Patriotic consumers and the political economics of agricultural trade

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Abstract

It is well documented that consumers tend to be patriotic in their choices of food. This paper theoretically examines the consequences of such patriotic behavior for agricultural policy, assuming that the policy is decided by the median voter. The analysis is conducted in the framework of a small open economy, with a ricardian production structure. Consumers differ with respect to how much extra they are prepared to pay for a domestically produced agricultural good. The indirect utility functions are used to find the specific values of tariffs and agricultural subsidies that the various households prefer. For the tariff we find that only the group that buys the domestically produced agricultural good will favor a strictly positive tariff. This tariff is higher the more disadvantage the country has in agricultural production. It is more likely that this group is a majority of the population if this country has a high productivity in the agricultural sector and if the patriotic parameter is large.

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JEL classification: Q17, Q18.

1 Introduction

Activities to influence agricultural policy is to a large extent carried out by producers and only to a smaller degree by consumers. The explanation for this is that is much easier for producers to form a pressure group, because relatively few agents are involved. As a consequence, the theoretical literature on the political economics of agricultural trade has been rather producer oriented. (See for example Swinnen (1994) and de Gorter and Swinnen (2002).)

Although the consumers, because of their vast number, are difficult to unite into active special interest groups, they certainly have an influence on the markets for agricultural goods, and probably also on agricultural policy.

For example, it is well documented that consumers tend to be patriotic in their choices of food. (See for example Pecher and Tregear (2000).) In this paper, we theoretically examine the consequences of such patriotic behavior for agricultural policy, assuming that the policy is decided by the median voter.

We conduct our analysis in the framework of a small open economy, with a ricardian production structure. Consumers differ with respect to how much extra they are prepared to pay for a domestically produced agricultural good. The indirect utility functions are used to find the specific values of tariffs and agricultural subsidies that the various households prefer. We assume that the median voter decides about the levels of these policy instruments.

For the tariff we find that only the group that buys the domestically produced agricultural good will favor a strictly positive tariff. This tariff is higher the more disadvantage the country has in agricultural production. It is more likely that this group is a majority of the population if this country has a high productivity in the agricultural sector and if the patriotic parameter is large.

In Section 2 the basic model is laid out and some central mechanisms are pointed out. In section 3 the political equililibria are analyzed and related to the social optimum. The two policy instruments, subsidy and tariff, are analyzed separately.

2 The Model

2.1 Households

Households consume an industrial good, denoted by x, and an agricultural product, which is denoted by a_I if the good is imported and by a_D if it is domestically produced. There is a continuum of consumers of unit mass uniformly distributed on the unit interval. The utility function of consumer j is

$$U^j = x + \alpha \ln \left[a_I + (1 + \beta j) a_D \right], \qquad j \in [0, 1]. \tag{1}$$

The two agricultural goods are thus perfect substitutes, with the qualification that the factor $(1 + \beta j)$ adds a 'patriotic premium' if the good is domestically produced. The higher it is, the more patriotic is the consumer. The household at $j = 0$ is not patriotic at all.[1]

The price of the industrial good is exogenously given by the world market and normalized to unity. Similarly, the price of the imported agricultural good is given by the world market and equals P^W. If the economy puts the tariff t on the import of this good, the effective price is $\tau = (1 + t)P^W$. By choice of units, we normalize P^W to unity. Consequently $\tau = (1 + t)$

[1] It would be more realistic to have many goods and let the degree of patriotism be captured by variations in the consumption bundles.

and $\tau = 1$ when the tariff is set to zero. Finally, the price of the domestic agricultural good is denoted by p and it is endogenous.

Looking first at the demand for the agricultural good, there is a household that is indifferent between choosing the domestic or the imported good. This means that the marginal rate of substitution of this household equals the the relative price: $(1+\beta j) = p/\tau$. We solve this, to define the indifferent household:

$$j* = \frac{p - \tau}{\beta\tau}. \tag{2}$$

Consumers with a j below this value will buy the imported good, while those with higher j:s will purchase the domestic agricultural output. The latter fraction of the population is larger if the domestic price is lower, the (effective) international price is higher or if the patriotic parameter is higher.

