CENTRE FOR RESEARCH ON GLOBALISATION AND LABOUR MARKETS

Research Paper 2000/18

Rules of Origin as Commercial Policy Instruments

by

Rod Falvey and Geoff Reed

Centre for Research on Globalisation and Labour Markets, School of Economics, University of Nottingham

The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

The Authors

Rod Falvey is Professor of International Economics, Geoff Reed is Reader in Economics in the School of Economics, University of Nottingham.

Acknowledgements

The authors thank three referees and participants in seminars at EPRU, Dublin and the Graduate Institute of International Studies for comments. The authors wish to acknowledge financial support from The Leverhulme Trust under Programme Grant F 114/BF.

Rules of Origin as Commercial Policy Instruments

by

R. Falvey and G. Reed

Abstract

This paper examines the role of Rules of Origin as a commercial policy instrument which targets the input composition of imports. Using a three country, partial equilibrium structure, we demonstrate conditions under which the imposition of a binding Rule will be welfare improving for an importer facing competitive export suppliers. We further show that employing Rules of Origin in this way would be complementary to, rather than a substitute for, conventional optimal tariffs.

Outline

1. Introduction
2. Optimal Tariffs
3. Rules of Origin
4. Optimal Policies and Preferential Trade
5. Conclusions

Non-Technical Summary

The growth of international trade in goods that are not manufactured in a single country has brought into prominence the rules for determining the "origin" of traded products. Governments apply rules to distinguish foreign from domestic products and to define the foreign origin of a product where some imports receive preferential treatment. But rules of origin (ROOs) also have wider usage. They play a role in the application of laws relating to marking, labelling, and advertising; duty drawback provisions; government procurement; countervailing duty and safeguard proceedings; and quantitative restrictions, including import prohibitions and trade embargoes.

Where two or more countries have been involved in the manufacture of a product, the general concept applied in formulating ROOs is that the product has origin where the last "substantial transformation" took place. In practice there are three main methods of determining whether substantial transformation has occurred, but these tests can be applied singly or in combination, and administrative agencies may depart from these methods in some cases. The upshot is an international regime where governments have considerable discretion in setting ROOs.

The interest of economists in ROOs is relatively recent, and has been prompted by the falling importance of MFN tariffs, their replacement by other (discriminatory) interventions, and the expansion of preferential trading arrangements. In general ROOs perform a supporting role to other policy instruments, defining the products to which these instruments will or will not be applied. Most economic analyses of ROOs has correspondingly taken place in frameworks involving a range of policies in which it is easy for the effects of the ROO to become obscured.

Our objective in this paper is to explore the potential role of ROOs as an independent commercial policy instrument. There are circumstances in which ROOs might have a distinctive commercial policy role. Their distinguishing feature as a policy instrument is their ability to target the input composition of inputs, and we demonstrate circumstances under which their use could lead to an improvement in the importing country's terms of trade. In a competitive market this came about through the final goods exporters' inability to take account of the difference between average and marginal costs in purchasing their inputs. We also demonstrate that while their potential benefits occur through terms of trade effects, ROOs are complementary to rather than substitutes for tariffs on final outputs. When used in combination, discriminatory tariffs can focus on differences in the elasticity of supply of value added while ROOs are targeted at the composition of intermediate inputs. In the context of preferential trade, where partner exports face a lower tax, the ROO has the ostensible purpose of reducing the revenue loss from trade deflection. We have shown that the importing country may gain from lower priced imports as well.

1 Introduction

The growth of international trade in goods that are not manufactured in a single country has brought into prominence the rules for determining the "origin" of traded products. Governments apply rules to determine the origin of products for two broad reasons. First, to distinguish foreign from domestic products, when imports are not to be granted national treatment. Second, to define the foreign origin of a product and, in particular, the conditions under which it will be considered as originating in a preference receiving country (hence "preferential" rules). But rules of origin (ROOs) also have wider usage. They play a role in the application of laws relating to marking, labeling, and advertising; duty drawback provisions; government procurement; countervailing duty and safeguard proceedings; and quantitative restrictions, including import prohibitions and trade embargoes.

Where two or more countries have been involved in the manufacture of a product, the general concept applied in formulating ROOs is that the product has origin where the last "substantial transformation" took place[1]. In practice there are three main methods of determining whether substantial transformation has occurred:

(1) The Value Added Test: which requires that the last production process has created a certain percentage of value added[2];

(2) Change in Tariff Heading Test: which confers origin if the activity in the exporting country results in a product that is classified under a different heading of the customs tariff classification than its intermediate inputs[3]; and

(3) Technical Test: which sets out certain production activities that may (positive test) or may not (negative test) confer originating status[4].

---

[1] See Vermulst (1992) and Vermulst et.al. (1994) for a discussion of ROOs and their applications in the major developed trading economies from a legal perspective. Falvey and Reed (1997) consider their economic effects.

[2] Application of this test requires an analysis of production costs and generally takes one or more of three forms:

(a) a maximum allowable percentage of imported parts and materials;
(b) a minimum percentage of local value-added; or
(c) a minimum percentage of originating parts relative to the total value of parts.

There are many variations between countries in the way this test is applied, and the same facts can lead to different origin determinations in different countries. Indeed there can be variations even within a country, depending on the objective of the law it is intended to implement.

[3] This test has the advantages of simplicity and predictability, although the tariff classification system itself was not designed to distinguish "substantial transformations".

[4] This test is the best equipped to deal with any specific case, but is also the most easily abused.

These tests can be applied singly or in combination, and administrative agencies may depart from these methods when origin is to be determined for reasons other than customs clearance (e.g. antidumping). The upshot is an international regime where governments have considerable discretion in setting ROOs, particularly preferential ROOs.

