Free trade agreements without delocation

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Abstract. Small nations fear that FTAs with larger, richer nations will erode their industrial bases. These concerns are recognized in FTA and multilateral talks: small nations may explicitly or implicitly maintain higher trade barriers. Using a model where symmetric liberalization de-industrializes small, poor nations, we characterize the path of protection-asymmetries that allow liberalization without delocation. In welfare terms, the large nation prefers this no-delocation liberalization scheme only when barriers are sufficiently high; the small nation's ranking is reversed. An anti-delocation scheme involving international income transfers is also evaluated and found infeasible.

Accords de libre-échange quand il y a délocalisation. Les petits pays craignent que les accords de libre-échange avec des pays plus grands et plus riches n'entament leur base industrielle. Ces malaises sont reconnus dans les négociations bilatérales et multilatérales: on permet aux petits pays de maintenir explicitement ou implicitement des barrières commerciales plus élevées. A l'aide d'un modéle où la libéralisation des échanges engendre une désindustrialisation des petits pays pauvres, les auteurs identifient les niveaux d'asymétrie dans le niveau de protection qui permettent d'engendrer une désindustrialisation sans délocalisation. En termes de niveau de bien-être, le grand pays préfère cet arrangement sans délocalisation seulement quand les barrières commerciales sont suffisamment élevées; la préférence des petits pays est à l'inverse. On évalue un arrangement sans délocalisation impliquant des transferts internationaux de revenus, et on montre qu'il est impraticable.

1. Introduction

Throughout the world, trade liberalization elicits anxiety – a phenomenon that Bob Lawrence has dubbed 'globaphobia' (Burtless et al. 1998). An important compo-

We acknowledge the help and comments of Francesca Castellani, Philippe Martin, and Tony Venables. The Swiss NSF provided financial support (#1214-050783). Thanks also to two anonymous referees. One referee's summary was so apt that we have incorporated part of it into the text almost verbatim.

Canadian Journal of Economics / Revue canadienne d'Economique, Vol. 33, No. 3
August / août 2000. Printed in Canada / Imprimé au Canada

0008-4085 / 00 / 766–786 / © Canadian Economics Association

nent of globaphobia is the fear that market-opening initiatives lead to 'delocation', that is, a loss of manufacturing jobs to trading partners. As Burtless et al. (1998, 44) state: 'Much of the debate about trade is about jobs; critics say that it destroys them, while proponents say it creates them.'

In the United States, for instance, Ross Perot famously quipped that when the North American Free Trade Agreement (NAFTA) had removed all trade barriers, millions of jobs would 'run' to Mexico, creating a 'great sucking sound.' The AFL-CIO labour union claims that this has occurred. 'The collapse of the peso and preferential treatment under NAFTA have made cheap labour in the maquiladoras even cheaper, and accelerated the flow of US capital investment south of the border' ('U.S. trade deficit sinks with NAFTA a major drain,' 25 Aug. 1995, www.aflcio.org). In Japan, the phrase 'hollowing out of the economy,' reflects similar fears that globalization promotes the loss of manufacturing jobs, especially to Southeast Asia.

This job-loss fear is common in large nations, but it is probably strongest in small nations that are considering signing free trade agreements (FTAs) with larger, richer nations. In Canada, for example, Wonnacott (1987, 14) notes that calls for an FTA with the United States always elicited 'the traditional Canadian fear of becoming mere "hewers of wood and drawers of water" for Americans.' Feinberg, Keane and Bognanno (1998) argue that the empirical evidence on delocation is mixed for the Canadian experience. They confirm, however, that fear of trade-linked delocation is important in the Canadian debate. Matching anxieties about U.S. dominance have long existed among Mexican industrialists, and even in groupings of small poor nations such as ASEAN, the poorer nations fear delocation to larger more developed partners (DeRosa 1995).

It is important to note that large nations have frequently recognized – de facto – the fears of their smaller partners by accepting asymmetric treatment. Consider some examples. In Europe, the European Union has explicitly paired greater integration (the 1992 program and the monetary union) with increased payments to poor, peripheral nations (Pelkmans 1997). In trade arrangements that lack explicit transfers, this recognition often shows up in terms of asymmetric liberalization that allows the small nations to maintain higher trade barriers during the transition to free trade. Such asymmetric liberalization is explicitly incorporated in several EU bilateral agreements. The Europe Agreements (the free trade deals between the European Union and the Central and Eastern European countries) cut EU tariffs faster than those of Central and Eastern European countries. The 1991 EU-Hungary Europe Agreement, which is typical, states that EU custom duties on industrial imports from Hungary shall be abolished either upon entry into force, or one, four, or five years later. Subsequently, this tariff-cutting timetable was accelerated. By contrast, Hungary's duties on EU industrial products are phased out over ten years, as table 1 shows.

The trade liberalization component of the Asia-Pacific Economic Co-operation (APEC) initiative also incorporates rich-poor asymmetry. According to announced plans, the developed APEC members should implement free trade by 2010, while developing members have until 2020 (Bergsten 1997). Likewise, the 1992 Singapore Declaration establishing the ASEAN Free Trade Area (AFTA) implicitly rec-

TABLE 1
Hungary's Europe Agreement tariff cuts

Date of tariff cut	Required level (per cent of initial duty)
1995	90
1996	75
1997	60
1998	45
1999	30
2000	15
2001	Zero

ognizes the delocation fears of Indonesia and the Philippines by granting these two nations a longer time horizon for implementing free trade (DeRosa 1995, 35).

In other free trade agreements, asymmetry occurs automatically. The U.S.-Mexico FTA entails staged tariffs cuts, with each stage reducing tariff levels by a specified percentage. Although these percentage cuts are the same for the United States and Mexico, Mexican duties remain higher than U.S. duties until duty-free trade is reach. The reason is that Mexican tariffs on U.S. exports were initially four times higher (on average) than U.S. tariffs against Mexican exports.

