

# **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

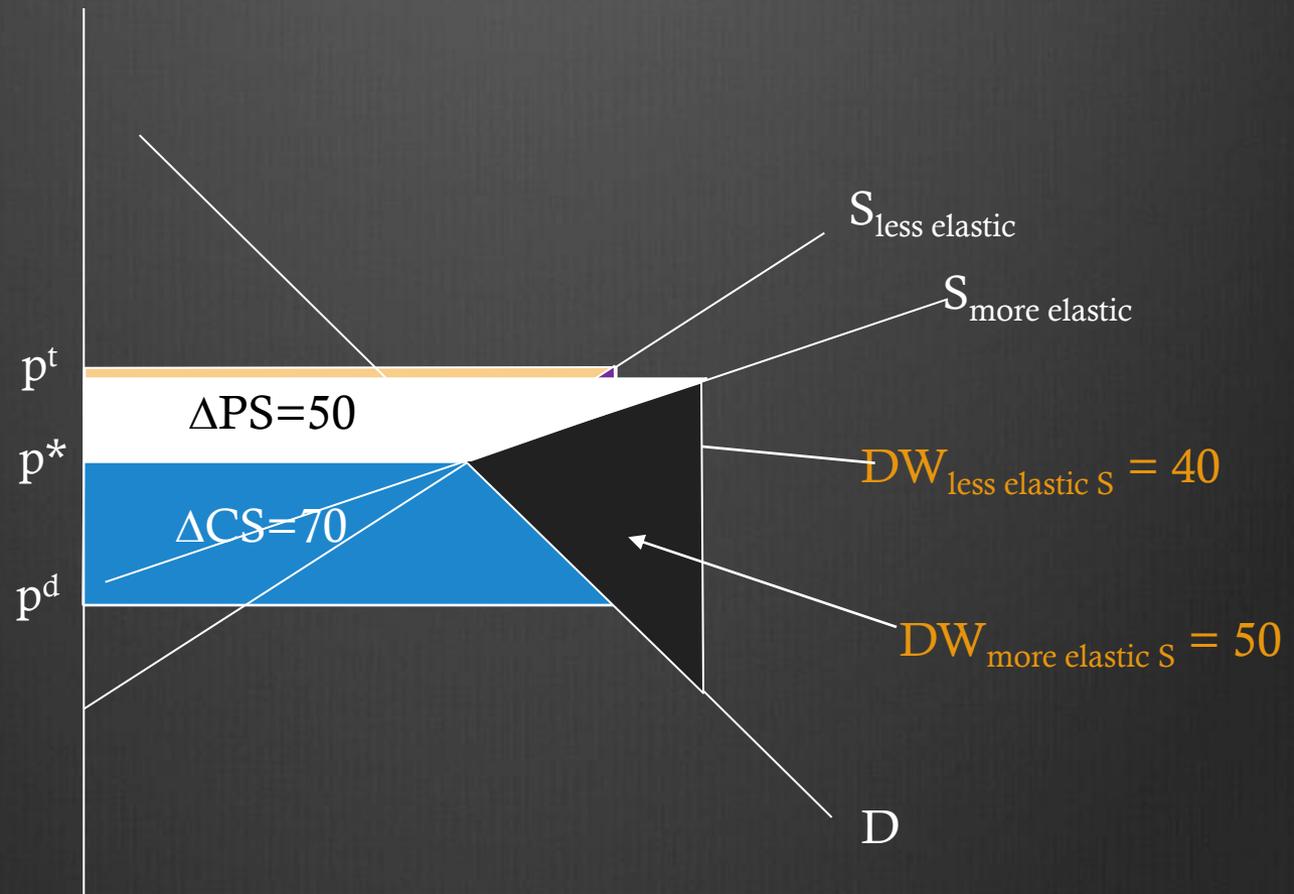
in political-economic equilibrium.

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):

$\uparrow e^s \Rightarrow \left\{ \begin{array}{l} \uparrow \text{ prdn subsidy efficiency} \\ \downarrow \text{ prdn quota efficiency} \end{array} \right.$

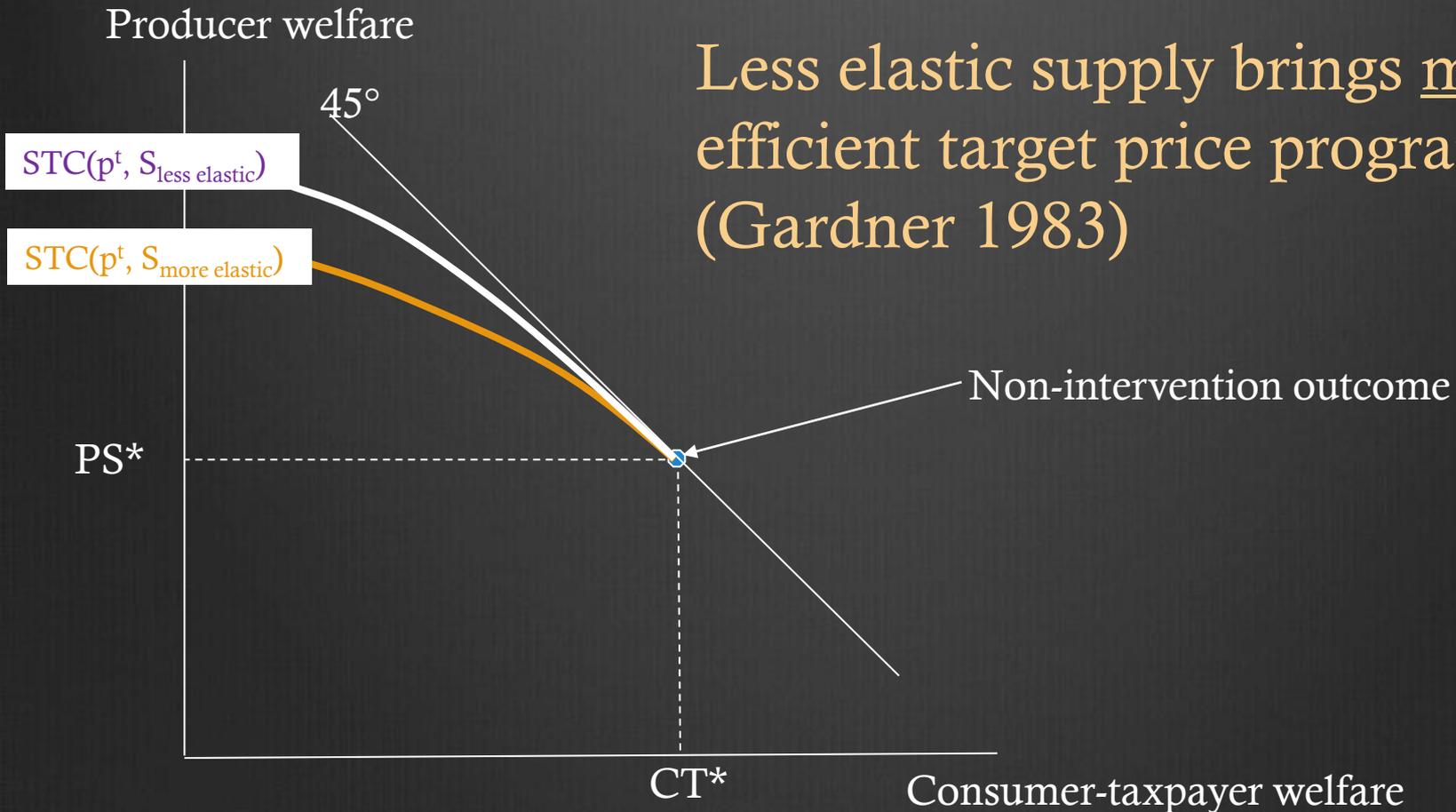
Think of the effects of a supply elasticity on the “costs” of a target price program:



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)