The interest of economists in ROOs is relatively recent, and has been prompted by the falling importance of MFN tariffs, their replacement by other (discriminatory) interventions, and the expansion of preferential trading arrangements. It has been argued that the manner in which ROOs are defined and applied within these arrangements will play a significant role in determining the protection that they confer and the degree to which trade is distorted as a consequence[5]. The economic analysis of ROOs has been relatively limited, however, particularly analysis within formal models[6]. Partly this reflects a view that they have been relatively unimportant; partly it reflects the complexity of the structures required for their analysis, particularly in a general equilibrium context.

Much of the formal analysis has been concerned with *content protection*, investigating the effects of host government requirements that foreign firms use a certain proportion (measured by quantity or value) of host country inputs in their output in order for it to be sold on the host market. The positive and normative aspects of these policies have now been investigated in a variety of market structures[7]. There is also a literature on trade in *vertically related markets*, which explores the linkages between trade policies in final and intermediate goods markets, again allowing for competitive and imperfectly competitive market structures[8]. Both types of analysis involve the same range of agents as considered below - consumers, final goods producers and intermediate goods producers. The content protection literature is concerned with a policy that "protects" domestic intermediate producers at the expense of domestic consumers and domestic producers of the final good (if there are any). In vertically related markets the focus is the interactions of trade in intermediates and final goods, particularly where one firm or country is an exporter in both markets. In each case the importing country potentially trades both types of goods, and its policy-making authorities are in a position to impose the usual trade restrictions in both.

[5] See, for example, Krueger (1993), (1995) and Krishna and Krueger (1993).
[6] An exception is Ju and Krishna (1998).
[7] See, for example, Grossman (1981), Dixit and Grossman (1982), Mussa (1984), Vousden (1987), Krishna and Itoh (1986), Davidson et. al. (1987), and Richardson (1991) and (1993).
[8] See, for example, Spencer and Jones (1989), (1991) and (1992).

But what policy options are available to countries which only import the *final* good? For them any trade in intermediates lies outside their jurisdiction, beyond the direct reach of traditional tax and subsidy measures. These are the circumstances in which ROOs might have a distinctive commercial policy role, because they target the input composition of imported products. Our objective in this paper then is not further analysis of ROOs as supporting instruments within a particular policy framework (e.g. a free trade area). Rather it is to explore their potential role as an independent commercial policy instrument. Our analysis addresses three main questions. What place, if any, is there for such an instrument in a nation's commercial policy portfolio? Under what circumstances might an importing country use its ROO to raise domestic welfare? Is a ROO simply a second best alternative to optimal tariff(s), or does it have an independent and complementary role to play?

In adopting this approach we recognise that ROOs are not applied independently in practice, and we are not intending for our results to support any change in this direction. Our primary aim is to gain some understanding of how ROOs might operate (both on their own and in conjunction with optimal tariffs) in a broader context than has been examined to date. An advantage of our structure is that it allows the properties of ROOs to emerge unencumbered by the complexities associated with preferential trading arrangements. We do this through a relatively simple three country partial equilibrium model, involving two exporters of a good (countries 1 and 2) and a single importer (the home country). Production of this good requires an intermediate input and value-added. For simplicity we assume that the good is not consumed in the exporting countries and neither the final good nor the intermediate are produced by the importer. The ROO is then modeled as imposing a constraint on the national origin of the intermediate used with domestic value added in producing the final good. One should note that our results do depend on increasing unit costs in the supply of all inputs. To the extent that this assumption is only appropriate for the short run this is a short run analysis.

In outline the remainder of this paper is as follows. The next section sets up the model and derives the optimal uniform and discriminatory tariffs. Section III then analyses the welfare effects of imposing a (just) binding ROO, both with and without tariffs. Section IV derives the optimal portfolio of tariffs and ROO, and considers how the optimal ROO will be affected by tariff preferences. The final section presents our conclusions.

2 Optimal Tariffs

Consider the market for a homogeneous final commodity in which there are three participants - the "home" country which is a pure importer of the product and whose inverse demand function is r(Q), where r denotes the consumer price of the product and Q is total consumption; and two pure exporters - countries 1 and 2. Units are chosen so that production of each unit of this product requires one unit of value added (q) and one unit of an intermediate input (x). This intermediate is also produced in the two exporting countries (but not in the importing country) by competitive suppliers with inverse (excess) supply functions $p_j(x_j)$, where p_j denotes the cost of the intermediate from country j (j = 1,2). The inverse supply function of value added to this industry in country j is denoted by $v_j(q_j)$, where v_j denotes the cost of value-added in country j. Intermediates are tradable but value-addeds are not. We can therefore let q_j denote both the value added and the final output from country j. The market is thus best viewed as composed of firms purchasing (nontraded) value added and (traded) intermediates to produce a final good which is then sold to the home country.

The free trade equilibrium conditions in this competitive market can be written as:

$$v_1(q_1) = v_2(q_2) = v(Q) \quad (1A)$$

$$p_1(x_1) = p_2(x_2) = p(Q) \quad (1B)$$

$$x_1+x_2 = q_1+q_2 = Q \quad (1C)$$

$$r(Q) = p(Q) + v(Q) \equiv ac(Q) \quad (1D)$$

Equations (1A) and (1B) require that the producers of the final product purchase inputs from the cheapest source, so that prices of inputs from the two sources are equated; (1C) is a materials balance equation; and (1D) equates consumer price with average cost (ac) which the price taking producers also assume to be their marginal cost. Consumer surplus in the importing country is

$$CS(Q) = \int_0^Q r(z).dz - r(Q).Q$$

so that the welfare effect of a change in total imports is

$$\frac{dCS(Q)}{dQ} = -Q.r' \quad (2)$$

where $r' \equiv dr(Q)/dQ < 0$[9].