The spirit of such asymmetry (large rich nations maintaining lower barriers than poor small nations) can also be found quite explicitly in the Generalised System of Preference, the Lomé Convention, and the Caribbean Basin Initiative, inter alia. Even multilateral trade negotiations, such as the Uruguay and Tokyo rounds implicitly embrace asymmetry, since the formula-approach to tariff cutting adopted in these rounds implies de facto asymmetry. The formula approach stipulates that negotiating nations will lower their tariff averages by an agreed percentage, for example, by 30 per cent. Since poor nations typically have much higher levels of protection on manufactured goods than do rich nations (see Table 2), an equal percentage cut allows the poor nations to maintain higher *levels* of protection before and after the liberalization.

Our main purpose in this paper is to evaluate asymmetric liberalization schemes that reduce the degree of delocation associated with liberalization between large and small nations. In particular, it characterizes an asymmetric liberalization such that free trade is achieved with no relocation of firms, and it evaluates the welfare effects of asymmetric against symmetric liberalization. To this end, we posits a two-nation model that allows us to take fears of delocation seriously. The model is similar to 'economic geography' models (Fujita, Krugman, and Venables 1999). In those models, scale economies and trade costs tend to foster location of increasing-returns activity, for example, manufacturing, in the larger nation. This pro-agglomeration 'market-size' effect is countered by a pro-dispersion 'local competition' effect. The strength of both effects erodes with liberalization, but the pro-dispersion force's strength erodes faster than that of the pro-agglomeration

TABLE 2
Post-Uruguay Round protection levels, various region averages (per cent tariff equivalents)

	NAFTA	EU	Jpn	Med * M.E.	SubS Africa	S. Amer	Asia
Textiles	8	7	5	35	16	15	29
Clothing	19	10	9	39	20	23	21
Lumber, pulp, paper	1	0	1	24	12	9	9
Proc'd petro. Gds	1	1	1	17	5	12	12
Chemicals, plastics, rubber	7	12	2	20	8	13	12
Primary steel	7	3	1	17	12	11	9
Nonferrous metals	3	1	1	24	14	7	9
Metal products	6	2	1	30	13	16	19
Transport equipment	3	5	0	25	10	19	23
Other machinery	13	7	0	24	6	19	11
Other manufactures	5	3	6	28	14	18	17

SOURCE: Global Trade Analysis Project dataset, version 3, 1996

force (Baldwin 1999); progressive and symmetric liberalization between asymmetric-sized nations thus monotonically de-industrializes the small nation. However, this feature of economic-geography models does not allow us to make sense of delocation fears in large nations (e.g., Perot's great sucking sound).

To counter this monotonic dominance of the market-size effect, our model allows for factor endowment differences among nations. Thus, apart from relative size, location is also determined by relative capital supplies. In the model, the number of industrial firms is proportional to the capital stock. The capital-abundant country has relatively many firms and therefore relatively strong competition and low profits. This gives firms an incentive to relocate to the capital-poor country. The reason is that as trade barriers rise, the strength of the pro-dispersion 'local competition' effect remains positive, but the strength of the pro-agglomeration effect drops to zero.

Our model also assumes a rather particular policy-setting environment. Avoiding delocation is only one of many goals of policymakers, however, to keep the analysis concrete, simple, and focused on essentials, we assume away all other goals and focus purely on delocation. We assume that policymakers choose a transitional path that takes both nations' tariffs to zero in an asymmetric fashion. The asymmetry is chosen quite precisely to achieve free trade without delocation. In particular liberalization takes trade barriers, which start at a prohibitive level, to zero and the no-delocation-asymmetry rule strives to maintain the autarky distribution of industry across nations. We then evaluate the welfare implications of this no-delocation scheme against two benchmarks: no liberalization and symmetric liberalization. We also consider the scope for using international income transfers – rather than asymmetric protection – as a means of avoiding delocation during liberalization.

The rest of the paper is organized as follows. In section 2 we present the basic model. In section 3 we characterize the forces that yield delocation when trade liberalization is symmetric and incomplete. In the fourth section we characterize the no-delocation liberalization scheme and evaluate its welfare implications. In the fifth section we study international transfers as an anti-delocation tool. Finally, in section 6 we summarize our results and provide some concluding comments.

2. Basic Model

The model and much of the analysis in this paper is based on Robert-Nicoud (1996), which is, in turn, based on Martin and Rogers (1995) and Flam and Helpman (1987).

2.1. Assumptions

The model allows for two factors (labour L and capital K), two sectors (X and Y), and two potentially asymmetric countries (West and East). Below, we consider three types of national asymmetries: size, relative factor endowment, and height of import barriers.

The industrial X-sector produces differentiated varieties under conditions of increasing returns and monopolistic competition. Following Flam and Helpman (1987), production of each X-variety involves a one-time fixed cost consisting of one unit of K and a per-unit-of-output cost consisting of a_X units of L. The corresponding cost function is $wa_Xx + r$, where x is output and r is K's reward. The Y-sector produces a homogeneous good under Walrasian conditions (i.e., constant returns and perfect competition).

Capital, which is specific to the X-sector, is internationally mobile with capital's income fully repatriated (i.e., capital is mobile but capital owners are not). Labour, which is employed by both sectors, is immobile across countries but perfectly mobile between sectors within a nation.