Net income is denoted by m. Households with $j < j*$ maximize $x + \alpha \ln(a_I)$, subject to the constraint $m = x + \tau a_I$, while those with $j \geq j*$ maximize $x + \alpha \ln((1+\beta j)a_D)$, subject to the constraint $m = x + pa_D$. The resulting demand functions are

$$a_I = \frac{\alpha}{\tau}, \qquad x = m - \alpha, \qquad j < j* \tag{3}$$

and

$$a_D = \frac{\alpha}{p}, \qquad x = m - \alpha, \qquad j \geq j* \, . \tag{4}$$

The demand functions are rather special, due to the choice of a quasi-linear utility function with a logarithmic term. However, they will be good enough to reveal some important mechanisms. At least, this formulation is consistent with the empirical regularity that agricultural output gets a declining share of income as it increases.

Finally, using capital letters for aggregate quantities, we get the demand functions by summing over all households in the two segments of the unit interval:

$$A_I^D = \frac{\alpha j*}{\tau}, \quad A_D^D = \frac{\alpha(1 - j*)}{p}, \quad X^D = m - \alpha. \tag{5}$$

We will assume that $m - \alpha > 0$, so that there is some positive consumption of the industrial good. An expression for m will be derived in equation (15) below.

2.2 Production

Each household supplies one unit of labor inelastically. Agricultural output per unit of labor is

$$a = \gamma, \tag{6}$$

where $\gamma < 1$ is a positive constant. Although this country is less productive in this sector, some patriotic consumers will buy the output here. In manufacturing, the output per worker is

$$x = 1. \tag{7}$$

This makes the price of this good equal to the world market price. Thus both goods will be produced in this economy.

The profit functions of the two sectors are $\pi_a = p(1+s)\gamma l_a - wl_a$ and $\pi_x = l_x - wl_x$. Here l_a and l_x denote the quantities of labor used in agriculture and manufacturing, w is the wage and s is a subsidy on agricultural output. The profit maximization conditions $p(1+s)\gamma - w = 0$ and $1 - w = 0$ imply that the wage equals unity and that the price is given by

$$p(1+s)\gamma = 1, \tag{8}$$

Only if this equality holds, will workers be indifferent between working in the two sectors. The gross income of every individual is thus equal to one.

Since everyone earns equally much in both sectors, the allocation of labor is entirely determined by the demand for the domestic agricultural good. Although everyone is willing to work in any sector, we introduce a certain (endogenous) $\widehat{j}$ and assume that all persons that work in manufacturing are collected to the left of this point of the unit interval. Households with $j \geq \widehat{j}$ produce the agricultural good. Using the production functions in (6) and (7) and summing over the two segments of the unit interval, we have the aggregate supplies:

$$X^S = \widehat{j} \tag{9}$$

and

$$A_D^S = (1 - \widehat{j})\gamma. \tag{10}$$

Note that we only have domestic supply of the agricultural product here. The imported agricultural supply is horizontal at the price level τ. We are now prepared for an examination of the equilibrium of the model.

2.3 Equilibrium

The equilibrium is recursive, in the sense that we can use (8) to determine one of the endogenous variables directly:

$$p = \frac{1}{(1+s)\gamma} \tag{11}$$

Recall that this price is obtained from the labor market-clearing condition, implying equality of earnings in the two sectors. Therefore, if the subsidy or the productivity of agriculture would increase, the price has to decline. Otherwise, the entire labor force would prefer to work in the agricultural sector. And this would not be an equilibrium, because there is not enough of patriotic demand for such a large quantity.

Using (11) to eliminate p from (2), we have

$$j* = \frac{1 - \tau(1+s)\gamma}{\beta\tau(1+s)\gamma} \tag{12}$$

If any of the parameters increases, $j*$ becomes lower, i.e. the share of the population that chooses the domestic agricultural good expands. It is of course entirely expected that this happens if there is a higher tariff, subsidy or productivity in agriculture, or if consumers are more patriotic.

Since $p > \tau$ for every interior solution of (2), there is no export of the domestic agricultural output. Therefore, there is equilibrium between supply and demand on this good. Using (2) and (11) to eliminate $j*$ and p from A_D^D in (5), and putting the result equal to aggregate supply in (10), the equilibrium condition is

$$\widehat{j} = 1 - \frac{\alpha\tau(1+s)\gamma(1+\beta) - \alpha}{\beta\tau\gamma} \tag{13}$$

The value of $\widehat{j}$ changes in the same direction as $j*$ when there are variations in the exogenous parameters. This of course mirrors the fact that the supply of the domestic agricultural good moves in the same direction as the demand.

