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Manish Pandey
John Whalley

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ABSTRACT

We discuss how social considerations can affect the desirability of trade liberalization in a conventional small open economy model. We consider a representative family in which there are location specific network effects from interactions with other family members, such as joint consumption, joint emotional support, and coinsurance. The benefits an individual receives from the network they participate in are nonlinearly related to the number of family members located in urban and rural areas. Family members choose whether to locate in urban or rural areas and average and marginal network benefits differ. With differential network effects in urban and rural areas, in a model with traded urban and rural goods, free trade will no longer be the best policy. We show this through a numerical example, and suggest that the conventional economists case for free trade may need to be more nuanced once social considerations of this type are taken into account.

Manish Pandey
University of Winnipeg
manish_p54@hotmail.com

John Whalley
Department of Economics
Social Science Centre
University of Western Ontario
London, Ontario N6A 5C2 CANADA
and NBER
jwhalley@uwo.ca

1 Introduction

Economists base their advocacy of free trade in small open economy models on simple analytical structures in which Ricardian gains from comparative advantage are fully exploited under complete openness. While the literature provides many counter examples in the presence of such features as market structure, rent shifting, infant industries and others, little or no analytical work has explored how social considerations can influence the case for free trade. This is despite an extensive sociological literature, and anti-globalization protests based on social concerns.

Here we consider a simple formulation in which one set of social considerations is considered which influence the desirability of free trade in such models. We consider a two good world with separate urban and rural products both of which are traded, and with labor as the intersectorally mobile input. We consider migration decisions between sectors as determined not only by wage rate differences between sectors, but also by the value to individuals of their participation in location specific (urban-rural) networks. We have in mind a family structure in which there is value to individuals from their interactions with other family members in the locality (urban or rural) through joint consumption with other family members in the location, emotional support from family members, coinsurance, and other benefits.

While these benefits are hard to quantify, and in reality are considerably more complex than in our simple treatment, we show here how an analytical representation of their role can modify the conventional case for free trade. We consider a representative family in which there are separate urban and rural network benefits available to individual family members which depend on the number of family members who choose to reside in each location. The individual benefits from these two separate networks are nonlinearly related to the number of family members who locate in urban and rural areas, and average and marginal network benefits differ. We show through numerical simulation that with differential network effects from location in urban and rural areas, free trade will no longer be the best policy. The implication is that the conventional economists case for free trade may need to be more nuanced once social considerations are taken in to account.

Specifically, we first numerically solve a simple two good trade model in the absence of network benefits for an equilibrium using assumed parameter values with and without a tariff on the good produced in the urban sector (assumed imported). In this case, wages are equalized between the two sectors through migration of labor, and without network effects removal of the tariff is welfare improving. This is as in conventional trade analysis.

Using the same model parameterization, we then introduce network benefits and choose parameter values for the model such that the intensity of the network effect is set higher in the rural sector through parameter selection. The presence of differential network effects causes the wage rates in the urban and rural sectors to differ, and in the case we analyze, removal of the tariff on the urban good is welfare worsening. However, this is not a general result since the model implies that there will be an optimal tariff rate given any parameterization of network effects, and if the comparison is between an actual tariff rate and free trade and involves a tariff rate larger than the optimal tariff rate, then free trade may still dominate in any particular pair wise comparison. Optimal policy will only be free trade where network effects are symmetric across urban and rural areas. We also assume that other instruments, such as a tax on migrating labour, are not available.

The main point of the paper, therefore, is to argue that in the presence of differential network effects in urban and rural areas trade liberalization can be welfare worsening. The literature on consumption insurance in rural areas in low income countries provides some evidence for the existence of community ties in rural areas (see Townsend (1995), Fafchamp and Lund (2000)), and seemingly supports our analysis.

2 A Two Good Model with Network Effects

We consider a small open economy populated with N identical individuals, and with two sectors with separate products and regional identities and a defined social network operating in each. We assume rural (1) and urban (2) sectors, produce an agricultural good (1) and a manufactured good (2) respectively using labor (n) and a fixed factor in each sector. Each individual, for simplicity, owns one unit of labor. World prices for the two goods, p_{w1} and p_{w2}, are taken as given.