Consideration of tariffs in a general equilibrium setting with imperfect competition raises a number of awkward issues. One must decide, for instance, whether tariffs are ad valorem or specific, whether the tariff is collected in X or Y, and what the government does with the tariff 'revenue,' that is, the physical goods in which the tariff is collected. Moreover, if revenue is returned directly to consumers, the revenue can affect demand and thereby the number of firms. Introducing such simultaneity, however, complicates the analysis without providing any compensating insight. This, of course, is why virtually all of the economic geography literature assumes iceberg trade costs, Flam and Helpman (1987) being the notable exception. The difference between tariffs and iceberg trade costs, however, is not second order when it comes to welfare analysis, so we allow the trade barriers in this paper to generate revenue. Yet to stay focused on essentials, we make assumptions that permit consideration of tariff 'revenue' when doing welfare calculations but ensure that tariffs act like iceberg trade costs for most purposes. In particular, we assume that tariffs are specific and governments collect tariff revenue 'in kind.' Thus, selling a unit of X to foreign consumers requires that $\tau > 1$ units be shipped, since $\tau - 1$ of the shipment will be used to pay the tariff. The government takes all of the X-varieties collected and costlessly transforms the goods into a good Z, which it provides exogenously to citizens. Z is not produced in the private sector (think of government services). For convenience, we following the standard practice of assuming that Y-trade is costless.[1]

The representative consumer in each nation owns all L and K. Her preferences are

$$U = AZ^{\Omega}\left(\int_{i=0}^{n+n^E} c(i)^{1-1/\sigma} di\right)^{\frac{\alpha\sigma}{\sigma-1}} Y^{1-\alpha-\Omega}; \qquad Z = (\tau - 1)\sum_{i=1}^{n^E} c(i), \tag{1}$$

where A is a scalar, n and n^E are the number of differentiated goods produced in the West and in the East (respectively), $\sigma > 1$ is the constant elasticity of substitution among X-varieties, and α is the X-sector expenditure share. Notice that Z is a linear function of the tax collected on all imported varieties and is returned to consumers in a lump-sum fashion. The East's Z-function is isomorphic.

2.2. Equilibrium conditions

Utility maximisation yields the market demand functions:

$$Y = (1-\alpha)(E/p_Y),\ c_j = \frac{p_j^{-\sigma}\alpha E}{\int p_i^{1-\sigma} di}; \qquad \forall j, \tag{2}$$

where E is expenditure (un-superscripted variables denote Western quantities) and the integral is over all varieties. Since there is no savings in this model, aggregate private expenditure E equals private income, $wL + rK$, where w and r are the rewards to L and K. Moreover because Z is not marketed, E is divided between X and Y and tariff revenue does not enter income. Eastern demand functions are isomorphic.

Competition implies marginal-cost pricing in the Y sector and, by choice of units, Y's price, p_Y, is set to w. Taking L as numeraire, perfect competition and zero Y-sector trade cost imply that $p_Y = w^E = w = 1$.[2]

As usual, monopolistic competition in differentiated goods implies single-product firms. Choosing units such that $a_X = 1 - 1/\sigma$, the first-order conditions for West and East firms yield the standard monopolistic competition pricing equations. These are $p_W^W = 1, p_E^W = \tau^{\mathrm{E}}, p_E^E = 1, p_W^E = \tau$, where τ and τ^E are Western and Eastern import barriers, and we adopt the explicit p_{to}^{from} notation, where superscripts indicate country of production and subscripts indicate country of consumption. Specifically, Eastern quantities are superscripted with an E, global quantities are superscripted with a G, and Western quantities are un-superscripted.

Competition for K drives 'r' to the level where pure profits are eliminated, so K's reward in the West is the operating profit of a typical West-based X-firm. A parallel

1 Davis (1998) shows that, in simple models such as ours, delocation does not occur when there are trade costs in both sectors. Fujita, Krugman, and Venables (1999), however, show that even when there are trade costs in both sectors, the qualitative features of delocation can be obtained in a more complex model. In order to focus sharply on the main issues, we adopt for a simple model and no trade cost in the Y sector.

2 α is assumed to be such that $(1-\alpha)(E + E^E) > \min\{L, L^E\}$, so both nations produce some Y in any equilibrium.

condition holds in the East and capital mobility ensures that $r = r^E$. Since X-firms need one unit of capital per variety and capital is internationally mobile (even though its reward is repatriated), capital's full-employment condition is $n + n^E = K + K^E$.

As usual, monopolistic competition implies that operating profit (namely, revenue less payment to labour) is $p_W^W x/\sigma$ for a typical West firm and $p_E^E x^E/\sigma$ for a typical East firm. The equilibrium size of a typical firm is therefore proportional to capital's reward, namely, $x = r\sigma$ and $x^E = r^E\sigma$ (Flam and Helpman 1987). The equalization of rental rates (enforced by capital mobility), therefore, implies an equalization of equilibrium firm sizes. Moreover, since the value of global X-sector output at producer prices must equal the value of global X-sector private expenditure, we have $(n + n^E)x = \alpha(L^G + rK^G)$, where x is the common scale (G denotes global quantities). Using this market-clearing condition and $r = x/\sigma$ yields the equilibrium scale and rental rate:

$$x = \alpha\mu \frac{L^G}{K^G}, \quad r = \frac{\alpha\mu}{\sigma}\frac{L^G}{K^G}; \quad \mu \equiv \frac{\sigma}{\sigma - \alpha} > 1, \tag{3}$$

where $\mu > 1$ is a parameter combination that appears frequently. Expression (3) also holds in autarky once national L and K are substituted for L^G and K^G. Thus, the autarky r is lower in the capital-abundant country.

Given (3), West's share of global income and expenditure, $s_I \equiv E/(E + E^E)$ is

$$s_I = \frac{1}{\mu}\left(s_L + \frac{\alpha\mu}{\sigma} s_K\right); \qquad s_L \equiv \frac{L}{L^G}, \quad s_K \equiv \frac{K}{K^G}, \tag{4}$$

where s_L and s_K are the West's share of the global labour and capital stock, respectively. It is useful to note that s_I is related to West's share of world capital and its capital abundance by the simple expression $s_I = s_K - \kappa$, where κ is defined as $(s_K - s_L)/\mu$.