The government receives a revenue from tariffs equal to tA_I^D and pays out the sum spA_D^D on subsidies. To balance its budget, it imposes a lump-sum tax or transfer, equal to η, on each household. Using the aggregate demand function in (5), the government's budget constraint is thus

$$s\alpha(1-j*) - t\frac{\alpha}{\tau}j* = \eta. \tag{14}$$

The policy parameters that the government choose here are s and t. Any variations in them of course have consequences for $j*$. The lump sum tax (or transfer) adjusts accordingly.

Since the gross income equals $w = 1$, the net income of each household now is $m = 1 - \eta$. Using (12) and (14):

$$m = 1 + \alpha\left(s + \frac{t}{\tau}\right)\frac{1 - \tau(1+s)\gamma}{\beta\tau(1+s)\gamma} - s\alpha. \tag{15}$$

3 Welfare and Political Equilibrium

To analyze welfare and the political equilibrium, we now formulate the indirect utility functions and the social welfare function. The indirect utility of a household depends on whether its j is above or below $j*$. Thus, using the demand functions (3) and (4) in (1) we get

$$V_I^j = m - \alpha + \alpha\ln(\alpha/\tau), \qquad j < j* \tag{16}$$

for those who buy the imported agricultural good and

$$V_D^j = m - \alpha + \alpha \ln((1+\beta j)(\alpha/p)), \qquad j \geq j*, \tag{17}$$

for those who buy the domestic agricultural good. To obtain the social welfare function, we sum these functions over the entire population:

$$W = \int_0^{j*} V_I^j + \int_{j*}^1 V_D^j = m - \alpha + \alpha \ln \alpha - j*\alpha \ln \tau - (1-j*)\alpha \ln p + \alpha \int_{j*}^1 \ln(1+\beta j) dj. \tag{18}$$

Since an analysis of the political equilibrium is difficult when the political decision is multidimensional, we examine one policy instrument at a time, putting the other equal to zero.

3.1 Tariff

Starting with tariffs, we thus put $s = 0$ and $t \geq 0$. Consequently, (12) and (15) are reduced to

$$j* = \frac{1-\tau\gamma}{\beta\tau\gamma} \quad \text{and} \quad m = 1 + \alpha \frac{t}{\tau} j*.$$

The derivatives of these expressions will appear repeatedly below, so we state them here (recall that $\tau = 1 + t$):

$$\frac{\partial j*}{\partial t} = -\frac{1}{\beta\tau^2\gamma} < 0 \quad \text{and} \quad \frac{\partial m}{\partial t} = \frac{\alpha}{\beta\tau^3\gamma}(1 - \tau\gamma - t)$$

We thus find that a higher tariff makes more consumers choose the domestic agricultural good, because the imported good gets a higher effective price. A higher tariff also increases the governmental revenues (which are transferred directly to households) at low tariff levels, whereas the revenues decrease at high levels of tariffs, because the effects of the decreasing $j*$ dominates.

To see how social welfare is affected by a change of the tariff, we differentiate (18) with respect to t:

$$\frac{\partial W}{\partial t} = \frac{\partial m}{\partial t} - \frac{\partial j*}{\partial t}\alpha \ln \tau - j*\frac{\alpha}{\tau} + \frac{\partial j*}{\partial t}\alpha \ln p - \alpha \ln(1+\beta j*)\frac{\partial j*}{\partial t}.$$

By equation (2), $\ln p - \ln \tau = \ln(1+\beta j*)$. Therefore this expression simplifies to

$$\frac{\partial W}{\partial t} = \frac{\partial m}{\partial t} - j*\frac{\alpha}{\tau} = \frac{\alpha}{\beta\tau^3\gamma} t(t - (1-\gamma)). \tag{19}$$

The derivative is equal to zero at $t = 0$ and at $t = 1-\gamma$. The former is a local maximum, while the latter is a minimum, since the derivative is negative between 0 and $1-\gamma$ and positive for $t > 1-\gamma$. We must therefore ask whether a very high tariff may imply a higher welfare than a zero tariff. The highest interesting value of t is $t = (1-\gamma)/\gamma$, because $j*$ becomes negative at higher higher values. The question is therefore whether welfare is highest at $t = 0$ or at $t = (1-\gamma)/\gamma$. Noting that these points are equivalent to $\tau = 1$ and $\tau = 1/\gamma$, respectively, we evaluate the welfare function at these two values and compute the following difference in the appendix:

$$\Delta W = W(\tau = 1) - W(\tau = 1/\gamma) = \frac{\alpha}{\beta}\left[\frac{1-\gamma}{\gamma} + \ln\gamma\right]$$

