E C O N O M I C S B U L L E T I N

A note on bilateral trade agreements in the presence of irreversible investment and deferred negotiations

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Abstract

A common result in the trade literature is that a small country will realize gains from a bilateral free trade agreement with a large country. McLaren (1997) casts aspersions on this traditional belief by demonstrating that irreversible investment in the small country, with the possibility of re-negotiation by the large country, can actually make the small country prefer autarky to free trade. In this note, we identify a middle ground where the small country can realize above-autarky utility by only partially specializing (relative to the free-trade level of specialization) in export production; this improvement occurs even in the presence of irreversible investment and deferred negotiations.

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1. INTRODUCTION

Small countries are often encouraged to embrace trade, especially free trade. Advocates of this recommendation point to the potential gains from trade (relative to autarky) and the difficulties a small country may encounter if it attempts protectionist policies.[1] By this reasoning, a small country that does not adhere to free trade is not acting optimally, or so it would appear.[2]

McLaren (1997) questioned this conventional wisdom: What if the small country's investment was irreversible and there were deferred negotiations? Generally, when a small country enters a trade agreement with a large country, the small country will reapportion its resources to the production of the good to be exported to the large country. McLaren points out, however, that if this investment is sunk, the small country will lose its ability to effectively re-negotiate in subsequent trade talks; *i.e.,* it tools-up specifically for the large country's needs (at the expense of its own import sector) in exchange for favorable trade conditions, only to have the trade conditions undone once tooling is complete. The small country's myopia precipitates a need for the large country's market thereafter, and a corresponding loss of bargaining power for future trade talks – the so-named "negative strategic externality". If this erosion in bargaining power is substantial, the large country can extract concessions or side payments from the small country, possibly making it worse off than autarky; McLaren discusses some historical examples in detail.[3]

Looking at trade through this aperture casts doubt on the conventional belief that trade is generally a "good deal" for the small country. McLaren's insights revitalize the debate about the merits of autarky and protectionism from the small country's perspective. Indeed, his results make isolationism look attractive for the small country.

To combat the shortcomings faced by the small country, McLaren (pg. 417) suggests that its government create a subsidy to maintain its autarky resource allocation:

> In addition, under either anticipated cooperation or trade war, a subsidy just large enough to induce the same allocation of Home [small country] resources as would obtain under autarchy would also be welfare improving, because then *ex post* Home utility would be no lower than under autarchy.

The intent of the subsidy is to prevent small-country agents from zealously investing in the up-and-coming export sector, hence mitigating the negative strategic externality.[4] Even a small subsidy, McLaren argues, would improve the small country's *ex post* utility.[5]

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[1] Even the protection of infant industries has been called into question; see, for example, Baldwin (1969).

[2] Throughout this note, and in the spirit of McLaren (1997), we use the term "free trade" to mean trade without tariffs; other modes of protectionism (*e.g.,* subsidies or quotas) are permissible within this free-trade paradigm.

[3] While this note works directly from McLaren (1997), other researchers have explored the implications of sunk investment in the presence of trade of agreements; see, for example, Park (2000) or Bond and Park (2002). Both of these papers deal with a more dynamic setting with possibilities of punishment. Park (2000) also has temporary irreversibility whereas McLaren (1997) has permanent irreversibility. In a related study, Chisik and Davies (2004) consider the impact of irreversible FDI.

[4] At first glance it seems that individually-rational, small-country agents should recognize that aggressive (irreversible) investment in the export sector will undermine their future bargaining power as a nation. However, McLaren (1997 pg. 404) contends ``... in the problem of national bargaining... decentralized investment decisions destroy the ``individual rationality'' constraint...''

While the myopic free-trade outcome of complete specialization is clearly non-optimal for the small country facing sunk investment and deferred negotiations, we show that McLaren's subsidy recommendation does not maximize the small country's utility in all circumstances. Describing an alternative, which prescribes partial specialization and therefore a more modest level of small-country protectionism, is the purpose of this note.

Specifically, we present a situation where it is optimal for the small country to protect its import sector and specialize in the export good, though not to the degree implied by free trade. Maintaining diversified production along with a measured amount of protectionism allows the small country to enjoy above-autarky utility levels. We demonstrate our approach in a simple two-period model using two cases, the leading case involving Cobb-Douglas utility and the other involving CES utility.

