higher import demand or export supply elasticities will have smaller ad valorem deviations from free trade. (p. 842)
I analyze and critique these claims, and suggest how models of political economies might be developed to empirically test the above hypotheses about the policies’ underlying causes.
Quick overview of my Becker-type model, here adapted to reflect typical agricultural policies:
Economic side of the model: S&D with subsidy and quota
Utilities of farmers and consumers/taxpayers:

\[ h(t, q^n, b) = \left( u_{CT}(t, q, b), u_F(t, q, b) \right) \]

- Subsidy instrument
- Production quota instrument
Surplus transformation curves depend on S&D elasticities
“Size of government” depends on political expenditures:

\[ I(x_{CT}, x_F) \]

- Farmers’ political expenditures
- Consumer/taxpayers’ political expenditures
The groups’ play a Nash game in political expenditures. Payoff depends on policy instrument levels.
Equilibrium subsidy depends on the parameters of the model:

\[ t^e(b, k) \]

Political parameters

Supply and demand parameters
The central questions:
What is $\nabla_b t^e(b, k)$?

That is, how does equilibrium policy change when elasticities change?
Which one?:

Equilibrium per-unit subsidy

$te^e$?

Elasticity of supply
What is $\nabla_b u^e (b, k)$?

That is, how does equilibrium welfare change when elasticities change?
Which one?:

\[ u_1^e? \]

\[ u_2^e? \]

utility

Elasticity of supply
Theory provides testable hypotheses about why various nations use various distortive policies.
Empirical research that does this kind of thing with the Grossman and Helpman (1994) model exists.
My Becker model results: higher supply elasticity decreases the equilibrium transfer to farmers (Proposition 2 holds)
But, after political expenditures are accounted for, everybody loses (Tullock-type rent dissipation.)
Some quick geometry of the Nash outcome of Becker model:

Nash equilibrium

Non-intervention

Figure 3. Nash equilibrium in the baseline Becker model of a production tax/subsidy.
Interesting result: It can be good to be in a situation where transfers have high deadweight costs—that keeps interest groups from lobbying, keeps everyone away from the Prisoners’ dilemma outcome.
Did similar exercises, but with Grossman and Helpman’s (1994) model of political economy.

Results:
Table 1. The effects of elasticity changes on total subsidization and per-unit subsidization in the equilibria of two models of political economy

<table>
<thead>
<tr>
<th>Elasticity change</th>
<th>Effect on the efficiency of redistribution from consumer/taxpayers to producers</th>
<th>Becker Model</th>
<th>G&amp;H Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total subsidy</td>
<td>Per-unit subsidy</td>
</tr>
<tr>
<td>Supply more elastic</td>
<td>Less efficient</td>
<td>Smaller</td>
<td>Ambiguous—depends on the initial value of the elasticity</td>
</tr>
<tr>
<td>Demand more elastic</td>
<td>More efficient</td>
<td>Larger</td>
<td>Smaller</td>
</tr>
</tbody>
</table>
Lesson: When thinking about Proposition 2, we have to be careful about whether we are talking about the ultimate size of the transfer, or the level of the policy instrument.