A first implication of this is that $\Delta W = 0$ when $\gamma = 1$. Both policies then imply the same welfare, because the agricultural good will have a price and marginal cost equal to unity in both cases. (In fact, $\tau = 1$ in both cases.) However, we are more interested in the case when our economy has a disadvantage in agricultural production, i.e. $\gamma < 1$. We therefore note that, when γ decreases from unity, the value of ΔW increases.[2] Consequently, we have that $\Delta W > 0$ for $\gamma < 1$, which implies that welfare is maximized when $\tau = 1$, i.e. when the tariff is equal to zero. This of course expected: zero policy intervention is socially optimal.

Turning to the political outcome, we maximize the indirect utility functions with respect to t. Starting with the consumers that choose the imported good, we have

$$\frac{\partial V_I^j}{\partial t} = \frac{\partial m}{\partial t} - \frac{\alpha}{\tau} = \frac{-\alpha}{\beta\tau^3\gamma}(\beta\gamma t^2 + (1+\gamma+2\beta\gamma)t + \gamma(1+\beta) - 1) \tag{20}$$

This derivative is negative for all $t \geq 0$ if $\gamma(1+\beta) > 1$. We assume that this holds.[3] Therefore this group of voters prefers to put the tariff as low as possible, i.e. at $t = 0$. The interpretation is that the positive effect of an increasing transfer is dominated by the negative effect of the rising price of the agricultural good, when t increases. This is not surprising, since a part of what this group pays in tariff is transferred to the other group.

Turning to the other group, we note that a change in the tariff only affects the net income:

$$\frac{\partial V_D^j}{\partial t} = \frac{\partial m}{\partial t} = \frac{\alpha}{\beta\tau^3\gamma}(1 - \tau\gamma - t). \tag{21}$$

[2] The derivative

$$\frac{d(\Delta W)}{d\gamma} = \frac{\alpha}{\beta\gamma^2}(\gamma - 1)$$

is negative for $\gamma < 1$.

[3] If $\gamma(1+\beta) < 1$, there is an optimal $t > 0$, obtained by putting the derivative equal to zero and solving for

$$t_{1,2} = \frac{-(1+\gamma+2\beta\gamma) \pm \sqrt{(1+\gamma+2\beta\gamma)^2 - [\gamma(1+\beta)-1]4\beta\gamma}}{2\beta\gamma}.$$

This derivative is positive at $t = 0$ (because $\gamma < 1$) and directly to the right of this point. It equals zero at $t = (1-\gamma)/(1+\gamma)$ and is negative for higher values of t. The function is thus quasi-concave in t and has a maximum at

$$t = \frac{1-\gamma}{1+\gamma}.$$

Households consuming the domestic agricultural good, benefit from the increasing tariff, up to the point where the transfer is maximized. It therefore prefers this strictly positive tariff level.

Let us sum up the result on the political equilibrium. There are just two possible tariff levels, and which one is chosen depends entirely on which group is the largest. If $j* > 1/2$ then the median voter buys the imported good and chooses $t = 0$. If $j* < 1/2$ then the median voter buys the domestic good and chooses a tariff equal to $t = (1-\gamma)/(1+\gamma)$.

How plausible is it that the median voter is a person who favors the strictly positive tariff? To answer this question, we compute $j*$ for this tariff, which is equivalent to $\tau = 2/(1+\gamma)$. The result is

$$j* = \frac{1}{2}\frac{1-\gamma}{\beta\gamma}.$$

We therefore have the condition

$$j* < \frac{1}{2} \quad \Leftrightarrow \quad \frac{1}{\gamma} < (1+\beta).$$

[This is also the condition for $\frac{\partial V_I^j}{\partial t} < 0 \quad \forall t$.] That is, consumers buying the domestically produced agricultural output will be a majority of the population if the productivity parameter of this sector and the patriotic term jointly are high enough. If γ is high (close to unity), however, t is close to zero, which means that the difference between the political equilibrium and the social optimum is small. A high patriotic parameter does not reinforce the distortion, since it does not influence the chosen tariff.