Since the importing country has monopsony power in this market, it can improve its welfare by taxing imports. We first investigate the optimal uniform tariff, and then consider the possibility of imposing discriminatory taxes. Let t denote a uniform specific tariff. Aggregate home welfare from this market then becomes

$$W = CS(Q) + t.Q$$

with

$$\frac{dW}{dt} = [t - Q.r'].\frac{dQ}{dt} + Q \qquad (3)$$

Using (1A)-(1C) we can solve for

$$\frac{dx_1}{dQ} = \frac{p_2'}{P'};\ \frac{dx_2}{dQ} = \frac{p_1'}{P'};\ \frac{dq_1}{dQ} = \frac{v_2'}{V'};\ \frac{dq_2}{dQ} = \frac{v_1'}{V'} \qquad (4)$$

where $p_j' \geq 0;\ v_j' \geq 0;\ P' \equiv p_1' + p_2'$, and $V' \equiv v_1' + v_2'$. After rewriting (1D) as

$$r(Q) = v(Q) + p(Q) + t = ac(Q) + t \qquad (5)$$

we have

$$\frac{dQ}{dt} = -\frac{1}{\Omega}, \quad \text{where } \Omega = ac' - r' > 0, \text{ and } ac' = \frac{p_1'p_2'}{P'} + \frac{v_1'v_2'}{V'} > 0.$$

Substituting in (3) gives

$$\frac{dW}{dt} = \frac{Qr' - t}{\Omega} + Q$$

so that the (implicit) formula for the optimum uniform specific tariff (t^o) in this instance is given by

$$t^o = Q.[r' + \Omega] = ac'(Q).Q > 0 \qquad (6)$$

In order to interpret this expression, note that the total cost of producing Q is

$$T(Q) = ac(Q).Q$$

from which the corresponding marginal cost is

$$T'(Q) = \frac{dT(Q)}{dQ} = ac(Q) + ac'(Q).Q$$

[9] In the remainder of the paper a ′ denotes a first derivative.

Thus the last term in this expression, which is the optimum uniform tariff formula, denotes the difference between the marginal cost and the average cost of imports to the importing country, implying that the optimal tax is set so as to equate consumer price with marginal cost[10].

While a uniform tariff raises welfare, the fact that the final product is purchased from two different sources with different supply elasticities suggests further gains if tariffs are made discriminatory. Let t_j denote the tariff levied on the final product from source j. Importing country benefits from this market then become

$$W = CS(Q) + \sum_j t_j q_j$$

and the welfare effects of a change in the taxes are given (in total derivative form) as

$$dW = -Q.r'.dQ + \sum_j [q_j dt_j + t_j dq_j] \qquad (7)$$

Now the price equals average cost condition (5) must be rewritten as two separate equations

$$r(Q) = v_j(q_j) + p(Q) + t_j \qquad j = 1,2 \qquad (8)$$

which, once differentiated, yield a system

$$\begin{bmatrix} A_1 & a \\ a & A_2 \end{bmatrix} . \begin{bmatrix} dq_1 \\ dq_2 \end{bmatrix} = \begin{bmatrix} dt_1 \\ dt_2 \end{bmatrix} \qquad (9)$$

where $A_j = r' - p' - v_j'$; $a = r' - p'$ and $p' = p_1' p_2' / P'$.

Let $A = A_1.A_2 - a^2 = V'.\Omega > 0$. Then (9) can be solved for

$$A.dq_1 = A_2.dt_1 - a.dt_2; A.dq_2 = A_1 dt_2 - a.dt_1; A.dQ = -[v_2'.dt_1 + v_1' dt_2]$$

Substituting these into (7) and rearranging yields

$$A.dW = [t_1 A_2 - t_2 a + Qr'v_2' + q_1 A].dt_1 + [t_2 A_1 - t_1 a + Qr'v_1' + q_2 A].dt_2$$

which allows us to solve for the optimal discriminatory tariffs (t_j^o) as

$$t_j^o = p'.Q + v_j'.q_j \qquad (10)$$

Recalling that $t^o = Q.[\frac{p_1' p_2'}{P'} + \frac{v_1' v_2'}{V'}]$, we have

$$\Delta \equiv t_1^o - t_2^o = v_1'.q_1 - v_2'.q_2 \qquad (11A)$$

[10] One can derive an equivalent expression where the importing country faces an export monopolist - see Falvey and Reed (1997). One difference is that it is now possible for the optimal intervention to be an import subsidy. A necessary condition for this is that the marginal revenue curve be "flatter" than the demand curve - see Brander and Spencer (1984).

$$t_1^o = t^o + \frac{v_1'}{V'}.\Delta;\ t_2^o = t^o - \frac{v_2'}{V'}.\Delta \qquad (11B)$$

$$t^o = \frac{v_2'.t_1^o + v_1'.t_2^o}{V'} \qquad (11C)$$

Three points, in particular, are worth noting about these results. First, the (marginal share weighted) average tariff conforms to the same implicit formula as the optimum uniform tariff. In this sense the "average level of tax" is the same under the uniform and discriminatory tariff regimes. Second, the difference between the two discriminatory tariffs takes into account differences in value added elasticities only. The more price inelastic of the two value addeds faces the higher tariff[11]. Again this expression can be interpreted in terms of the difference between marginal and average costs. The average cost of value added from source j is v_j, while its marginal cost is $v_j + q_j.v_j'$. The difference in tariff rates (Δ) thus mirrors the difference in the marginal costs of value added from the two sources. Third, the products from the two sources cannot be distinguished with respect to their intermediate inputs. In fact the two sources of intermediate supply may have quite different price elasticities, implying that there might be scope for further welfare gains to the importing country if there were some way to tax these two sources differentially. The importing country is not in a position to do this directly, however, since any production and trade in the intermediates takes place entirely outside its borders. But this observation does suggest a potential role for policies which are able to distinguish the products on the basis of the origin of the intermediates embodied within them[12].