With capital mobility, the number of varieties produced in a nation may differ from the nation's capital stock, so we must determine the equilibrium location of X-firms. In particular, the commonality of firm scale and the pricing equations, demand functions, and market-clearing conditions can be used to find the equilibrium levels of n and n^E. It proves convenient, however, to focus on the proportion (rather than the level) of firms located in each country, since the global number of X-firms is fixed by endowments at K^G. Using s_n to denote the West's share of X-firms:

$$s_n = \frac{s_I(1 - \phi\phi^E) - \phi(1 - \phi^E)}{(1 - \phi)(1 - \phi^E)};$$

$$0 \le \phi \equiv \tau^{1-\sigma} \le 1, \quad 0 \le \phi^E \equiv (\tau^E)^{1-\sigma} \le 1, \tag{5}$$

where ϕ is a mnemonic for the 'free-ness' (phi-ness) of trade. That is, ϕ ranges from zero, with infinite barriers, to unity, with zero barriers. This expression holds for interior solutions of s_n, namely, when parameters are such that $0 < s_n < 1$. Outside this parameter space, s_n equals zero or unity in an obvious manner. By inspection of (5), West's share of firms is increasing in its income share and in its own level of protection. The East's share of firms, namely s_n^E, equals $1 - s_n$.

Equilibrium *Y*-sector output satisfies $Y + Y^E = (1 - \alpha)\mu L^G$.

3. Symmetric liberalization and delocation

In this section we open our analysis of delocation and trade liberalization by studying the baseline case of symmetric liberalization of initially symmetric trade barriers. Thus, in this section East and West differ only in their economic size and relative factor endowments. It may be helpful to think of the West as bigger (i.e. $s_I > 1/2$) and more capital abundant (i.e. $\kappa \equiv (s_K - s_L)/\mu > 0$) than East, even though the formulas allow for general asymmetries.

3.1. Symmetric liberalization and delocation: competition and size effects

To get a handle on how symmetric trade liberalization leads to delocation, we start with inspection of (5) with symmetric levels of trade ϕ-ness, namely, $s_I(1 + \phi) - \phi$ divided by $(1 - \phi)$. When trade barriers are prohibitive, $\phi = 0$, the division of industry matches national endowments of *K*. But when $s_I > 1/2$, we see that the share of industry in the big nation reaches unity when ϕ is sufficiently close to free trade. This tells us that in our simple model, progressive symmetric liberalization will eventually de-industrialize the small nation entirely.

The path to de-industrialization can be complex, however, when the big nation is also relatively capital abundant. To trace out the full path, we introduce a delocation metric, $s_n - s_K$. This metric ranges from zero with no delocation (i.e., when nations are autarkic in terms of both trade and capital flows) to $1 - s_K$ when complete delocation has occurred (i.e., when $s_n = 1$). From (5), with *X*-trade restricted by a common ϕ, we find the delocation metric varies with size and factor endowment differences. Specifically:[3]

$$s_n - s_K = \left(s_I - \frac{1}{2}\right)\frac{2\phi^G}{1 - \phi^G} - \kappa; \qquad \kappa \equiv \frac{s_K - s_L}{\mu}, \tag{6}$$

where ϕ^G is the common ϕ and κ is a measure of the West's relative capital abundance. As before, this expression holds for interior solutions of s_n; outside this parameter space the metric equals zero or κ in an obvious manner. In particular, the metric always equals $1 - s_K$ at some ϕ sufficiently close to unity. Expression (6) illustrates the two fundamental forces driving delocation in this model: the local-competition effect and the market-size effect. Intuition is served by isolating them with the following two thought-experiments.

If nations had prohibitive trade barriers in *X* (i.e., $\phi^G = 0$), but trade in *Y* and capital were free, firms would flow from the capital-abundant West to the capital-poor East. This tendency of capital to move eastward is called the 'competition

3 This holds for interior solutions of s_n, in other words, when $\phi^G < (1/s_I) - 1$. For ϕ^G below this, $s_n = 1$.

effect,' since other things being equal, firms would rather be in the country with less competition. Because operating profits are proportional to sales, the key indicator of competition is the unit of local expenditure per firm. The delocation of firms continues, therefore, until national expenditure-to-n ratios are equalized and the delocation metric equals κ. Observe that the pure competition effect does not interact with trade costs. It does not interact with size in the sense that the same degree of delocation would result if nations were symmetric in size but had asymmetric relative factor endowments. We can therefore loosely associate the competition effect with factor endowment differences.

To isolate the second effect – the size effect – consider countries with identical relative endowments (i.e., $s_K - s_L = 0$ and hence $\kappa = 0$), non-prohibitive trade barriers (i.e., $0 < \phi^G < 1$), and unequal sizes. By inspection of (6) with $\kappa = 0$, delocation of Eastern firms to the West is exactly proportional to the extent that the West's income share exceeds 1/2. The factor of proportionality is monotonically increasing in openness (i.e., ϕ^G) and it always exceeds unity. Consequently, the bias in West's share of world industry is greater than the bias in West's size (since $2\phi^G/(1-\phi^G) > 1$). This result is reminiscent of the Krugman (1980) home market effect.

Because $2\phi^G/(1-\phi^G)$ increases without bounds as ϕ^G approaches unity, there exists a level of symmetric trade free-ness – call it ϕ' – that leads to the 'core-periphery outcome,' where the small country is entirely specialized in Y and $s_n = 1$. The particular level is

$$\phi' = \frac{\mu\sigma}{\sigma s_L + \alpha\mu s_K} - 1. \tag{7}$$

Note two facets of (7). First, the first right-hand term equals $1/s_I$, so the level of trade free-ness necessary to produce the core-periphery outcome depends only on relative size. Second, there does not exist any $\phi^G \in [0,1]$ where the large country has no industry.

Clearly, progressive symmetric liberalization between different-sized nations with symmetric factor endowments eventually de-industrializes the small country. Such liberalization among nations with different factor-endowment ratios, however, eventually leads to delocation from the capital-rich to capital-poor nation. We turn now to the welfare effects of this delocation for the case of general size and factor-endowment asymmetries.