In the presence of a tariff on imports, domestic prices are given by $p_1 = p_{w1}$, if good 1 is exported and $p_2 = p_{w2}(1+\tau_2)$, if good 2 is imported (which is what we assume as the initial direction of trade).

The utility function for an individual who locates his/her labor in sector j we assume is of CES form, written as

$$U_j = \left(\lambda_j c_{j1}^{\rho} + (1-\lambda_j)\, c_{j2}^{\rho}\right)^{\frac{\theta_j}{\rho}} \left(n_j^{\mu_j}\right)^{1-\theta_j}, \quad (1)$$

where c_{ji} is consumption of good i $(=1,2)$ and n_j is the number of people in sector j.

This formulation reflects the feature that individuals derive utility not only from consumption of goods, but also from participation in the network in the region that they choose to live in. An individual decides where to locate by comparing the utility of locating , working and consuming in each of the two networks.

We assume, for simplicity, that the more people that are in the network the more preferrend the outcome, but this may not be the case in practice if there are conflicts between individuals or crowding/congestion effects. λ is the share parameter on the two consumption goods in the CES sub-utility function defined over goods. ρ determines the elasticity of substitution between the two goods. θ and μ are parameters which determine the strength of the network effects. In the absence of prior literature, we assume parameters for this network sub-function for each sector. θ_j is the constant elasticity of substitution share parameter between the network and traditional consumption benefits. μ_j is an exponent which implies that average and marginal network benefits differ. n_j is the number of members of the representative family (of size N) who locate in sector j. For simplicity, we assume that the family is characterized by a single family.

The budget constraint individuals face if they choose to locate in sector j is

$$p_1 c_{j1} + p_2 c_{j2} = w_j L_j + R_j \tag{2}$$

where p_1 and p_2 are domestic prices of goods 1 and 2 respectively, w_j is the wage in sector j, L_j is the amount of labor which locates in sector j, and R_j is the amount of transfers these individuals receive both from the returns to the two fixed factors and tariff revenues.

The two consumption goods (good 1 in the rural sector and good 2 in the urban sector), are produced according to decreasing returns production functions which use labor and sector specific fixed factors. These are written as

$$Y_1 = A_1 n_1^{\alpha_1} \tag{3}$$

$$Y_2 = A_2 n_2^{\alpha_2}, \tag{4}$$

where A_i and α_i are productivity and share parameters in the two sectors.

An equilibrium in this model can be characterized as follows:

1. Individual who locate in sector j given prices p_1, p_2, w_1 and w_2, and R, solve the

following utility maximization problem:

$$\max_{c_{j1},c_{j2}} \left(\lambda_j c_{j1}^{\rho} + (1-\lambda_j)\, c_{j2}^{\rho}\right)^{\frac{\theta_j}{\rho}} \left(n_j^{\mu_j}\right)^{1-\theta_j} \tag{5}$$

$$\text{subject to:} \qquad p_1 c_{j1} + p_2 c_{j2} = w_j + R. \tag{6}$$

2. Labor is paid its marginal value product in each sector.

3. Transfers, R, are given by the sum of the returns to the fixed factors and tariff revenues. For simplicity these are assumed equally divided among the population.

4. A migration condition across the two locations, $U_1 = U_2$, is satisfied for all individuals.

In equilibrium, trade balance holds, i.e. $p_{w1}XM_1 + p_{w2}XM_2 = 0$, where XM_1 and XM_2 are net imports (exports) of the two goods.

3 Numerical Computation of Equilibrium

Analytical comparative static analysis for this model is not feasible and so we use numerical simulation analysis to compare equilibria under free trade and in the presence of a tariff. We numerically solve for model equilibria in the following way. N, p_{w1}, p_{w2}, τ_1 and τ_2 are taken as exogenous. Given w_j and R, we solve each individual's maximization problem assuming they locate in region j. First order conditions combined with the budget constraint then yield demands for each consumption good, under an assumed locational choice, as

$$c_{j1} = \frac{(w_j L + R)\left(\frac{p_1}{p_2}\left(\frac{1-\lambda}{\lambda}\right)\right)^{1/(\rho-1)}}{p_1\left(\frac{p_1}{p_2}\left(\frac{1-\lambda}{\lambda}\right)\right)^{1/(1-\rho)} + p_2} \tag{7}$$

$$c_{j2} = \frac{(w_j L + R)}{p_1\left(\frac{p_1}{p_2}\left(\frac{1-\lambda}{\lambda}\right)\right)^{1/(\rho-1)} + p_2}. \tag{8}$$