3 Rules of Origin

To this point the exact origin of the intermediates used by each of the competitive final goods suppliers has been of no consequence. Intermediates are supplied by competitive firms in the two countries, and final goods producers are price takers in the intermediate market. The mix of intermediates supplied is simply that which equates the prices from the two sources. We now investigate the effects of constraining this choice, by requiring that output "originate" in a country before it is exported. The qualification test is a ROO, and the most

[11] The price elasticity for value added j is $e_j = v_j \big/ v_j'.q_j$, so that when evaluated at $v_1 = v_2 = v$, we have

$v.\Delta t = e_1^{-1} - e_2^{-1}$

convenient form in which to model a ROO in this framework is to write it as specifying a minimum requirement on the ratio of intermediate input of the same national origin as the value added (or, equivalently, the final output). A "stricter" ROO will then require that a larger fraction of the total intermediate used be of the same national origin as the value added. Though ROOs are not typically expressed directly in this form, this must be their impact here. Such a ROO would specify that for final output to qualify as "originating" in country j not only would it need to incorporate value added from j but, in addition, its use of intermediate from j ($\bar{x}_j$) would need to satisfy a constraint of the form $\bar{x}_j \geq \theta . q_j$ where $1 > \theta > 0$. Suppose that when intermediate use is unconstrained country 1 is the intermediate importer -i.e. $x_1 << q_1$ and, consequently, $x_2 >> q_2$. In this case the output of country 2, which uses only x_2, clearly meets the constraint, and it is only final goods producers in country 1 that are directly constrained[13].

Our objective in this section is to determine if there are circumstances under which the imposition of a (just) binding constraint of this form could raise welfare in the importing country. To do this we need to restructure the model to incorporate a ROO constraint. The most convenient form in which this can be done is to focus on the intermediate price differential created by the ROO as our policy variable. If we let τ denote this differential, our equations, including discriminatory tariffs, are:

$$r(Q) = p_2(x_2) + v_2(q_2) + t_2 \qquad (12A)$$

$$r(Q) = p_2(x_2) + \tau.\theta + v_1(q_1) + t_1 \qquad (12B)$$

$$x_1 + x_2 = q_1 + q_2 = Q \qquad (12C)$$

$$\tau = p_1(x_1) - p_2(x_2) \qquad (12D)$$

The right side of equation (12B) denotes the cost of producing a unit of the final product in the country subject to the ROO. The unit cost is higher in this country than the other by the intermediate price differential (τ) times the proportion of their own intermediate that must be

[12] Analogous expressions can be derived in the monopoly exporter case, where the relevant weights are the derivatives of the marginal costs of value added.

[13] Note that we impose the ROO as a binding constraint and do not give exporters the opportunity to accept or reject it. Output from either country that does not meet its relevant ROO is denied admittance to the home market. In practice where a product does not meet the origin criterion for its last location of production, origin will be given to another country in the case of nonpreferential ROOs or to no country where preferential agreements are concerned. See Vermulst (1992)

included $(\theta = x_1/q_1)$. This formulation highlights the similarity between this ROO and a tariff on imported intermediates levied by country 1. Both policies introduce a price "wedge" in the intermediate market. Where they differ is that under the tariff regime producers of the final good in country 1 would have to pay a higher price for intermediates from both sources. Under the ROO they continue to purchase imported inputs at the "world" price[14].

We begin by considering the imposition of a ROO from an initially unconstrained equilibrium (i.e. $\tau = 0$ initially). From equations (12C) and (12D) we can derive

$$dx_1 = \frac{p_2'}{P'}.dQ + \frac{d\tau}{P'}; dx_2 = \frac{p_1'}{P'}.dQ - \frac{d\tau}{P'} \qquad (13)$$

Imposing a ROO shifts intermediate production from country 2 to country 1, at any given level of total output. The corresponding expressions for value added are obtained from (12A) to (12C) as

$$dq_1 = \frac{v_2'}{V'}.dQ - \frac{\theta}{V'}d\tau; \quad dq_2 = \frac{v_1'}{V'}.dQ + \frac{\theta}{V'}d\tau \qquad (14)$$

The ROO shifts the composition of total value added from country 1 to country 2. These expressions can then be used with (12A) to solve for the change in total output, obtaining

$$dQ = \frac{\Phi}{\Omega}d\tau \qquad \text{where} \quad \Phi = [\frac{p_2'}{P'} - \theta\frac{v_2'}{V'}] \qquad (15)$$

We note that imposing a (just) binding ROO ($d\tau > 0$, from $\tau = 0$) can increase equilibrium output, if $\frac{p_2'}{P'} - \theta\frac{v_2'}{V'} > 0$. Here θ measures the ratio of the average shares of these two country 1 inputs in output (i.e. $\theta = \frac{x_1/Q}{q_1/Q}$), while $[\frac{p_2'}{P'}\Big/\frac{v_2'}{V'}]$ is the corresponding ratio of the marginal shares of these two inputs in output.