3.2. Welfare analysis: gains despite delocation

The welfare yardsticks employed are the indirect utility functions of West and East. They are

$$\begin{aligned} \nu &= E\big(n^G s_I(1+\phi^G)\big)^{\frac{\alpha}{\sigma-1}} \left(\alpha\mu L^G(\tau^G - 1)\,\frac{1 - s_I(1+\phi^G)}{1-\phi^G}\right)^{\Omega} \\ \nu^E &= E\big(n^G(1-s_I)(1+\phi^G)\big)^{\frac{\alpha}{\sigma-1}} \left(\alpha\mu L^G(\tau^G - 1)\,\frac{s_I - (1-s_I)\phi^G}{1-\phi^G}\right)^{\Omega}. \end{aligned} \tag{8}$$

The West's function has three elements. The first term, E (equal to $s_I \mu L^G$ in equilibrium), is unaffected by capital mobility and/or trade liberalization, since L is immobile, profits are repatriated, and r is unaffected by ϕ^G. The second term, which depends upon n^G, s_I, and ϕ^G, captures the net impact of the Venables effect (i.e., delocation's impact on the price index; see Venables 1987) and the direct gain from unilaterally liberalizing imports. The final term captures tariff revenue effects.

If tariff revenue plays a negligible role in national welfare calculations, as is the case in all OECD nations (e.g., if Ω is zero), (8) shows that both nations gain from any degree of reciprocal liberalization, despite any ensuing delocation. This is true, since with $\alpha/(\sigma - 1) > 0$, liberalization (i.e., $\mathrm{d}\phi^G > 0$) raises the product of the first two terms in both ν and ν^E. The result is easy to understand for the West, since both the Venables effect and the direct gain from liberalizing imports serve to lower the Western consumer price index. The positive gain for the East, however, is less intuitive. The Eastern price index can be written as $(\phi^G s_n + 1 - s_n)^{\alpha/(1-\sigma)}$. The direct liberalization effect, $d\phi^G > 0$, lowers the price index. By contrast, the Venables effect, which stems from the fact that $\partial s_n/\partial \phi^G > 0$, tends to raise the price index, since Eastern consumers are forced to pay for trade barriers on a larger fraction of their purchases. When both nations liberalize, however, the rate of delocation is insufficient to induce an overall loss to the small nation (the East).

When tariff revenue is not negligible, the liberalization-induced change in tariff revenue complicates matters. For the West, the tariff-revenue loss is unambiguously negative since both the rate and the tax base (i.e., number of X varieties imported) fall as the ϕ-ness of trade rises. For the East, the tax rate reduction tends to be offset by the increase in the range of X varieties imported from the West, so the usual Laffer-curve non-linearity arises. Moreover, given the multiplicative manner in which Z enters utility, extreme levels of ϕ produce zero utility.[4] In any case, we can say that if tariff revenue is sufficiently unimportant (i.e., Ω is small enough), then both nations gain from symmetric liberalization.

4. Trade liberalization without delocation

Because we have seen that symmetric market opening is good for both large and small nations (abstracting from tariff revenue considerations) despite any liberalization-induced delocation, small-country fears of liberalization may seem misplaced. Nevertheless, it is a simple fact that many policymakers around the world view de-industrialization per se as unfavourable. This may reflect sophisticated concerns, such as technological externalities and national security issues, which are excluded from our simple model. It may also reflect political economy factors that lead policymakers to judge outcomes by a measure other than national welfare. Be that as it may, this section takes the desire to avoid de-industrialization

4 To deal with this formally, we could assume that Z never falls below a small positive level, even with zero tariff revenue. This would introduce complications in to formulas without providing any compensating insight.

as a primitive and investigates the nature of trade-barriers asymmetries that would be necessary to allow liberalization without delocation.

To make the argument as clean as possible we work with an exaggerated form of policymakers' concern about delocation. That is, we assume that nations coordinate their tariff cutting in a manner that allows both partners' barrier to fall from infinite to zero without any delocation. Of course, real-world policymakers operate with many goals and constraints ignored here, but the extreme form highlights the novel aspects of asymmetric liberalization that are aimed, at least in part, at reducing delocation.

It is easy to see that asymmetric protection can influence the location of firms. To take an extreme case, prohibitive barriers in the small nation would ensure that at least some *X*-production remained in all cases. More generally, however, the tendency of firms to relocate to the large market is driven by their desire for better market access. Since trade barriers can affect the amount of access available in each location, asymmetric protection may alter the relative attractiveness of the two locations.

Specifically, we shall assume that both levels of trade free-ness, ϕ and ϕ^E, will be brought from zero (prohibitive *X*-sector barriers) to unity (free trade), but that asymmetric ϕs are allowed during the transition. Our task is to characterize the trade barrier asymmetry that is necessary to ensure that *no* delocation occurs, that is, to ensure that each region keeps the number of firms it has in autarky. The autarky level is a convenient benchmark that simplifies calculations. Working with some arbitrary, initial distribution of industry would complicate the analysis without introducing any important considerations. In the case of the EU-CEEC liberalization, this starting point is not entirely unrealistic, since both East-West capital and trade flows were relatively small before the 1990s.

Formally, we characterize the levels of ϕ and ϕ^E necessary to keep

$$s_n = s_K, \quad s_n^E = s_K^E \tag{9}$$

during the whole trade liberalization process. As will become clear, what counts is the relative importance of the ϕs, not their levels. Hence, we treat the West's liberalization path (namely, the level of ϕ at any point in time) as exogenous and focus on the corresponding level of ϕ^E that is necessary to prevent delocation. Since we are working with a static model, time plays no explicit role in the analysis. While this prevents us from looking at many interesting issues – for example, adjustment costs – it allows us to parsimoniously highlight the key links between asymmetric barriers and delocation.