# 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.

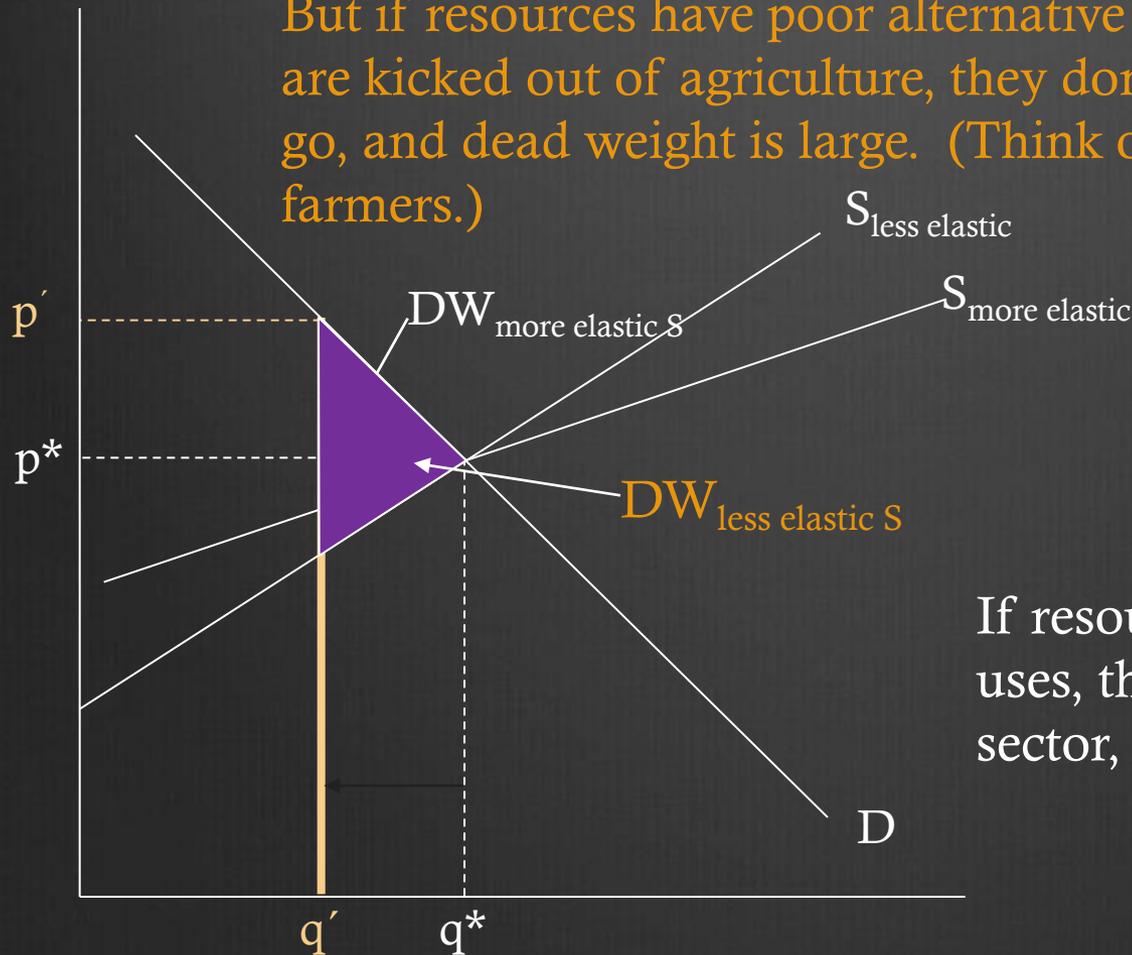
# The EU learned this the hard way

- ⊙ 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.



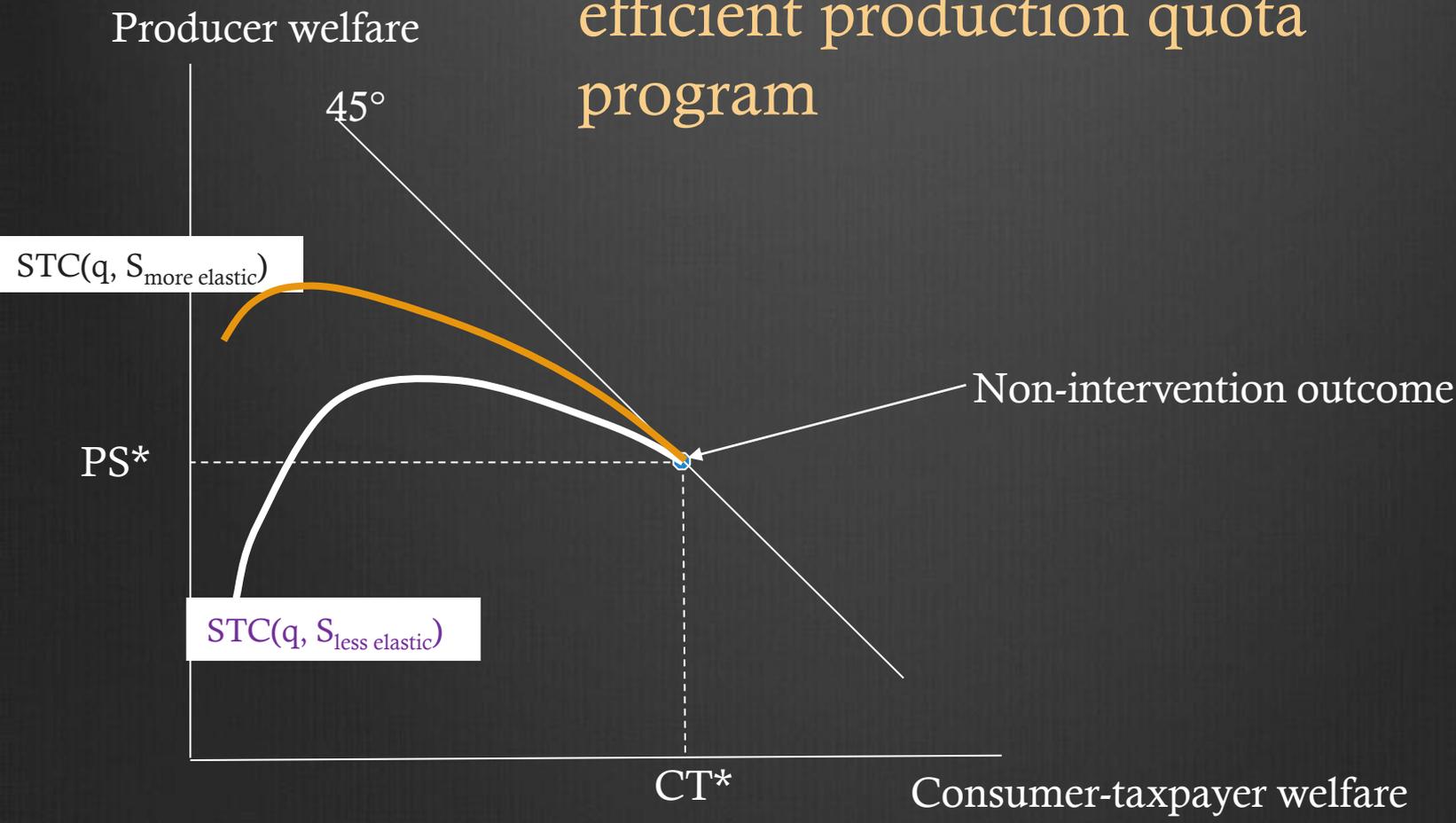
Wallace (1962) recognized that the elasticity of supply has just the opposite effect on the efficiency of a production quota...

But if resources have poor alternative uses, Then when they 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.)