This outcome can be readily interpreted if we consider the effects of this ROO on the average cost of producing the final good. From (13), (14) and (15) we have

$$\frac{d[v_2 + p_2]}{d\tau} = \frac{r'}{\Omega}.[\frac{p_2'}{P'} - \theta\frac{v_2'}{V'}] \qquad (16)$$

[14]Thus a tariff on intermediate imports into country 1 is a substitute for the ROO imposed by the final good importer that we examine below. It is an imperfect substitute, however, because it involves a greater distortion on intermediate input costs. See Mussa (1984).

Imposing a tighter ROO will *reduce* average cost if $\frac{p_2'}{P'} - \theta \frac{v_2'}{V'} > 0$, which is the same as the condition for the ratio x_1/q_1 to rise as output rises in a competitive market. We conclude that if the ratio of these marginal shares exceeds the ratio of their average shares, imposing a (just) binding ROO of this form at the competitive equilibrium will reduce average cost and hence lead to an increase in aggregate output. From (2) such an increase in output leads to a rise in the importing country's consumer surplus.

The key to understanding this outcome is to recognize that the competitive solution *does not* choose the combination of intermediate inputs and value addeds that minimizes total costs. Firms treat the price (average cost) of each input as its marginal cost, and select an input combination where the prices of inputs from the two sources are equated (i.e. $p_1=p_2$,$v_1=v_2$) rather than their marginal costs. The result is an equilibrium where the final good price equals average cost, but the latter is higher than necessary to produce this output. Imposing a binding ROO changes the input mix at both levels (for any given total output), increasing the share of x_1 in intermediates and reducing the share of q_1 in aggregate value added. If this rearrangement leads to a fall in average (and marginal) cost then output will rise, the consumer price will fall, and consumer surplus will increase as a consequence[15].

Where the importing country imposes a uniform import tariff the preceding analysis will continue to apply. The uniform tariff does not, in itself, compensate for the failure of the competitive market to choose the cost minimizing input mix. Hence imposing a (just) binding ROO, in addition to a uniform tariff, can be welfare improving under the same condition relating marginal and average shares.

Where the importing country imposes differential tariffs on imports "originating" from the two sources, the situation is slightly different. For one thing the presence of a ROO seems more natural since deeming origin is important for determining which tax is to apply. Given

[15] The potential role of the ROO in reducing average costs in a competitive market does not carry over directly to a monopolised market, since the monopolist chooses an input mix that minimises total (and average) costs for each level of output. But the monopolist's choice does not necessarily minimise the corresponding marginal cost, and it is the equation of marginal cost with marginal revenue that determines output, price and consumer surplus. Under certain circumstances a just binding ROO can reduce marginal cost, hence the possibility that a ROO could raise importing country welfare in a monopolised market, and by extension, in other market structures - see Falvey and Reed (1997).

the discriminatory tariffs, the distribution of final output is now also important. Rearranging (7) and using (14) and (15), we have that

$$\frac{dW}{d\tau} = \sum_{j=1}^{2}[t_j^o - Qr'].\frac{dq_j}{d\tau}$$

Using (11C) and (14), we can write the welfare effects of imposing a (just) binding ROO as

$$\frac{dW}{d\tau} = [t^o - Qr']\frac{dQ}{d\tau} + \frac{\theta}{V'}[t_2^o - t_1^o]$$

which reflects the effects from changes in total output as well as from shifting value added from country 1 to country 2. Further substitution from (11A) and (15) gives us

$$\frac{dW}{d\tau} = [\frac{p_2'}{P'} - \frac{x_1}{Q}].Q = \frac{p_2'.x_2 - p_1'x_1}{P'} \qquad (17)$$

Thus whether imposing a (just) binding ROO will raise or reduce welfare when there are optimal discriminatory taxes on final outputs in place depends on whether the marginal share of x_1 in output (p_2'/P') exceeds or is less than its average share (x_1/Q). This can be compared with the condition for a (just) binding ROO to raise welfare with no (or uniform) taxes - i.e. $p_2'/P' > \theta\ v_2'/V'$. The discriminatory tariffs, which are targeted at differences in value added elasticities, have effectively neutralized the role of the latter in determining the welfare effects of the ROO. Now the ROO can be focused on intermediates only, in particular increasing the output of that intermediate whose share of the market increases as output expands[16].

In conventional terms, given the existence of discriminatory taxes, a preferential ROO would be imposed to determine output from the country subject to the smaller tax. The case considered above would fit this pattern if the country with the more elastic supply of value added (e.g. $v_1'.q_1 < v_2'.q_2$), is an intermediate importer (e.g. $x_1 < q_1$), but has a rising share of the intermediate market (e.g. $p_2'/P' > x_1/Q$).

[16] Again, a similar argument applies with an export monopoly.

4 Optimal Policies and Preferential Trade

Having established circumstances where imposing a ROO can raise welfare, we now consider the optimal portfolio of policies including both output tariffs and the ROO. For this we need expressions for the effects of tightening an already existing ROO on outputs and inputs. Following the procedure used above, the intermediate input equations remain as in (13). But the value added equations now reflect the presence of the binding ROO – i.e.