4.1. The general rule

Substituting (9) into (5) and using (4) yields the no-delocation level of ϕ^E that corresponds to any given ϕ. We write this as

$$1 - \phi^E = \left(\frac{s_I}{s_K(1-\phi) + (1-s_I)\phi} \right)(1-\phi). \tag{10}$$

Note that all right-hand side variables are independent of ϕ^E and that s_I and s_K depend only on endowments and parameters. Thus, the no-delocation path for ϕ^E is dictated by the West's path of liberalization (taken to be exogenous).

Three general results are immediately available. First, the left-hand side can be taken as a measure of the remaining distance to free trade ($\phi^E = 1$ under free trade). Second, the right-hand side of the expression is everywhere decreasing in ϕ, so the no-delocation-rule implies that the two levels of openness must move in the same direction. In other words, the no-delocation-rule never requires the East to respond to Western liberalization with a *rise* in Eastern barriers. Third, if the two trading areas are identical ($s_K = s_L = s_I = 1/2$), the no-delocation-rule requires symmetric liberalization.

Considering special cases provides further insight. We first consider size asymmetries in isolation by supposing that nations have equal relative endowments ($\kappa = 0$) but West is larger ($s_I > 1/2$). Under these provisos, (10) simplifies to

$$1 - \phi^E = \frac{s_I}{s_I(1-\phi) + (1-s_I)\phi}(1-\phi). \tag{11}$$

By inspection of this expression, $\phi^E = \phi$ in only two cases: when barriers are prohibitive (both ϕs are zero) and when trade is perfectly free (both ϕs are unity). Between these two extreme cases, the convexity of the right-hand side of (11) implies that in the size-difference-only case, Western barriers should always be lower than Eastern barriers until free trade is reached. The convexity also implies that the protection asymmetry must be greatest at intermediate values of ϕ.

To understand this result intuitively, note that delocation at very high barriers is less advantageous, since the migrating Eastern firms face very large barriers when re-exporting to the small Eastern market. Delocation at very low barriers brings few advantages, since, with low barriers, the degree of competition is almost as high in the East as it is in the West. Consequently, the incentives to delocate are strongest for intermediate levels of trade cost. Offsetting these forces requires very asymmetric barriers.

The second special case highlights factor-endowment asymmetries by considering countries of equal size but allowing West to be relatively capital abundant ($\kappa > 0$). In this case, the implied protection asymmetry is reversed. When $s_I = 1/2$ but $\kappa > 0$, the ratio of closed-ness, namely $(1-\phi^E)/(1-\phi)$, must be equal to $[1 + 2\kappa(1-\phi)]^{-1}$. Since the latter is always less than unity, the no-delocation-rule requires the East to be more open than the West. Intuitively, the lack of size differences means that the only force operating is the decentralizing competition effect. That is, with no market-size advantage to attract firms to the Western market, Western capital tends to shift to the East in order to reduce its exposure to competition. Offsetting this tendency requires Western barriers to exceed those of the East.[5]

5 A similar result can be found in the three-nation endogenous growth model of Martin and Ottaviano (1996).

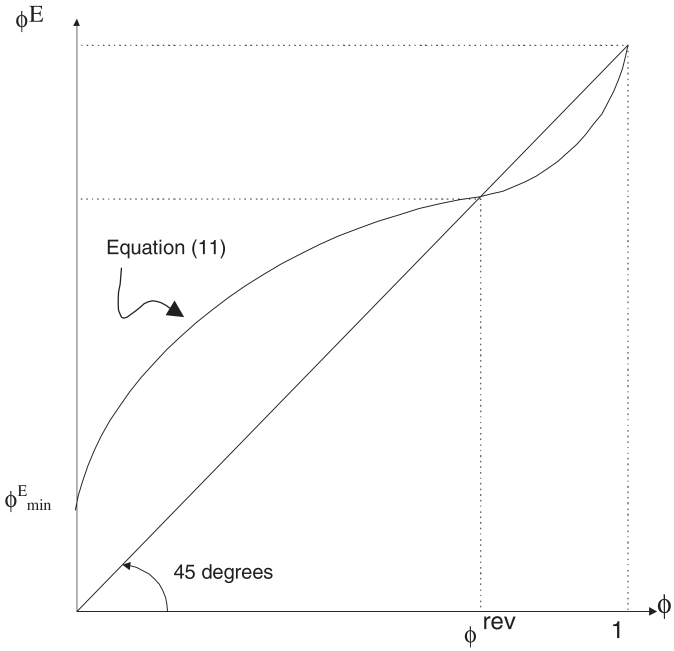

FIGURE 1 The rule for no-delocation

Finally, consider what we might be called the ‘European case’ of $s_I > 1/2$ and $\kappa > 0$, that is, where the West is larger and relatively capital abundant. Here, the competition and size effects work in opposite directions, yet the relative strengths of the two effects vary with ϕ.[6] Consequently, the prevention of delocation requires the East to maintain *lower* barriers than West in the first phase of liberalization (i.e., when Western barriers are high) but to maintain *higher* barriers in the final phase (i.e., when Western barriers are sufficiently low). This relationship is summarized graphically in figure 1.

To characterize the rule more precisely, we focus on two specific levels of ϕ^E. First, note that Eastern trade barriers never need to be infinitely high, even when Western barriers are. Specifically, when $\phi = 0$, $\phi^E \equiv \kappa/(s_I + \kappa)$. This minimum level of Eastern openness provides a handy landmark, so we denote it as $\phi^E_{\min}$. Second, from (11) there is some intermediate value of ϕ, call it ϕ^{rev} (mnemonic for ‘reversal’) where the competition effect just offsets the size effect. At this point, the East’s import barriers on industrial goods must exactly equal those of the West in order to prevent delocation. For freer levels of trade barriers, the East’s barriers

6 Specifically, we showed in section 3 that the competition effect does not depend upon ϕ, but size-effect’s strength grows with ϕ.

must be *above* those of the West to prevent Eastern firms from moving Westward. To find ϕ^{rev} formally, we look for the fixed point in (11), namely,

$$\phi^{rev} = \frac{\kappa}{2(s_I - 1/2) + \kappa}. \tag{12}$$

Several aspects of (12) are worth pointing out. First, ϕ^{rev} is never smaller than $\phi^{E}_{\min}$ and they coincide at zero when $\kappa = 0$. Thus, when nations have identical relative endowments, the no-delocation combination of ϕ and ϕ^E lies strictly below the 45°-line for $\phi \in (0,1)$. In words, this says that relative endowment differences are a necessary and sufficient condition to get reverse asymmetry (i.e., the situation where East must be more open than the West). Second, if the only difference between the two countries is that West is relatively capital abundant, then there always exists an incentive for some West firms to delocate to the East. This incentive is stronger, the larger are the trade barriers. Finally, note that both ϕ^{rev} and $\phi^{E}_{\min}$ are increasing with κ and decreasing with s_I. This means that delocation in the large, capital-abundant country is more likely when capital-labour ratios are close to each other and/or when its market size is larger.