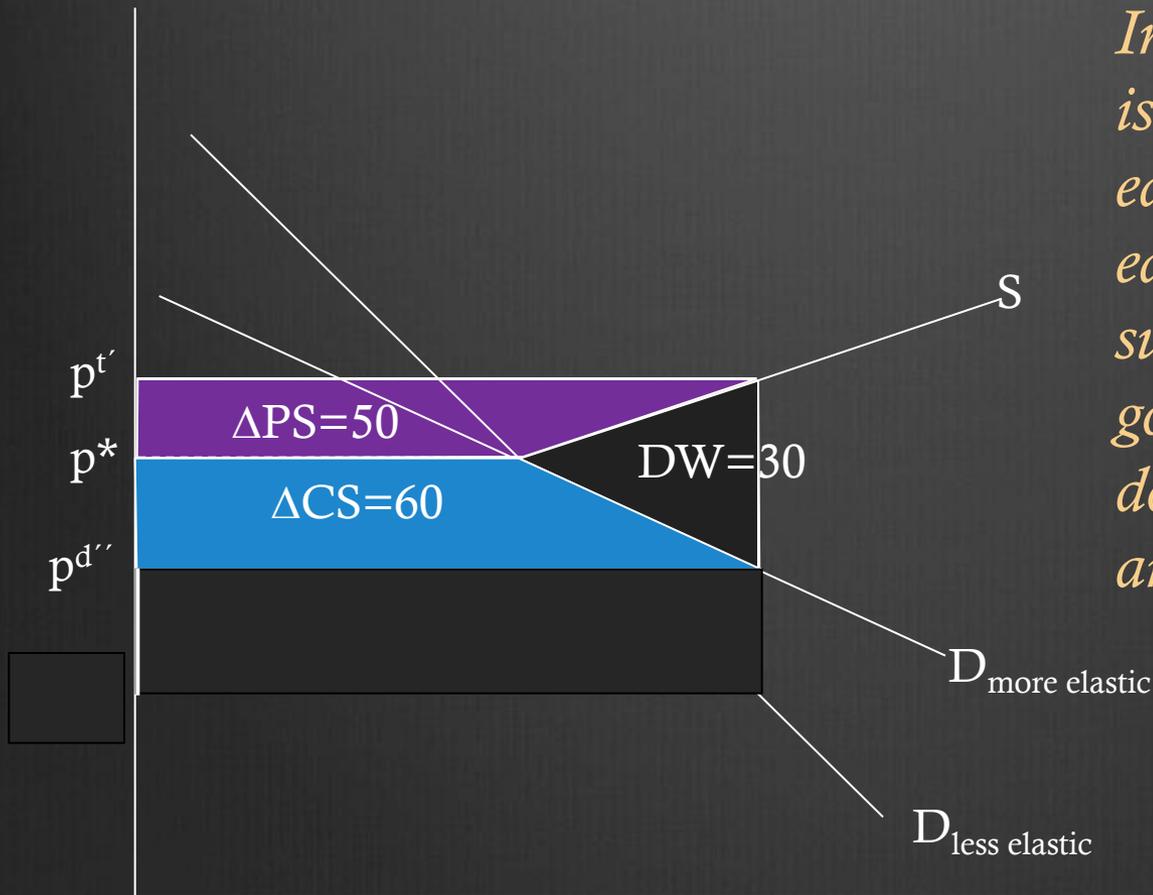


If resources have good alternative uses, they can easily leave the sector, and dead weight is small.

# Less elastic supply brings less efficient production quota program

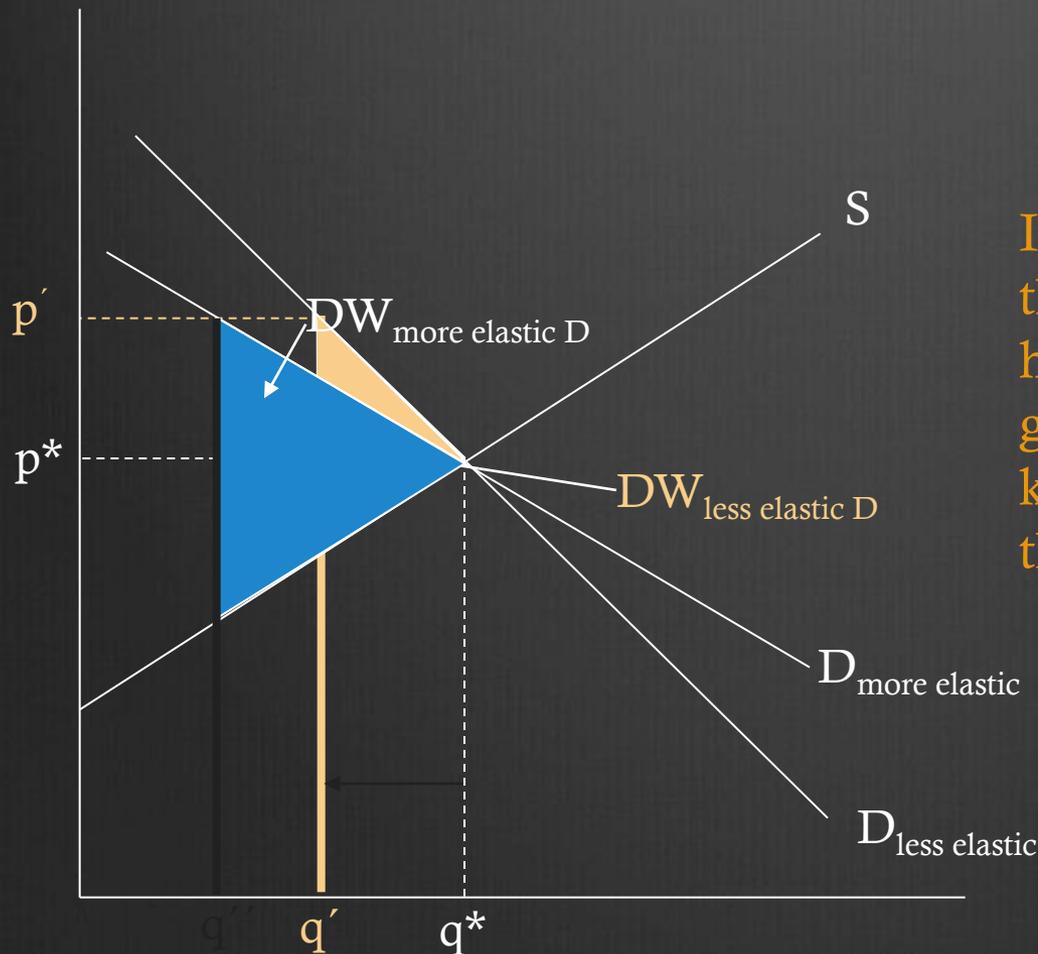


And when demand becomes more elastic, transferring the same amount of income to producers with a subsidy requires taking less away from consumers-taxpayers:



*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.*

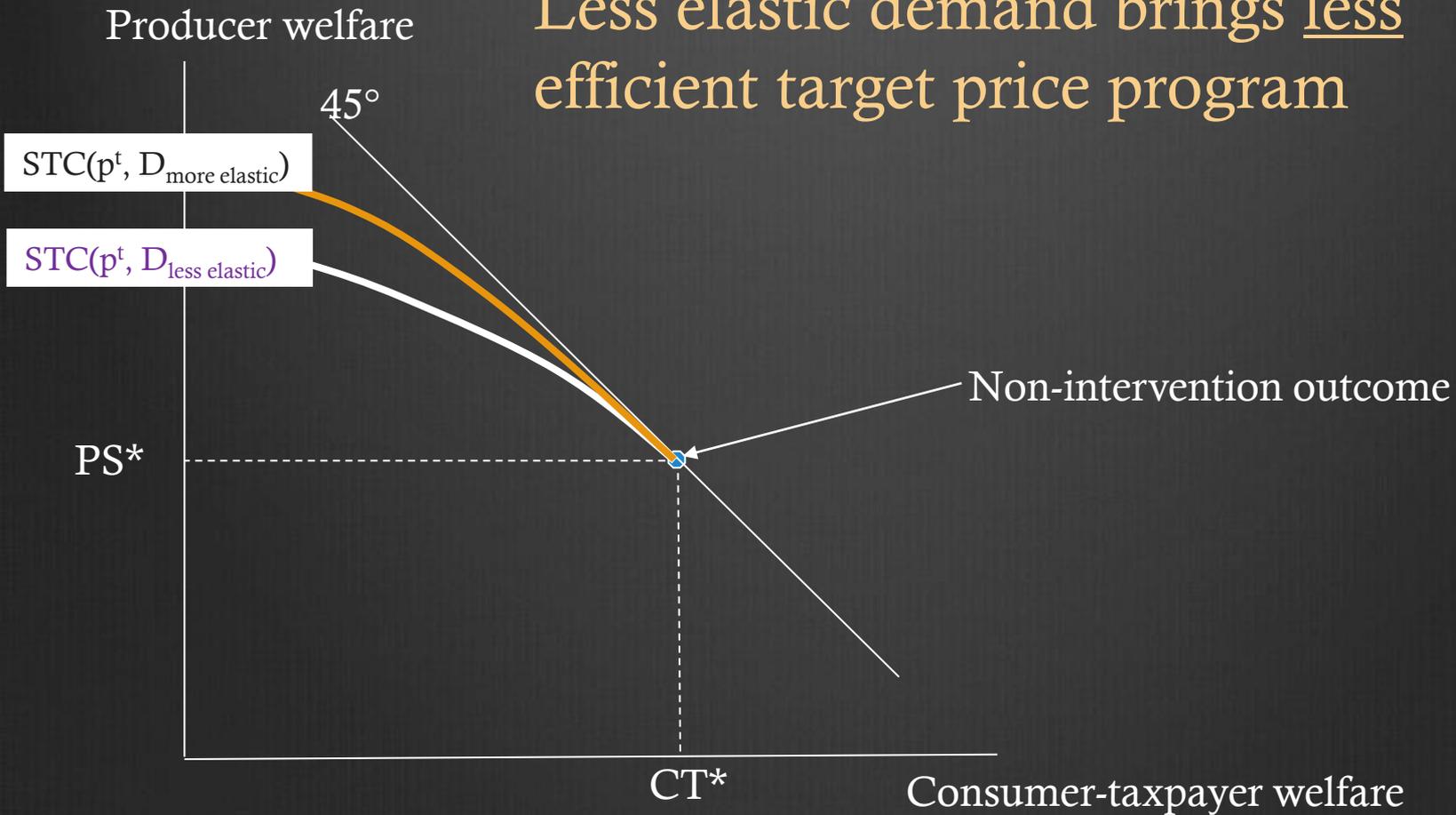
But the elasticity of demand has just the opposite effect on the efficiency of a production quota...