2. THE MODEL

Following McLaren (1997), we use a simple two-period Ricardian model wherein two countries, one small and the other large (demarcated by "*" hereafter), are poised to trade. We assume production is linear with labor as the only factor, and that each worker supplies one unit of labor.[6] We use L and L^* to denote the labor supplies in the respective countries, where $L^* > L > 0$.

There are two goods, X and Y. A unit of labor in the small country can produce either $\alpha > 1$ units of good X or 1 unit of Y; one unit of labor in the large country can either produce 1 unit of X^* or Y^*; *i.e.,*

$$\frac{X}{\alpha} + Y = L \qquad\qquad X^* + Y^* = L^*.$$

All consumers are assumed to have identical Cobb-Douglas utility functions:

$$U(C_X, C_Y) = C_X^{\gamma} C_Y^{\beta}.$$

We assume that the large country may choose to impose a per-unit tariff, which we denote as τ^*.[7] We also assume that the small country has various non-tariff protectionist policies (*e.g.,* quotas or subsidies) at its disposal, though we do not explicitly incorporate them in the model.[8] This assumption does not impact our intended contribution because we are interested instead in a more general question: Should the small country erect trade barriers or not? We are deliberately agnostic about the form of protectionism the small country may choose.

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[5] Here, "*ex post*" refers to the time after the trade agreement has been re-negotiated.

[6] While a more general production technology could be used, our intended contribution builds directly on McLaren's formulation. We conjecture that our results would qualitatively hold in the presence of more sophisticated production technologies provided there is a clear comparative advantage to be exploited in a bilateral trade environment. For example, a technology (*e.g.,* in a Heckscher-Ohlin framework) exhibiting a bowed-out PPF would likely reduce the severity of the deferred negotiations (in the case of expected cooperation) because the small country will not fully specialize. However, once production levels are chosen and fixed, the small country essentially becomes an endowment economy, as is the case in our model. So, unless the curvature is such that they will choose autarky in period one, there is likely to be a middle-ground (*i.e.,* a difference between autarky and trade levels of specialization) where our result can arise.

[7] Since the autarky price of X^* is 1, an *ad valorem* tariff produces the same result.

[8] The small county has the option to charge a tariff, but its optimal tariff in first-round negotiations is zero.

Our focus is on the case where the small country is very small relative to the large country, which corresponds with $L/L^* \approx 0$. An implication of this assumption is that the small country has no impact on the large country's prices, resulting in fixed prices for the large country. Letting Y^* be the numeraire good induces the following prices:

$$\begin{aligned} P_X &= P & P_X^* &= 1 \\ &= P_X^* - \tau^* = 1 - \tau^* & & \\ P_Y &= 1 + \tau = 1 & P_Y^* &= 1 \end{aligned}$$

The Walrasian demand functions are as follows:

$$C_X = \frac{\gamma I}{(\gamma + \beta)(1 - \tau^*)} \qquad C_X^* = \frac{\gamma I^*}{(\gamma + \beta)}$$

$$C_Y = \frac{\beta I}{(\gamma + \beta)} \qquad C_Y^* = \frac{\beta I^*}{(\gamma + \beta)}$$

where

$$I = (1 - \tau^*)X + Y \qquad I^* = X^* + Y^* + \tau^* M^*.$$

The model unfolds over two periods. Two activities occur in period 1: a) the free trade agreement is signed and b) labor is irreversibly invested (as in McLaren's paper) in the two sectors of the small country. Three activities occur in period 2: a) production output is realized, b) the large country re-negotiates and starts charging its optimal (revenue-maximizing) tariff, and c) trading commences.

The nature of the trading will either be cooperative or non-cooperative (*i.e.,* trade war). If the small country anticipates cooperation it will fully specialize in the production of the good slated for export to the large country – here good *X*, as that is where its comparative advantage lies. This ultimately allows the large country to extract all the utility from the small country when re-negotiation occurs; *i.e.,* the small country will have irreversibly tooled-up for the export good, only to have the large country take advantage of it thereafter. If the small country anticipates a trade war, the rational expectations equilibrium occurs wherein the small country is indifferent between autarky and trade.

Neither of these outcomes gives the small country an incentive to enter the trade agreement in period 1: with anticipated cooperation, the small country ends up worse off than autarky and with an anticipated trade war, the small country would at best be indifferent between autarky and trade.[9] However, if we allow for government intervention, the small country can in fact realize gains from trade, provided the specialization decision is made carefully.