3.2 Subsidy

We now put focus on the other policy parameter, i.e. the subsidy. Thus we examine the case in which $t = 0$ and $s \geq 0$. Therefore (12) and (15) boil down to

$$j* = \frac{1-(1+s)\gamma}{\beta(1+s)\gamma} \quad \text{and} \quad m = 1 - s\alpha(1-j*)$$

The analysis will include the effects of changes in s and we will frequently use the following two derivatives:

$$\frac{\partial j*}{\partial s} = -\frac{1}{\beta(1+s)^2\gamma} < 0 \quad \text{and} \quad \frac{\partial m}{\partial s} = -\frac{\alpha}{\beta(1+s)^2\gamma}((1+\beta)(1+s)^2\gamma - 1) < 0$$

In relation to $j*$, the subsidy plays a role that is very similar to the role of the tariff in the previous section: by increasing it, the consumer price of the domestic agricultural output gets lower. Therefore, more consumers buy this good, i.e. $j*$ gets lower. The subsidy implies a reduction of net income, which is unambiguously reduced when the subsidy level gets higher.

The socially optimal subsidy is obtained by maximizing W with respect to s. Again we use the implication from (2), that $\ln p - \ln \tau = \ln(1 + \beta j*)$, which eliminates three terms. The remaining expression is

$$\frac{\partial W}{\partial s} = \frac{\partial m}{\partial s} - (1 - j*)\frac{\alpha}{p}\frac{\partial p}{\partial s} = -\frac{\alpha(1+\beta)s}{\beta(1+s)} < 0. \tag{22}$$

Increasing the tariff unambiguously decreases welfare, as expected. The socially optimal tariff is thus $s = 0$.

To be able to say something about the political equilibrium, we differentiate the indirect utility function with respect to s. First,

$$\frac{\partial V_I^j}{\partial s} = \frac{\partial m}{\partial s} = -\frac{\alpha}{\beta(1+s)^2\gamma}((1+\beta)(1+s)^2\gamma - 1) < 0. \tag{23}$$

For this group the effect of a higher subsidy is merely a higher tax and therefore a lower net income. They therefore vote for the lowest possible tariff, i.e. $s = 0$.

To find the preferred subsidy level of the other group, we compute the derivative

$$\frac{\partial V_D^j}{\partial s} = \frac{\partial m}{\partial s} - \frac{\alpha}{p}\frac{\partial p}{\partial s} = \frac{\alpha}{\beta(1+s)^2\gamma}(1 - \gamma(1+s)(s(1+\beta)+1)). \tag{24}$$

The terms are of opposite signs; this group benefits from a lower price but suffers from a higher tax, when s increases. The derivative is monotonously decreasing in s and the question is whether it is positive before it eventually turns negative. It turns out that it is positive at $s = 0$ if $\gamma < 1$, which we have assumed.

The function V_D^j is thus quasi-concave. The optimal s is found by putting the derivative equal to zero. This yields a second-order equation[4] with the solutions

$$s_{1,2} = \frac{-(2+\beta) \pm \sqrt{(2+\beta)^2 + [1-\gamma]\gamma^{-1}4(1+\beta)}}{2(1+\beta)}.$$

The positive root is declining in γ, converging to zero as γ approaches unity. Thus, the less productive the agricultural sector is, the more do the consumers that are patriotic enough to buy it want to protect it.

[4] $(1+\beta)s^2 + (2+\beta)s - (1-\gamma)\gamma^{-1} = 0$

4 Conclusions

(To be written.)

5 Appendix

The values of the welfare function at the two endpoints are

$$W(\tau = 1/\gamma) = 1 - \alpha + \alpha \ln \alpha + \alpha \ln \gamma + \alpha \int_0^1 \ln(1 + \beta j) dj$$

(where $j* = 0$) and

$$W(\tau = 1) = 1 - \alpha + \alpha \ln \alpha + (1 - j*)\alpha \ln \gamma + \alpha \int_{j*}^1 \ln(1 + \beta j) dj,$$

where $j* = (1 - \gamma)/(\beta\gamma)$. The difference is

$$\Delta W = W(\tau = 1) - W(\tau = 1/\gamma) = -j * \alpha \ln \gamma - \alpha \int_0^{j*} \ln(1 + \beta j) dj$$

Computing the integral, we find

$$\Delta W = \frac{\alpha}{\beta} \left[\beta j * (1 - \ln \gamma) - (1 + \beta j*) \ln(1 + \beta j*) \right]$$

Using the fact that $\ln \gamma = \ln(1 + \beta j*)$, this reduces to the expression in the main text.

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