4.2. Welfare analysis

We now evaluate this asymmetric no-delocation liberalization scheme against two possible benchmarks. The first of these is the 'no liberalization' case. This may be somewhat extreme, but for many years developing nations refused trade liberalization at least in part because they feared that symmetric liberalization would eliminate the un-competitive industries that had be created by import-substitution policies. The second benchmark, the 'symmetric trade liberalization' studied in section 3, is perhaps a more natural point of reference. To avoid a proliferation of special cases, we focus on the 'European' case, where West is larger and relatively capital abundant.

The first benchmark is simple to use when we abstract from the welfare impact of tariff revenue (i.e., $\Omega = 0$). Here, only one effect distinguishes asymmetric trade liberalization from autarky – the direct gains from unilateral trade liberalization. Both with and without liberalization, the Venables effect (i.e., the impact of delocation on local price indices) is absent. We can directly assert, therefore, that even partial asymmetric liberalization of the no-delocation type is welfare improving with respect to isolation.

The second benchmark is more involved. To fully compare asymmetric and symmetric trade liberalization, one would have to account for the speed of liberalization. For instance, at one extreme, a 'big-bang' autarky-to-free-trade liberalization makes the issue of delocation irrelevant (location is indeterminate when all trade is costless). Including these issues, however, complicates the analysis without providing much compensating insight. We chose, therefore, to take as our metric the difference in Eastern utility levels under the no-delocation scheme and the symmetric liberalization scheme *at any given level of Western openness*.[7]

For the West, the individual indirect utility function depends directly on ϕ and indirectly on ϕ and ϕ^E via s_n (see (5) for the exact relationship); ν can be expressed implicitly, therefore, as $\nu[s_n(\phi, \phi^E), \phi]$. Under the symmetric-liberalization benchmark, which we denote as ν_s, the level of ν is given by $\nu[s_n(\phi^G, \phi^G), \phi^G]$, where ϕ^G is our notation for the common level of trade free-ness. Under the no-delocation-rule, Western utility, which we denote as ν_a, is given by $\nu[s_K, \phi]$ since in this case s_n always equals s_K. Analogous functions, $\nu_a^E[\cdot]$ and $\nu_s^E[\cdot]$ can be defined for Eastern utility levels.

To streamline the expressions, we take the ratios of the utility levels, namely, $\Delta \equiv \nu_a/\nu_s$ and $\Delta^E \equiv \nu_a^E/\nu_s^E$. The asymmetric no-delocation policy is preferred only when the Δs exceed unity. Dropping the G-superscript and using (8), (10), and (4), we get

$$\Delta = \frac{\nu_A}{\nu_S} = \left(\frac{1 - s_K}{1 - s_n}\right)^{\Omega} \left(\frac{s_I(1+\phi) - \dfrac{\kappa(\phi - \phi^{rev})}{\phi^{rev}}}{s_I(1+\phi)}\right)^{\frac{\alpha}{\sigma - 1}} \tag{13}$$

As before, we first consider the case where tariff revenue has a negligible impact on welfare, that is, $\Omega = 0$. This could reflect the fact that most of the liberalization concerned non-tariff barriers (as is often the case in Europe) or the fact that tariff revenue is a negligible fraction of national income. In either case, only the second term in (13) matters. Since its exponent is positive, $\Delta > 1$ – that is, the large nation prefers the no-delocation scheme to symmetric liberalization – if and only if $\kappa(\phi - \phi^{rev})/\phi^{rev}$ is negative. From (12), we know that ϕ^{rev} lies between zero and unity in the 'European' case, so $\kappa(\phi - \phi^{rev})/\phi^{rev}$ definitely changes sign in the $\phi \in [0,1]$ range. The large, rich country prefers symmetric liberalization at high levels of trade free-ness. The switchover in ranking occurs exactly at $\phi = \phi^{rev}$.

The intuition for this finding is straightforward. Under symmetric liberalization, West firms migrate Eastward when barriers are very high (in order to avoid competition), but Eastern firms shift to the West when barriers are sufficiently low. According to the Venables effect, the Eastward delocation harms Western welfare while the Westward delocation benefits the West. Since the no-delocation scheme shuts off the Venables effect, West prefers the no-delocation scheme when trade barriers are high (ϕ is low), but prefers symmetric liberalization when barriers are low. Note that as factor-endowment differences between nations disappear (i.e., κ limits to 0), the reference point ϕ^{rev} approaches zero and $\kappa(\phi - \phi^{rev})/\phi^{rev}$ limits to

7 To account for the speed of liberalization, we would integrate the discounted difference over the liberalization period, taking ϕ as a function of time.

$2\phi(s_I - 1/2)$. In this case, where size is the only asymmetry, the large country always fares better under the symmetric liberalization scheme.