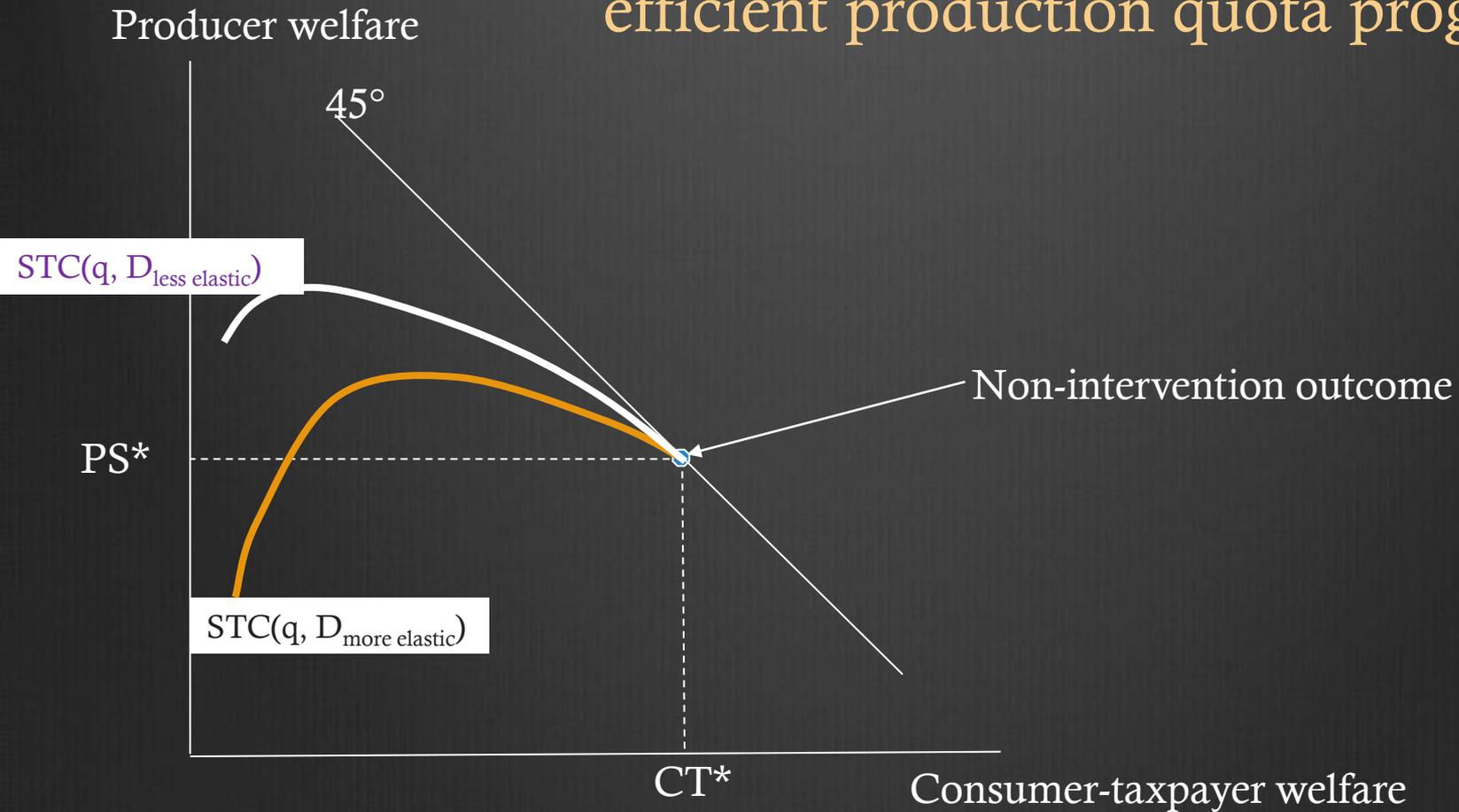
If there are good substitutes, then the production quota will have to be very strict to get the good's price up much. End up kicking lots of resources out of the sector.

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



$$\uparrow |h^d| \Rightarrow \begin{cases} \downarrow \text{ prdn subsidy efficiency} \\ \uparrow \text{ prdn quota efficiency} \end{cases}$$

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)

↑ DW → ↓ Subsidy

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



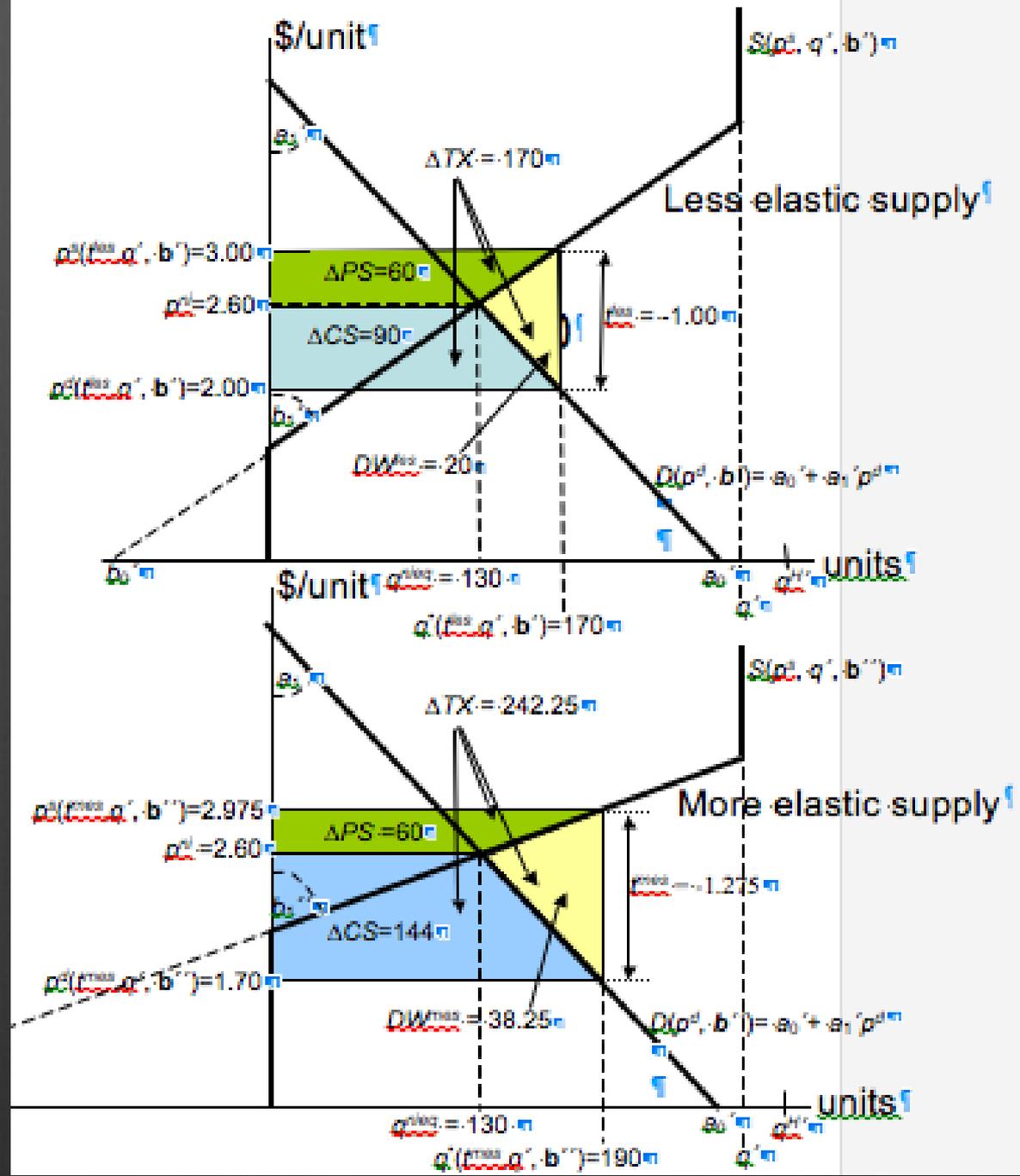
Grossman and Helpman (1994)  
made similar remarks in regard  
to trade policy:

*... 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



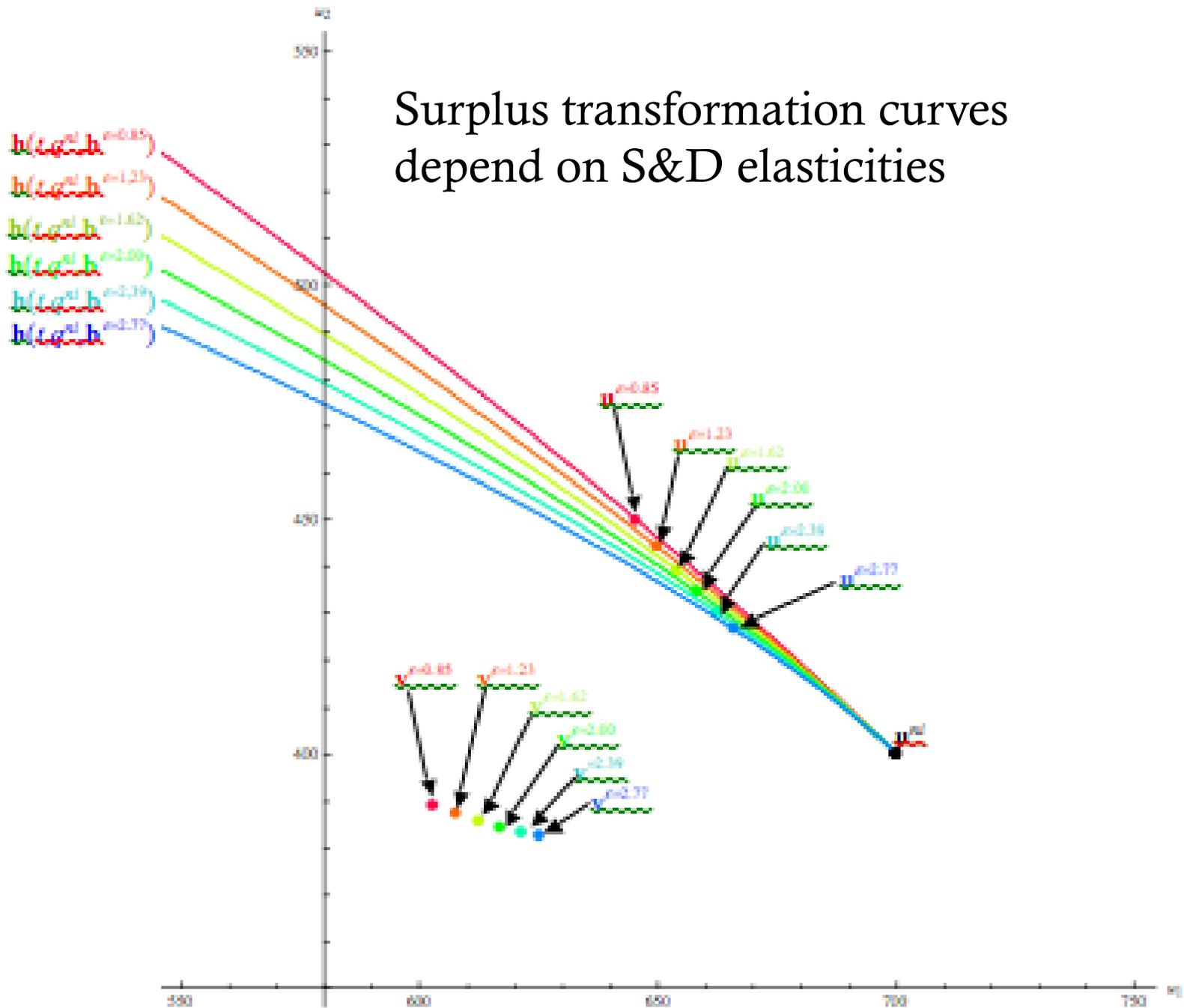
# Utilities of farmers and consumers/taxpayers :

$$\mathbf{h}(t, q^n, \mathbf{b}) = (u_{CT}(t, q, \mathbf{b}), u_F(t, q, \mathbf{b}))$$

Diagram illustrating the utility functions for consumers/taxpayers ( $u_{CT}$ ) and farmers ( $u_F$ ), showing the influence of instruments and elasticities:

- elasticities** (indicated by a downward arrow) influence the quantity  $q$ .
- Subsidy instrument** (indicated by an upward arrow) influences the consumer utility  $u_{CT}$ .
- Production quota instrument** (indicated by an upward arrow) influences the quantity  $q$ .

Surplus transformation curves depend on S&D elasticities



“Size of government” depends  
on political expenditures:

$$I(x_{CT}, x_F)$$

Consumer/taxpayers' political expenditures

Farmers' political expenditures

The diagram illustrates the function  $I(x_{CT}, x_F)$ . Two arrows point upwards from the labels below to the variables  $x_{CT}$  and  $x_F$  in the function. The label "Consumer/taxpayers' political expenditures" is positioned below  $x_{CT}$ , and "Farmers' political expenditures" is positioned below  $x_F$ .

The groups' play a Nash game  
in political expenditures.  
Payoff depends on policy  
instrument levels.

Equilibrium subsidy depends  
on the parameters of the  
model:

Political parameters

$$t^e(\mathbf{b}, \mathbf{k})$$

Supply and demand parameters

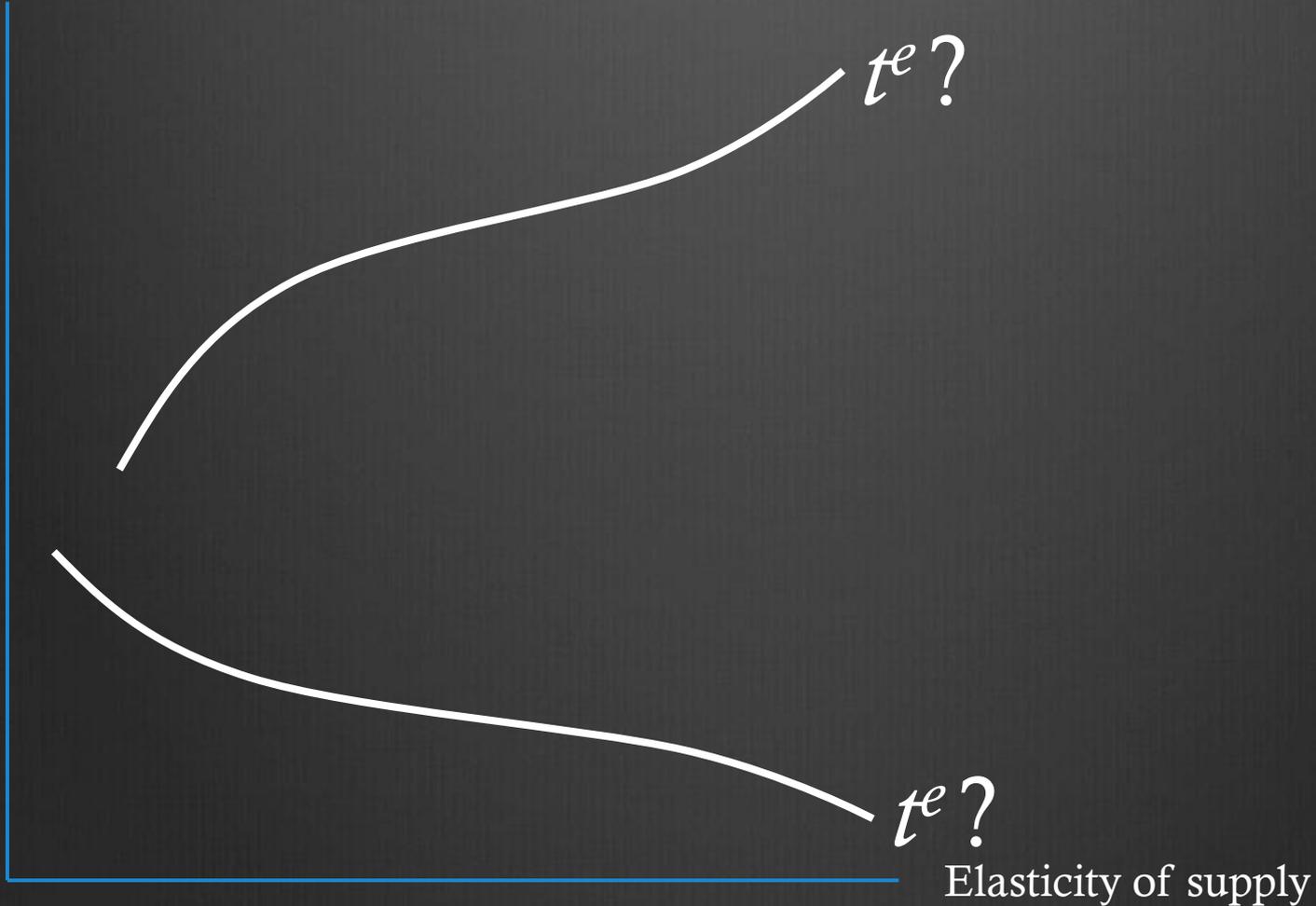
The central questions:

What is  $\nabla_{\mathbf{b}} t^e(\mathbf{b}, \mathbf{k})$ ?

That is, how does equilibrium policy change when elasticities change?

# Which one?:

Equilibrium per-unit subsidy



What is  $\nabla_{\mathbf{b}} \mathbf{u}^e(\mathbf{b}, \mathbf{k})$ ?

That is, how does equilibrium welfare change when elasticities change?

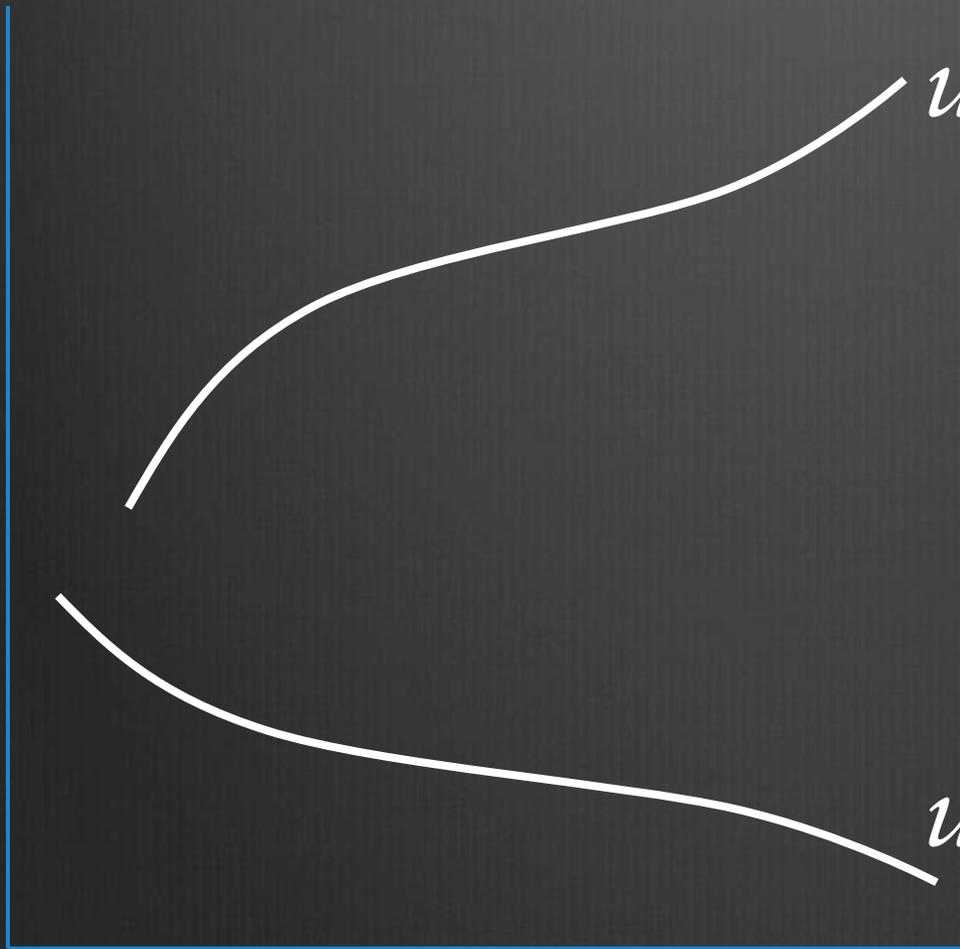
# Which one?:

utility

$u_1^e?$

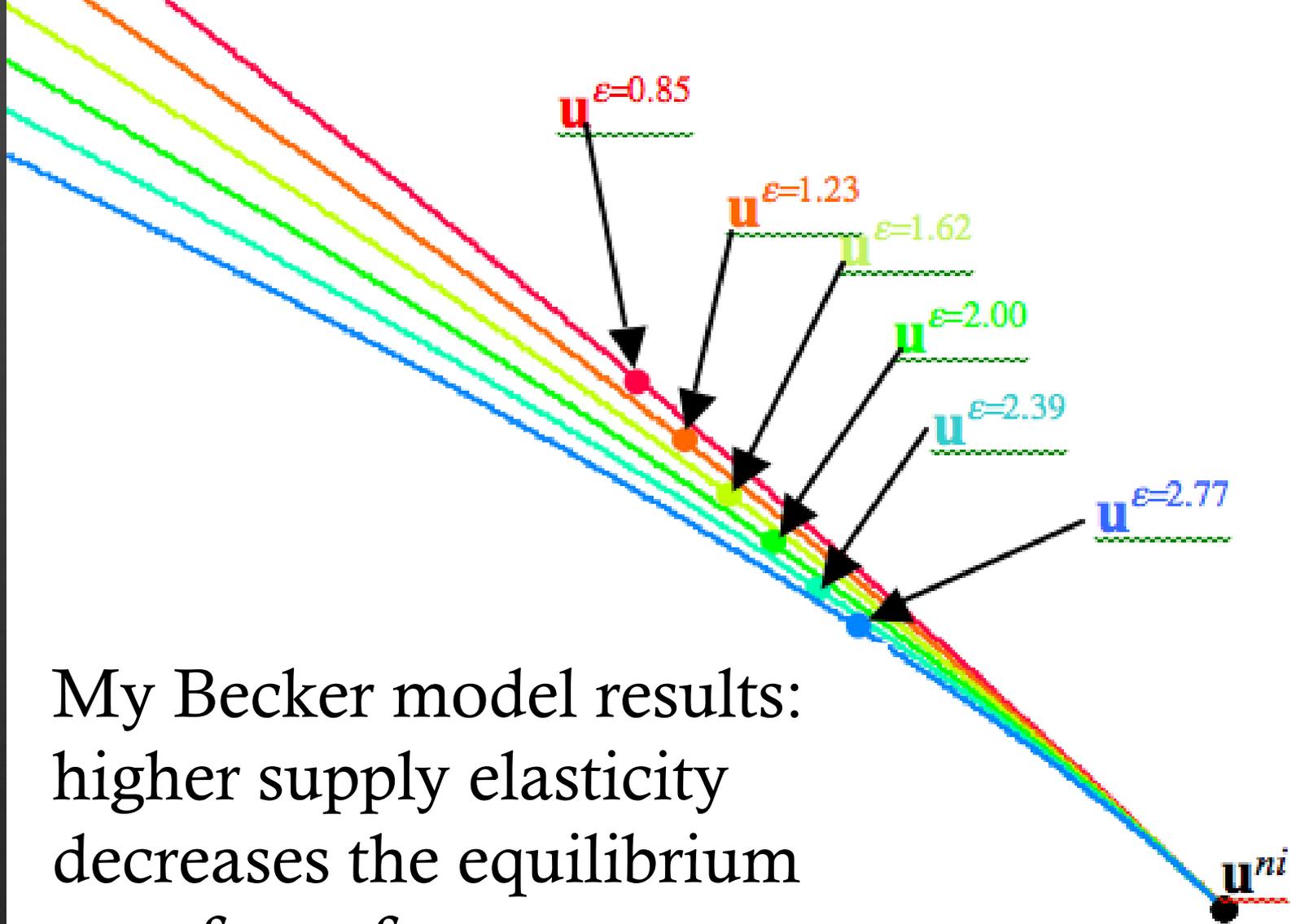
$u_2^e?$

Elasticity of supply



Theory provides testable hypotheses about why various nations use various distortive policies.