To see how the small country's government can beneficially intervene, first let ψ represent changes in production in the small country, interpreted as units of labor moved from sector *Y* to sector *X*; *i.e.,* ψ gauges the small country's intended degree of specialization. The value ψ is chosen in period 1 and determines the labor allocation that is then fixed, because of the irreversibility assumption, for period 2.

[9] The outcome of a trade war depends on elasticities and country size, where bigger is better; see Kennan and Riezman (1988) or Syropoulos (2002). See Mayer (1981) for a discussion of bargaining power differentials between countries of asymmetric size.

For each $\psi \in \left[0, \frac{L\beta}{\gamma+\beta}\right]$ there is a particular endowment of *X* and Walrasian demand for *X*:

$$X(\psi) = \frac{\gamma\alpha L}{\gamma+\beta} + \alpha\psi$$

$$C_X(\tau^*;\psi) = \frac{\gamma I}{(\gamma+\beta)(1-\tau^*)}$$

where

$$I = \alpha(1-\tau^*)\left(\frac{\gamma L}{\gamma+\beta} + \psi\right) + \frac{\beta L}{\gamma+\beta} - \psi \ .$$

Using the small country's export function

$$E_X(\tau^*;\psi) = X(\psi) - C_X(\tau^*;\psi),$$

the large country's optimal tariff obtains by maximizing revenue:

$$\max_{\tau^*} \quad \tau^* E_X(\tau^*;\psi) \ ,$$

which implies that the large country's optimal tariff is[10]

$$\tilde{\tau}^* = 1 - \frac{\sqrt{\gamma\left[\beta L - \psi(\gamma+\beta)\right]}}{\sqrt{\beta\alpha\left[L\gamma + \psi(\gamma+\beta)\right]}} \ .$$

Note that this is increasing in ψ, the degree to which the small country specializes.[11]

With the large country's optimal tariff in hand, the government of the small country can maximize utility by choosing its degree of specialization. A wise small-country government will seek to limit the degree of specialization (*i.e.,* keep it less than the free-trade level), which in turn lowers the large country's optimal tariff. The net result is a "best" amount of specialization for the small country, which maps to above-autarky levels of utility for the small country – a more encouraging outcome for the small country than McLaren foresees.

This result is interesting because it falls somewhere between the conclusions of traditional trade theory and McLaren's critique. Under the latter, the small country would be, at best, indifferent between trade and autarky; here, there is a clear reason (*i.e.,* higher utility) to engage in trade even if investment is irreversible and trade terms are likely to be re-negotiated (by the large country) to the detriment of the small country. We summarize this finding in the following proposition.

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[10] We can now verify McLaren's result that the small country may prefer autarky to a free trade agreement (and deferred negotiations) with the large country. If the small country is myopic and fully specializes, then $\psi = \beta L/(\gamma+\beta)$, the numerator equals zero and the denominator is strictly positive. Therefore, the large country's optimal tariff equals one, which results in the small country's price (*P*) equaling zero, and consequently its income equals zero as well.

[11] This follows from $\psi \le \beta L/(\gamma+\beta)$.

PROPOSITION. *The small country will experience an increase in utility following an increase in production of its export good relative to autarky production levels, even when the large country charges its optimal tariff.*

PROOF. Consider the maximization problem faced by the small country:

$$\max_{\psi} U\left(C_X, C_Y, \psi; \tilde{\tau}^*\right),$$

or, more specifically,

$$\max_{\psi} \left\{ \frac{\gamma\left[\alpha(1-\tilde{\tau}^*)\left(\frac{\gamma L}{\gamma+\beta}+\psi\right)+\frac{\beta L}{\gamma+\beta}-\psi\right]}{(\gamma+\beta)(1-\tilde{\tau}^*)} \right\}^{\gamma} \left\{ \frac{\beta\left[\alpha(1-\tilde{\tau}^*)\left(\frac{\gamma L}{\gamma+\beta}+\psi\right)+\frac{\beta L}{\gamma+\beta}-\psi\right]}{(\gamma+\beta)} \right\}^{\beta}$$

where

$$\tilde{\tau}^* = 1 - \frac{\sqrt{\gamma\left[L\beta - \psi(\gamma+\beta)\right]}}{\sqrt{\beta\alpha\left[L\gamma + \psi(\gamma+\beta)\right]}} \ .$$