$$dq_1 = \frac{\varepsilon_1}{\varepsilon} dQ - \frac{\varepsilon_\tau}{\varepsilon} d\tau - \frac{dt_1 - dt_2}{\varepsilon}; \quad dq_2 = \frac{\varepsilon_2}{\varepsilon} dQ + \frac{\varepsilon_\tau}{\varepsilon} d\tau + \frac{dt_1 - dt_2}{\varepsilon} \qquad (18)$$

where $\varepsilon = \varepsilon_1 + \varepsilon_2$; $\varepsilon_1 = v_2' - \frac{\tau}{q_1}.\frac{p_2'}{P'}$; $\varepsilon_2 = \tilde{v}_1' + \frac{\tau}{q_1}.\frac{p_2'}{P'}$; $\tilde{v}_1' = v_1' - \theta\frac{\tau}{q_1}$, and $\varepsilon_\tau = \theta + \frac{\tau}{q_1 P'}$. As before, the ROO shifts value added output away from country 1 towards country 2, at any given output level (since $\varepsilon_\tau > 0$). But a binding ROO also affects the marginal output shares of the two value addeds. Comparing (18) with (14), we note that the marginal share of value added 1 is increased (reduced) by the ROO as $\frac{\varepsilon_1}{\varepsilon} > (<) \frac{v_2'}{V'}$, i.e. as $\theta\frac{v_2'}{V'} > (<) \frac{p_2'}{P'}$. From (16) we note that a cost reducing ROO will reduce the marginal share of value added from country 1.

The change in total output can be derived as above, obtaining

$$dQ = \frac{\tilde{\Phi}}{\tilde{\Omega}} d\tau - \frac{v_2'}{\varepsilon}\frac{dt_1}{\tilde{\Omega}} - \frac{\tilde{v}_1'}{\varepsilon}\frac{dt_2}{\tilde{\Omega}} \qquad (19)$$

where $\tilde{\Omega} = -r' + \frac{p_1'.p_2'}{P'} + \frac{v_2'.\varepsilon_2}{\varepsilon} > 0$ and $\tilde{\Phi} = [\frac{p_2'}{P'} - \varepsilon_\tau \frac{v_2'}{\varepsilon}]$. We can obtain the optimal uniform tariff and ROO by setting $dt_1 = dt_2 = dt$ and substituting (19) in

$$dW = [t - Qr'].dQ + Q.dt$$

obtaining

$$dW = [t - Qr'].\tilde{\Phi}.d\tau - \{t - Q[r' + \tilde{\Omega}]\}.dt = 0.$$

The optimum uniform tariff therefore satisfies

$$\tilde{t}^o = Q.[r' + \tilde{\Omega}]$$

which has the same form as t^o in (6). The optimum ROO in this case is set where $\tilde{\Phi} = 0$ (i.e. where $dQ/d\tau = 0$), yielding

$$\tilde{\tau}^o = \frac{p_2'.V' - \theta.v_2'.P'}{v_2' + \theta.p_2'} \qquad (20)$$

When discriminatory tariffs are possible, we can use (7), (18) and (19) to obtain

$$dW = [\tilde{\Phi}\frac{T}{\tilde{\Omega}} + \varepsilon_\tau.\frac{\Delta}{\varepsilon}].d\tau + [q_1 - \frac{v_2'}{\varepsilon}.\frac{T}{\tilde{\Omega}} + \frac{\Delta}{\varepsilon}].dt_1 + [q_2 - \frac{\tilde{v}_1'}{\varepsilon}.\frac{T}{\tilde{\Omega}} - \frac{\Delta}{\varepsilon}].dt_2 \qquad (21)$$

where $\Delta = t_2 - t_1$ and $T = \frac{\varepsilon_1 t_1 + \varepsilon_2 t_2}{\varepsilon} - Qr'$. The optimal values of the import taxes can then be obtained by equating the sum of the coefficients on the taxes to zero, solving for T then substituting this value in the coefficient on either of the taxes to obtain a solution for Δ. The results are

$$\frac{\varepsilon_1 \tilde{t}_1^o + \varepsilon_2 \tilde{t}_2^o}{\varepsilon} = Q.[r' + \tilde{\Omega}] = \tilde{t}^o$$

$$\tilde{\Delta}^o = v_2'.q_2 - \tilde{v}_1'.q_1.$$

Comparing this with (11), we see that the optimal taxes have the same form as they had in the absence of the ROO, although the actual values will adjust to reflect the impact of the ROO on value added elasticities. These solutions are then substituted in the coefficient on $d\tau$ to obtain the optimal intermediate tax "implicit" in the ROO – i.e.

$$\tilde{\tau}^o = p_2'.Q - \theta.q_1.P' = p_2'.x_2 - p_1'.x_1$$

The ROO is set to take account of differences in intermediate input elasticities only, and is implicitly performing an analogous function to the difference in final tariff rates.

As we noted in the Introduction, the most prominent applications of ROOs are in Preferential Trading Arrangements (PTAs), where they are employed to define the partner products to be given preferential (usually duty free) access. We also observed the considerable flexibility that trading partners have in defining ROOs, so that, if it is considered necessary, different specifications can apply to different sectors[17]. In this section we consider how the general commercial policy role for ROOs just investigated might interact with their use in a PTA context.

Since PTAs are one of the few exceptions to most-favored-nation (MFN) treatment permitted under WTO obligations, we start from an initial equilibrium in which the importing country has imposed a uniform (MFN) tariff on imports from both sources. This may or may

[17] Krishna and Krueger (1995) provide examples.

not be the optimum MFN tariff, but we assume that the ROO has been chosen optimally, in accordance with equation (20). We then suppose that this country enters a PTA with country 1[18], which requires that access for final output from country 1 be provided at a reduced tariff, while the original MFN tariff continues to apply to imports from country 2, and ask whether this (small) reduction in t_1 will induce the welfare-maximizing government in the importing country to tighten or loosen the ROO that it imposes on imports from its PTA partner. One might presume, from the nature of this tariff policy change, that the ROO will be tightened, since a tighter ROO will act to reduce imports from the now lower taxed source. But one should note that the composition imports may not have been optimal to begin with, since the importing country was constrained to employ an MFN tariff, and that the tariff reduction itself has a direct effect on the restrictiveness of the ROO, as we shall see.