Labor is paid its marginal value product.

$$w_1 = p_1 \alpha_1 A_1 n_1^{\alpha_1 - 1} \tag{9}$$

$$w_2 = p_2 \alpha_2 A_2 n_2^{\alpha_2 - 1}. \tag{10}$$

and goods markets clear

$$c_{11} + c_{21} = Y_1 + XM_1 \tag{11}$$

$$c_{12} + c_{22} = Y_2 + XM_2, \tag{12}$$

where XM_i are net imports of the two goods. The labor market clears, that is

$$N = n_1 + n_2. \tag{13}$$

and transfers, R, are the sum of the returns to the fixed factors and tariff revenue. We assume for simplicity that these are equally divided among the population, so that

$$R_j = \frac{1}{N}\left(\left(p_1 Y_1 \left(1 - \alpha_1\right)\right) + \left(p_2 Y_2 \left(1 - \alpha_2\right)\right) + \tau_1 p_{w1} XM_1 + \tau_2 p_{w2} XM_2\right). \tag{14}$$

In equilibrium the migration condition implies

$$U_1 = U_2. \tag{15}$$

Trade balance holds as a property of an equilibrium, that is

$$p_{w1}XM_1 + p_{w2}XM_2 = 0. \tag{16}$$

We use these conditions in a numerical optimization package (GAMS) and solve for both tariff and free trade equilibria and compare them. We are also able to reverse solve the model in calibration mode using the same code.

4 Some Numerical Examples of Welfare Worsening Trade Liberalization

For the model set out above we have constructed some examples of welfare worsening trade liberalization using arbitrarily chosen model parameters. We use the parameter values set out below in an experiment in which we eliminate a tariff on imports and compare free trade with tariff equilibrium. We do this first in the absence of network effects. These examples only serve to make our point that social considerations can influence the desirability of free trade, since network benefits in practice are difficult to quantify. We leave it for later work to refine and apply our approach more concretely to actual settings for particular economies.

Using the following exogenous parameter values

$$
\begin{aligned}
\text{Population of individuals in the representative family} &: \quad N = 100 \\
\text{Number of labor units per person} &: \quad L = 1 \\
\text{Number of families} &: \quad 1 \\
\text{World prices} &: \quad p_{w1} = 1, p_{w2} = 1.5 \\
\text{Utility parameters} &: \quad \rho = 0.5, \lambda_1 = \lambda_2 = 0.5 \\
\text{Production shares} &: \quad \alpha_1 = 0.8, \alpha_2 = 0.7 \\
\text{Productivity parameters} &: \quad A_1 = 1.3, A_2 = 1 \\
\text{Tariff rate:} & \quad \tau_1 = 0, \tau_2 = 0.1.
\end{aligned}
$$

The equilibrium solution for the model is that

$$
\begin{aligned}
n_1 &= 74.81, \; n_2 = 25.19 \\
U_1 &= U_2 = 0.461,
\end{aligned}
$$

and the remaining model solution values are

$$
\begin{aligned}
\text{Demands} &: \quad c_{11} = 0.357, c_{12} = 0.131, c_{21} = 0.357, c_{22} = 0.131 \\
\text{Output} &: \quad Y_1 = 41.03, Y_2 = 9.57 \\
\text{Wages} &: \quad w_1 = 0.439, w_2 = 0.439 \\
\text{and Net Trade} &: \quad XM_1 = -5.323, XM_2 = 3.55.
\end{aligned}
$$