Substituting for $\tilde{\tau}^*$, differentiating, setting $\psi = 0$, and assuming that $\gamma + \beta = 1$ yields

$$\frac{\partial U(\bullet)}{\partial \psi} = \frac{\left(\alpha - \sqrt{\alpha}\right)\left(\alpha\gamma^2 + \beta\gamma\sqrt{\alpha}\right)^{\gamma}\left(\beta^2 + \beta\gamma\sqrt{\alpha}\right)^{\beta}}{2\left(\alpha\gamma + \beta\sqrt{\alpha}\right)} > 0 \ .$$

□

Because the first partial is positive at $\psi = 0$, the utility of the small country will increase with an increase in production of its export good.[12] The point where $\psi = 0$ is of particular interest because it coincides with the pre-trade allocation of labor – the circumstance in which the small country will be in when considering the period-1 trade agreement. As we will demonstrate below for specific parameter values, the partial derivative above decreases but remains positive as ψ increases, ultimately reaches zero at the point ψ_{Umax} (consider the *slope* of the utility function depicted in figure 1), and is negative for values larger than ψ_{Umax}. The value ψ_{Umax} is the point at which the small country's utility is maximized, and it occurs, interestingly, somewhere between the autarky and rational expectation levels of specialization (indicated by ξ).

3. NUMERICAL EXAMPLES

We have demonstrated that the small country can gain (relative to autarky) by specializing strictly less than the rational expectations equilibrium would indicate; to see this clearly we provide two numerical illustrations. In figure 1, we depict the outcome when the parameter set $\{\gamma, \beta, \alpha\}$ equals $\{0.5, 0.5, 2.5\}$. As described above, there exists a range of positive values for ψ

[12] The constant-returns-to-scale assumption is not crucial; we impose it here to tidy the presentation.

where the small country gains from trade and partial specialization. Movement along the horizontal axis indicates the small country shifts labor from import sector *Y* to export sector *X*. At each ψ there is a new export function and consequently a new optimal tariff. The point of specialization where with-trade utility equals autarky utility is labeled ξ, and is the unique rational expectations equilibrium. If the small country specializes anywhere from zero to this point, it will be at least as well off as in autarky; ψ_{Umax} represents the level of specialization that maximizes utility.

If we hold the utility parameters (γ and β) constant and increase α, we can see how the landscape changes when the small country is more efficient at producing good *X*. As expected, the autarky utility level increases, as do the gains from trade with autarky levels of production. The optimal level of specialization ψ_{Umax} increases as well. In table I, we summarize three additional representative parameterizations (we experimented with others as well) for the Cobb-Douglas model; for purposes of comparison, values of specialization (ψ) have been normalized to be a percent of total labor allocated to autarky production of the imported good. In all instances, partially specialized production offers the small country higher utility than the autarky resource allocation. Thus, a small country facing trade negotiations involving irreversible investment and deferred negotiations (as posed by McLaren, 1997) may prefer a smaller subsidy (or equivalent) than McLaren recommends.

Table II contains numerical examples for the more general CES utility function, showing the same qualitative results. For these and other values (not reported here) we find, as in the Cobb-Douglas case, that the small country facing trade negotiations involving irreversible investment and deferred negotiations may prefer a smaller subsidy (or equivalent) than McLaren recommends.

4. CONCLUSIONS

It is commonly believed that small countries greatly benefit from free trade. McLaren (1997) argued to the contrary by demonstrating that, in the presence of irreversible investment and deferred negotiations, a small country may actually have very little to gain from trading and that it should consider using protectionist policies. McLaren (1997) recommended a subsidy that would keep the small country's resource allocation fixed at autarky levels, thus avoiding the deleterious effects of the negative strategic externality.

In this note we demonstrate that targeting the autarky resource allocation may, in fact, not be the small country's utility-maximizing course of action in the presence of irreversible investment and deferred negotiations. We find that the small country's best strategy is to partially specialize in the export good, and that the small country should accomplish this using some form of protectionism, though we are deliberately agnostic about which instrument should be used. The implications of this note should be of interest to trade-policy makers in small and large countries alike.

Our contribution can also be understood in a somewhat broader context. For example, adding more countries to the model has some interesting implications, which we outline below in three cases.

> **Case 1:** Suppose one large country signs a bilateral free trade agreement with multiple, identical small countries. By the definition of a small country, each country cannot affect the world relative price. In this vein, one could think of each

country as decentralized firms and both the anticipated cooperation and rational expectations results hold. If we allow for a benevolent government (as in our model), it does not appear obvious that the "optimal" level of specialization for each country would be any different than presented in our model, assuming there is no collusion on the part of the small countries. If we allow the small countries to form a trade union, such as a customs union, then the optimal strategy of the customs union will depend on the collective size of the union; see, for example, Abrego, Riezman, and Whalley (2005).