For convenience we continue with the policy formulation used above, modeling the ROO as setting τ rather than θ. But we consider the changes in both variables, beginning with the direct effects of the reduction in t_1 on θ, for the "fixed" initial τ; then looking at the induced change in the optimal τ; and finally combining these to derive the total change in θ. At the initial τ, the effects of a change in t_1 on θ can be found, from (18), to be

$$\frac{\partial\theta}{\partial t_1} = \frac{1}{q_1}.[\frac{\partial x_1}{\partial t_1} - \theta.\frac{\partial q_1}{\partial t_1}] = \frac{1}{q_1}.\{\frac{\theta}{\varepsilon} + [\frac{p_2'}{P'} - \theta.\frac{\varepsilon_1}{\varepsilon}]\frac{\partial Q}{\partial t_1}\}$$

At the initial total output, a reduction in t_1 has no effect on x_1, but increases q_1 and hence reduces θ. In addition to this, equation (19) implies that the reduction in t_1 raises total output thereby increasing both x_1 and q_1. If we rewrite the coefficient on the change in Q as

$$\frac{p_2'}{P'} - \theta.\frac{\varepsilon_1}{\varepsilon} = \tilde{\Phi} + \tau.\frac{[v_2' + \theta.p_2']}{q_1.\varepsilon.P'}$$

we see that it is positive in the initial equilibrium (since $\tilde{\Phi} = 0$ when the ROO is chosen optimally under a uniform tariff). That is, the overall output increase induced by the reduction in t_1 tends to raise θ. The direct effect of a change in t_1 on θ is therefore ambiguous.

[18] This is the interesting case, since no ROO would be binding in this sector under a PTA between the importer and country 2.

To derive the indirect effect, through the induced change in the optimal τ, we use the first order condition that yields the optimal τ in (21) – i.e.

$$\frac{\partial W}{\partial \tau} = \frac{T}{\tilde{\Omega}}\Phi + \frac{\varepsilon_\tau}{\varepsilon}\Delta = 0$$

to solve for $\partial\tau/\partial t_1$, noting the $\Phi = 0 = \Delta$ in the initial equilibrium. This gives us

$$\frac{\partial \tau}{\partial t_1} = \frac{\frac{\varepsilon_\tau}{\varepsilon} - \frac{T}{\tilde{\Omega}}\frac{\partial \Phi}{\partial t_1}}{\frac{T}{\tilde{\Omega}}\frac{\partial \Phi}{\partial \tau}} \qquad (22)$$

One can show that $\partial\Phi/\partial\tau < 0$ as required by the second order condition for a maximum, while

$$\frac{\partial \Phi}{\partial t_1} = -\frac{v_2'}{\varepsilon\tilde{\Omega}}.\{[1+\gamma].\frac{\partial \theta}{\partial t_1} + \gamma.\frac{\partial \theta}{\partial \tau}\} \qquad (23)$$

where $\gamma = \tau\varepsilon_\tau/\varepsilon q_1 > 0$ and $\partial\theta/\partial\tau > 0$ in the initial equilibrium[19]. The total change in θ induced by the change in t_1, can then be determined from

$$\frac{d\theta}{dt_1} = \frac{\partial \theta}{\partial t_1} + \frac{\partial \theta}{\partial \tau}.\frac{\partial \tau}{\partial t_1}. \qquad (24)$$

Using (22), (23) and (24), we can derive expressions for the effects of the change in t_1 on our two measures of the ROO, obtaining

$$\frac{\partial \tau}{\partial t_1} = \frac{\frac{\varepsilon_\tau}{\varepsilon} + \frac{Tv_2'}{\varepsilon\tilde{\Omega}}.\{\gamma.\frac{\partial \theta}{\partial \tau} + [1+\gamma].\frac{\partial \theta}{\partial t_1}\}}{T\frac{\partial \Phi}{\partial \tau}}; \quad \frac{d\theta}{dt_1} = \frac{\frac{\varepsilon_\tau}{\varepsilon} + \frac{Tv_2'}{\varepsilon\tilde{\Omega}}.\{\gamma.\frac{\partial \theta}{\partial \tau} - [1+\gamma].\frac{\partial \theta}{\partial t_1}\}}{T\frac{\partial \Phi}{\partial \tau}} \qquad (25)$$

Recall that $\partial\Phi/\partial\tau < 0$ and $\partial\theta/\partial\tau > 0$ in the initial equilibrium, so that the signs of both these expressions are ambiguous, depending, inter alia, on the sign and magnitude of $\partial\theta/\partial t_1$. There are then two cases to consider:

[A] $\frac{\partial \theta}{\partial t_1} > 0$, which implies that $\frac{\partial \tau}{\partial t_1} < 0$ but $\frac{d\theta}{dt_1}$ can have either sign; and

[B] $\frac{\partial \theta}{\partial t_1} < 0$ which implies that $\frac{\partial \tau}{\partial t_1}$ can have either sign but $\frac{d\theta}{dt_1} < 0$.

---

[19] $\frac{\partial \Phi}{\partial \tau} = -\frac{2v_2'}{\varepsilon\tilde{\Omega}}.[1+\gamma].\frac{\partial \theta}{\partial \tau} < 0$, since $\frac{\partial \theta}{\partial \tau} = \frac{v_2' + \theta p_2'}{v_2' P' q_1} > 0$ in the initial equilibrium.