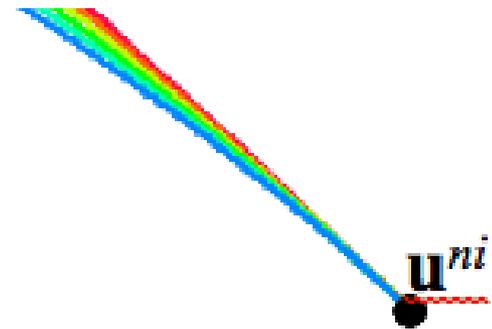
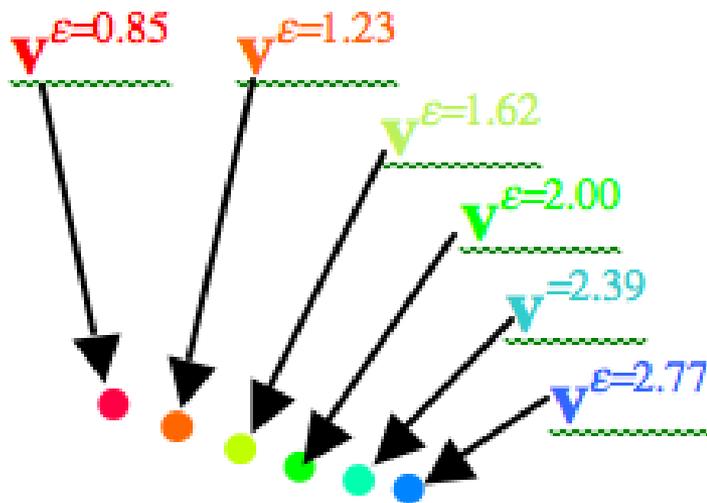
Empirical research that does  
this kind of thing with the  
Grossman and Helpman  
(1994) model exists.



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.)

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Some quick geometry of the Nash outcome of Becker model:

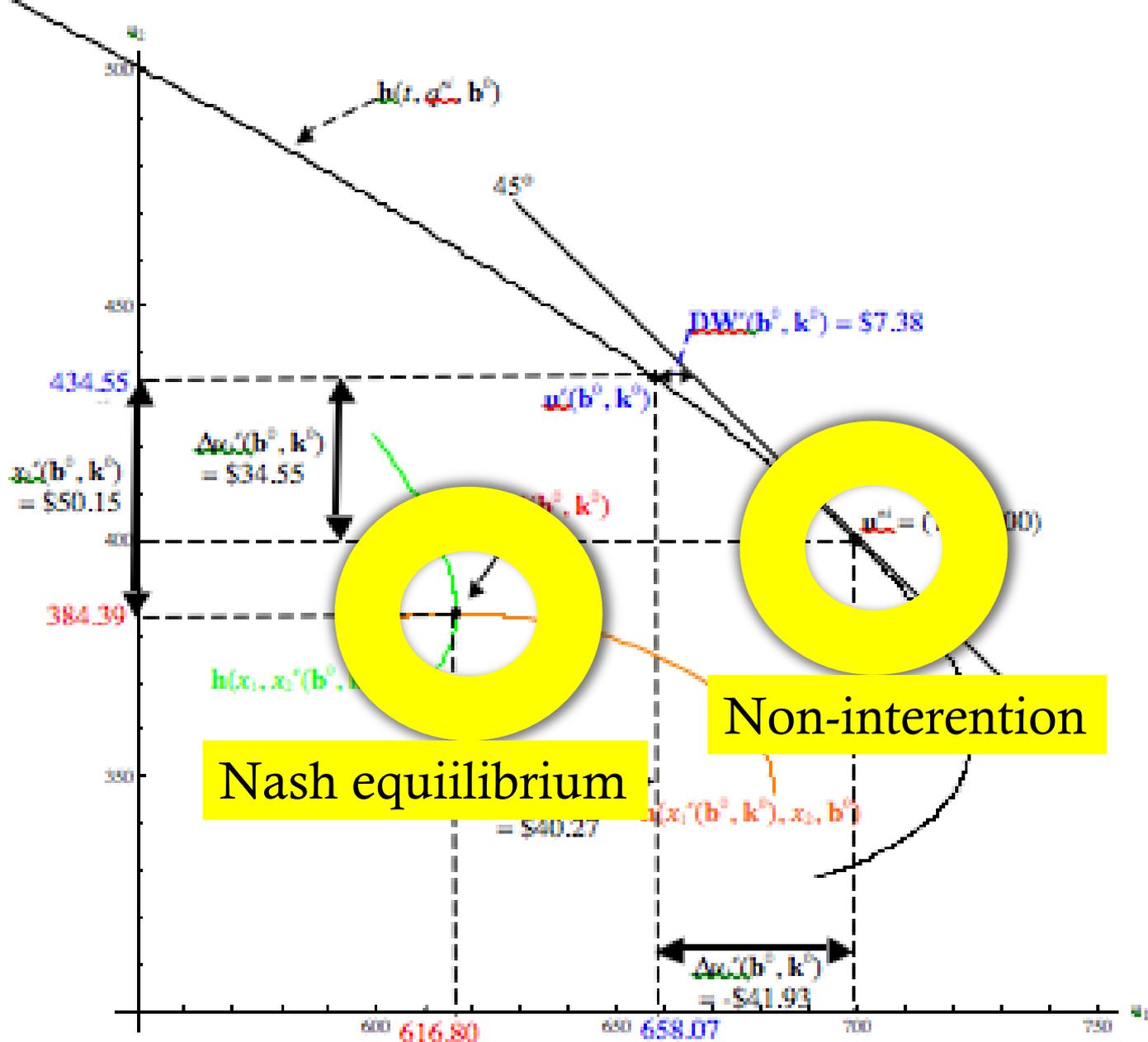
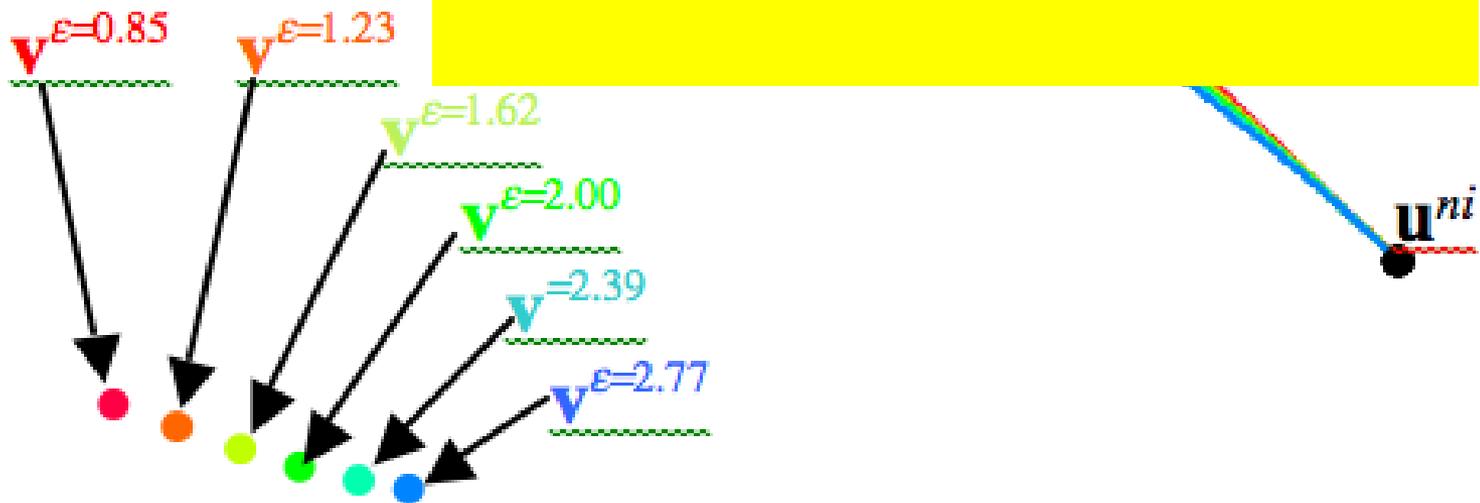


Figure 3. Nash equilibrium in the baseline Becker model of a production tax/subsidy.