Case 2: Suppose a bilateral free trade agreement is signed between multiple large countries and one or more small countries. Since the optimal tariff of a large country is the revenue-maximizing tariff, and because there is now competition for revenue, each large country would lower its tariff to attract the small country's exports; this would continue until there was free trade. This scenario assumes zero (or identical) transaction costs between a small country and all large countries. If we allow for differing transportation costs, the ability of a large country to re-negotiate with the small country in the second period would be bounded by these differing costs.

Case 3: Suppose a bilateral free trade agreement is signed between two WTO members. Here, the principle of non-discrimination, as embodied in the most-favored-nation (MFN) clause, plays a key role (see Bagwell and Staiger, 1999). In this case, the ability of a large country to re-negotiate is bounded by the MFN rate (assuming there is another member country also exporting the same good).

In the end, however, the synopsis is this: McLaren recommends autarky levels of production when the potential repercussions from irreversible investment are virtually unbounded – a worst-case scenario. We show that, even under this worst-case scenario, some specialization can be optimal for the small country. When the repercussions are bounded by real-world trade features, like those described in cases 2 and 3, McLaren's recommendation of autarky levels of production is more questionable because the damage the large country can do after re-negotiation is now limited; *i.e.,* the binding of the large country's second-period tariff *increases* the small country's optimal level of specialization. Because our argument for some specialization obtains in the circumstance that is *most* hostile towards doing so, adding institutional realities (*e.g.,* cases 2 and 3) strengthens our contention that McLaren's prescription of autarky production is too strong.

Figure 1
Small Country's Utility Given Level of Specialization

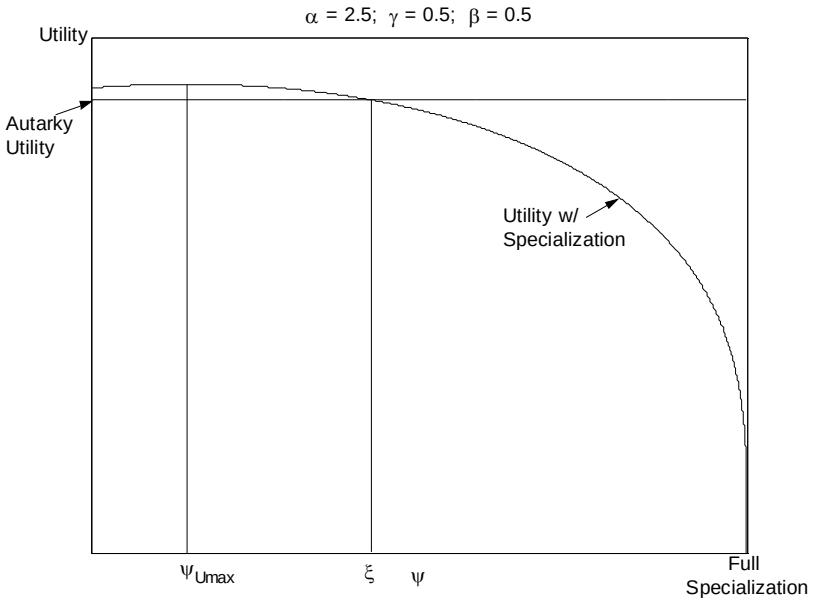

Table I: Small Country Cobb-Douglas Parameterizations

			Autarky			Gains from trade under...	
α	γ	β	Utility	ψ_{Umax}	ξ	Autarky Production	Specialized Production
5	0.5	0.5	55.902	24.08%	66.67%	8.20%	10.75%
2.5	0.5	0.5	39.526	14.71%	42.86%	2.64%	3.49%
2.5	0.25	0.75	35.829	8.88%	27.27%	2.13%	8.88%
2.5	0.75	0.25	56.651	18.90%	52.94%	1.83%	2.34%

Table II: Small Country CES Parameterizations

		Autarky			Gains from trade under	
α	σ	Utility	ψ_{Umax}	ξ	Autarky	Specialization
5	0.5	23.8729	8.39%	27.64%	3.94%	5.24%
2.5	0.25	29.0426	2.71%	8.27%	0.64%	0.85%
2.5	0.5	18.7624	5.88%	18.45%	1.30%	1.74%
2.5	0.75	4.8134	9.34%	29.98%	1.98%	2.62%

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