If we eliminate the tariff and compute a free trade equilibrium solution, the corresponding variables in equilibrium are

$$
\begin{aligned}
n_1 &= 80.72,\ n_2 = 19.28 \\
U_1 &= U_2 = 0.463,
\end{aligned}
$$

and

$$
\begin{aligned}
\text{Demands} &: \ c_{11} = 0.333,\ c_{12} = 0.148,\ c_{21} = 0.333,\ c_{22} = 0.148 \\
\text{Output} &: \ Y_1 = 43.60,\ Y_2 = 7.94 \\
\text{Wages} &: \ w_1 = 0.432,\ w_2 = 0.432 \\
\text{and Net Trade} &: \ XM_1 = -10.30,\ \ XM_2 = 6.87.
\end{aligned}
$$

In this case the demand for good 2 increases when the tariff is eliminated, whereas that for good 1 falls with the removal of the tariff. Note that in the absence of network effects wages are equalized in the two sectors through migration. Since utility increases for individuals in both sectors with the removal of tariff on the urban good, trade liberalization is unambiguously welfare improving in this case.

We next use the same set of parameter values for an experiment in which we eliminate a tariff on imports and again compare free trade with tariff equilibrium, but now do this in the presence of differential network effects across urban and rural areas. We find that trade liberalization is welfare worsening in this case when network benefits are taken into account.

We assume the following for the network parameters in the model parameterization

$$\text{Network parameters:}\mu_1 = 1.3, \mu_2 = 1.1, \theta_1 = \theta_2 = 0.5$$

In the tariff case $(\tau_1 = 0, \tau_2 = 0.1)$, the model solution is now

$$\begin{aligned} n_1 &= 20.03,\ n_2 = 79.77 \\ U_1 &= U_2 = 6.538, \end{aligned}$$

and the remaining model variables are

$$\begin{aligned} \text{Demands} &: \ c_{11} = 0.430,\ c_{12} = 0.158,\ c_{21} = 0.267,\ c_{22} = 0.0.098 \\ \text{Output} &: \ Y_1 = 14.30,\ Y_2 = 21.48 \\ \text{Wages} &: \ w_1 = 0.571,\ w_2 = 0.31 \\ \text{and Net Trade} &: \ XM_1 = 15.69,\ XM_2 = -10.46 \end{aligned}$$

The higher wage in the rural sector offsets the stronger network effect in the urban sector due to the substantially larger number of people who locate in the urban sector, even though $\mu_1 > \mu_2$.

With free trade $(\tau_1 = 0, \tau_2 = 0)$, the model solution is

$$\begin{aligned} n_1 &= 26.142,\ n_2 = 73.588 \\ U_1 &= U_2 = 1.386. \end{aligned}$$

and the remaining model variables are

$$\begin{aligned} \text{Demands} &: \quad c_{11} = 0.40, c_{12} = 0.178, c_{21} = 0.25, c_{22} = 0.111 \\ \text{Output} &: \quad Y_1 = 17.84, Y_2 = 20.27 \\ \text{Wages} &: \quad w_1 = 0.540, w_2 = 0.289 \\ \text{Trade} &: \quad XM_1 = 11.103, XM_2 = -7.402 \end{aligned}$$

Thus in the presence of differential network effects for individuals trade liberalization is in this case welfare worsening as there is a decrease in the utility of individuals located in both sectors when the tariff is removed on good 2. Hence differential network effects between rural and urban sectors imply that trade liberalization can be welfare worsening when social considerations are take into account. If the above set of non network parameter values is used with the same network effects in both the sectors, trade liberalization is again beneficial.

In these computations we only compare equilibrium in the presence of an arbitrary tariff to one under free trade. Given differntial urban rural network effects, an optimal tariff can be computed, although we have not done that here. Free trade can thus dominate an arbitrary tariff since the tariff chosen may greatly exceed the optimal tariff.

5 Conclusion

In the paper we use numerical simulation to show that when social considerations are taken into account the conventional argument that trade liberalization is welfare improving for a small open price taking economy need not apply. This reflects the presence of social networks in urban and rural areas that individuals may choose to join. Network benefits create uninternalized externalities, whose differential externality benefits can be captured through a tariff.

While simplistic, we believe our analysis is relevant to the wider debate on the social consequences of globalization, where social factors strongly enter verbal discussion of the desirability of free trade but are absent from the analytics of economists. More complex formulations with positive and negative network effects are possible, and we leave these for later elaboration. Empirical implementation of our structure may be difficult, but this does not detract from our main point.

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