In the first case, the direct effect of a reduction in t_1 is assumed to reduce θ at the initial τ. From (25), the optimal policy response is to raise τ, which raises θ. Although the net outcome for θ is ambiguous, the intermediate price difference will be higher in the new equilibrium. In the second case, the direct effect raises θ, by assumption, but the indirect change in θ (through the induced change in τ) is ambiguous. However, the net effect is that the "domestic content" (i.e. θ) is increased by the tariff cut. Thus while the exact implications of a reduction in the tariff on product 1 for the optimal ROO are ambiguous, by some measure at least the ROO is always tightened. In the new equilibrium, either the intermediate price differential in favor of intermediate 1 has increased, or the share of the domestic intermediate in production of the final good in country 1 has increased or both. In this sense there is a presumption that a ROO will be tighter in a PTA.

5 Conclusions

Rules of origin have grown in significance with the spread of preferential trading arrangements and the increasing importance of contingent, selective trade measures. In general ROOs perform a supporting role to other policy instruments, defining the products to which these instruments will or will not be applied. Most economic analyses of ROOs has correspondingly taken place in frameworks involving a range of policies in which it is easy for the effects of the ROO to become obscured.

Our objective in this paper has been to examine the potential commercial policy effects of the ROO itself. Its distinguishing feature as a policy instrument is its ability to target the input composition of inputs, and we demonstrated circumstances under which its use could lead to an improvement in the importing country's terms of trade. In a competitive market this came about through the final goods exporters' inability to take account of the difference between average and marginal costs in purchasing their inputs[20]. We also demonstrated that while their potential benefits occur through terms of trade effects, ROOs are complementary to rather than substitutes for tariffs on final outputs. When used in combination, discriminatory tariffs can focus on differences in the elasticity of supply of value added while ROOs are targeted at the composition of intermediate inputs. In the context of preferential trade, where partner exports face a lower tax, the ROO has the ostensible purpose of

[20] In a monopolised market, the exporter minimises total (and average) costs, but a ROO may reduce marginal costs.

reducing the revenue loss from trade deflection. We have shown that the importing country may gain from lower priced imports as well.

Finally, it is important to recall the qualifications that were made in the introduction. Our aim here has been to deepen our understanding of the role of ROOs in economic models and analysis, not to suggest new and wider applications for them in practice. Yet one should also recognise that developed countries in particular are increasingly likely to employ policies that discriminate amongst imports on the basis of how they have been produced. This is equivalent to employing a ROO, and may be justified on the grounds of “protecting the environment” or “discouraging the use of child labour” for example. Whatever their effects on these practices, such policies will distort trade, and although the potential distortions created by ROOs have been recognised, they warrant greater analysis. Only when they are better understood can they be better regulated.

References

Brander, J. A. and B. Spencer (1984) "Tariff Protection and Imperfect Competition" in H. Kierzkowski (ed) *Monopolistic Competition and International Trade* Oxford: Clarendon Press.

Davidson, C., S. Matusz and M. Kreinen (1987) "Analysis of performance standards for direct foreign investments" *Canadian Journal of Economics* 28(4), 876-890.

Dixit, A. K. and G. M. Grossman (1982) "Trade and Protection with Multistage Production", *Review of Economic Studies,* XLIX, 583-594.

Falvey, R. E. and G. V. Reed (1997) "Rules of Origin as Commercial Policy Instruments" *EPRU Working Paper* 1997-20, Copenhagen Business School.

Falvey, R. E. and G. V. Reed (1998) "Economic Effects of Rules of Origin" *Weltwirtschaftliches Archiv* 134(2), 209-229.

Grossman, G. M. (1981) "The Theory of Domestic Content Protection and Content Preference" *Quarterly Journal of Economics* 96, 583-603

Ju, J. and K. Krishna (1998) "Firm Behaviour and Market Access in a Free Trade Area with Rules of Origin" *NBER Working Paper No. 6857*

Krishna, K. and M. Itoh (1986) "Content protection and oligopolistic interactions" *Review of Economic Studies* LV, 107-125.

Krishna, K. and A. Krueger (1995) "Implementing Free Trade Areas: Rules of Origin and Hidden Protection" in A. Deardorff, J. Levinsohn and R. Stern (eds) *New Directions in Trade Theory,* Ann Arbor:University of Michigan Press.

Krueger, A. O. (1993) "Free Trade Agreements as Protectionist Devices: Rules of Origin" *NBER Working Paper No. 4352*

Krueger, A. O. (1995) "Free Trade Agreements versus Customs Unions" *NBER Working Paper No. 5084*

Mussa, M. (1984) "The Economics of Content Protection" *NBER Working Paper No. 1457.*

Richardson, M. (1991) "The effects of a content requirement on a foreign duopolist" *Journal of International Economics,* 31, 143-155.

Richardson, M. (1993) "Content protection with foreign capital" *Oxford Economic Papers* 45, 103-117.

Spencer, B. and R. W. Jones (1989) "Raw materials, processing activities, and protectionism" *Canadian Journal of Economics* 22, 467-486

Spencer, B. and R. W. Jones (1991) "Vertical foreclosure and international trade policy" *Review of Economic Studies* 58, 153-170

Spencer, B. and R. W. Jones (1992) "Trade and protection in vertically related markets" *Journal of International Economics* 32, 31-55

Vermulst, E. A. (1992) "Rules of Origin as Commercial Policy Instruments - Revisited" *Journal of World Trade* 26(2), 61-102.

Vermulst, E. A. P. Waer and J. Bourgeois (eds) (1994) *Rules of Origin in International Trade: A Comparative Study* The University of Michigan Press, Ann Arbor

Vousden, N. (1987) "Content protection and tariffs under monopoly and competition" *Journal of International Economics,* 23, 263-282.