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:

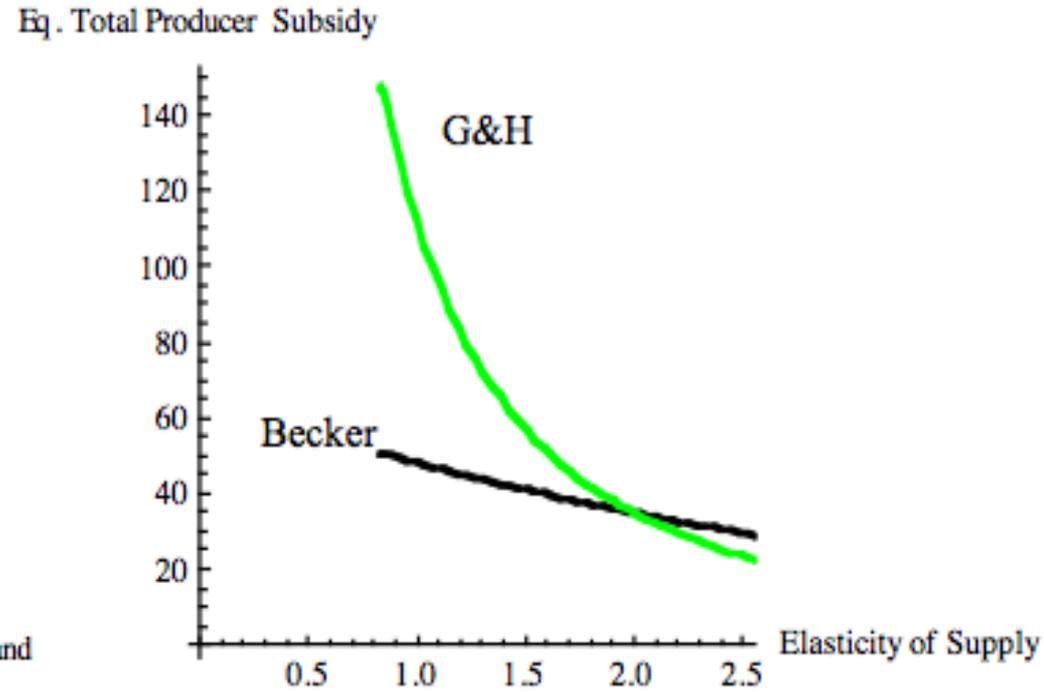
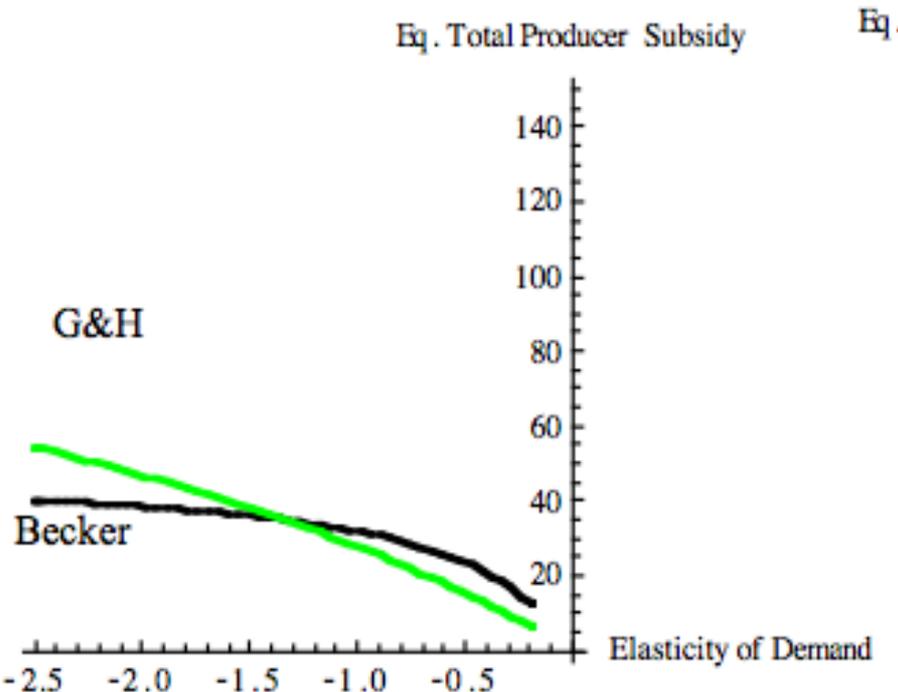
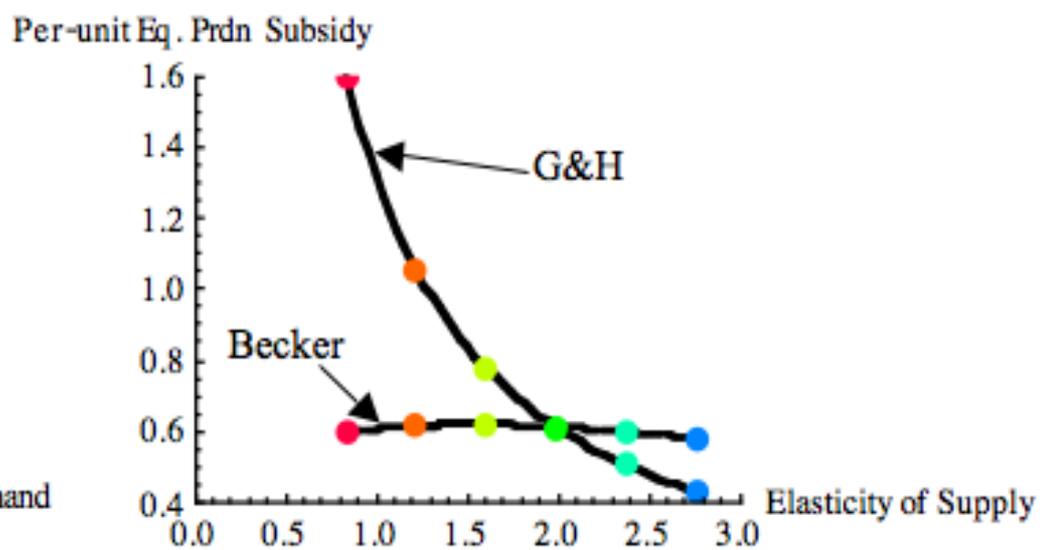
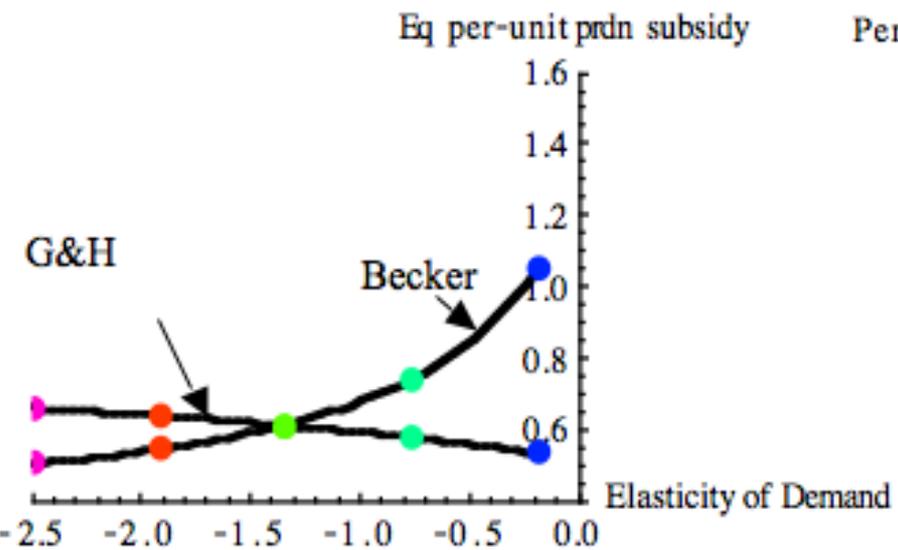


Table 1. The effects of elasticity changes on total subsidization and per-unit subsidization in the equilibria of two models of political economy

Elasticity change	Effect on the efficiency of redistribution from consumer/taxpayers to producers	Becker Model		G&H Model	
		Total subsidy	Per-unit subsidy	Total subsidy	Per-unit subsidy
Supply more elastic	Less efficient	Smaller	Ambiguous — depends on the initial value of the elasticity	Smaller	Smaller
Demand more elastic	More efficient	Larger	Smaller	Larger	Larger

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*.