If we allow tariff revenue to matter, the finding may change. The first term is the ratio of varieties produced in East (and thus imported by West). As we saw above, symmetric liberalization produces West-to-East delocation for low levels of trade free-ness but East-to-West delocation for high levels of ϕ. Thus, the ratio of varieties is larger than unity when $\phi > \phi^{rev}$ and the reverse is true for $\phi < \phi^{rev}$. What this means is that the revenue effect mitigates, and may reverse, the large country's preference for symmetric liberalization when ϕ is high. The interaction of the main effect and the tariff revenue effect is complicated and not very interesting. We can say, however, that if Ω is sufficiently small, namely, $\Omega < \alpha/(\sigma - 1)$, tariff revenue considerations will not reverse the large country's ranking.

Plainly, the overall welfare comparison of the two schemes would, in the general case, require more detailed information on the time path of ϕ. For instance, suppose, as is often the case, that the liberalization process lowers barriers rapidly in the beginning but slowly at the end. In this case, the West could lose in welfare terms from the no-delocation scheme.

The ratio for the East can be written as

$$\Delta^E = \left(\frac{\tau_A^E - 1}{\tau - 1}\frac{s_K}{s_n}\right)^{\Omega}\left(\frac{(1-s_I)(1+\phi) + \dfrac{\kappa(\phi - \phi^{rev})}{\phi^{rev}} - \Gamma}{(1-s_I)(1+\phi)}\right)^{\frac{\alpha}{\sigma-1}};$$

$$\Gamma \equiv \frac{s_K(1-\phi)\dfrac{\kappa(\phi-\phi^{rev})}{\phi^{rev}}}{s_I - \dfrac{\kappa(\phi-\phi^{rev})}{\phi^{rev}}}. \tag{14}$$

The first left-hand term reflects the ratio of tariff revenue collected under the liberalization schemes. Unlike the expression for Δ, the tariff rates do not cancel out, owing to (11). The Γ term, which has no counterpart in (13), captures the direct Eastern welfare impact of having a higher or lower tariff under the no-location scheme. Γ does not appear in (13) owing, of course, to the fact that protection in this model is not a zero-sum game.

Abstracting from tariff revenue effects and Γ, we could immediately say that the small country's welfare ranking is exactly opposite to that of the large country. That is, the small country would prefer the symmetric scheme whenever the large country preferred the asymmetric one and vice versa. As it turns out, this statement is true, even allowing for Γ, but its demonstration is somewhat involved. We turn first to signing Γ. The denominator of Γ can be rewritten as $(s_I + \kappa)(1-\phi) + \phi(1-s_I)$ with the help of (12). This is clearly positive, so the sign of Γ depends only on its numerator's sign. By inspection, therefore, Γ is positive for $\phi > \phi^{rev}$ but negative for $\phi < \phi^{rev}$. Given this, the Γ term tends to dampen the small countries' preferences for symmetric liberalization in the high-barrier region and tends to dampen its preference for asymmetric liberalization in the low-barrier region. We can, however, go beyond this.

Solving $1 - \Delta^E$ for phi, we find that the only two roots are zero and ϕ^{rev}. Thus, the small country's ranking changes only once over the $\phi \in [0,1]$ range (because $0 < \phi^{rev} < 1$ when West is larger and more capital abundant). Moreover, since Γ approaches zero as ϕ approaches its free trade level of unity, we know that in the neighbourhood of free trade, $\Delta^E > 1$. Owing to the single-crossing feature, we can therefore say that $\Delta^E < 1$ for $\phi < \phi^{rev}$ but $\Delta^E > 1$ for $\phi > \phi^{rev}$. In words, the East prefers the symmetry rule when trade is very restricted but prefers the no-delocation rule when barriers are low. Again, the dividing line is ϕ^{rev}.

As it is with Δ, much of the complexity of Δ^E stems from factor-endowment differences. As κ limits to zero – and $\kappa(\phi - \phi^{rev})/\phi^{rev}$ limits to $2\phi(s_I - 1/2)$ – we find that Δ^E is always greater than unity and Δ is always less than unity. In words, when there is only a size asymmetry between them, the rankings of large and small countries do not change with ϕ. In terms of welfare, the large country prefers the symmetric liberalization scheme, while the small country prefers the asymmetric scheme. Of course, as discussed above, the large nation may still prefer the no-delocation scheme on grounds that are not reflected in our simple aggregate welfare calculation.

Allowing for tariff revenue consideration complicates the analysis somewhat. For instance, consider the ratio of East's tariff revenue under the asymmetric scheme to its revenue under the symmetric scheme. When barriers are high (i.e., $\phi < \phi^E$), East's tax base is larger with asymmetry than with symmetry, but its tax rate is larger under symmetry. Thus, determining when the tariff revenue ratio is greater than or less than unity is not a simple matter. As it turns out, the ratio of tax bases, namely, s_n with symmetry from (5) to s_K is fairly simple. The ratio of tariff rates, however, is highly non-linear, involving the power $1/(1 - \sigma)$. To cut through the complexity we work with a Taylor expansion of the tariff rate ratio evaluated at the critical ϕ^{rev}. The result, together with the expression for s_K/s_n, is

$$\frac{\tau^E - 1}{\tau - 1} = 1 + \frac{\kappa(1 - \phi^{rev})}{s_I \phi^{rev}}\left(\frac{\tau - \tau^{rev}}{\tau - 1}\right),$$

$$\frac{s_K}{s_n} = \frac{(s_I - \kappa)(1 - \phi)}{\kappa(1 - \phi^{rev}) + (s_I - \kappa)(1 - \phi)}. \tag{15}$$

By inspection, both expressions – and the product of the two – exceed unity when $\tau > \tau^{rev}$.

Consequently, we see that the tariff revenue tends to reverse results from above. That is, ignoring tariff revenue issues (i.e., taking Ω close to zero), we showed that East prefers asymmetry when trade is quite free (namely, $\phi > \phi^{rev}$), but prefers symmetry when trade was quite restricted. Here, we see that when only tariff revenue is considered, East prefers symmetry when trade is quite free but asymmetry when trade was quite restricted.

Of course, if tariff revenue is not very important in the welfare calculations, then tariff-revenue considerations will not overturn other factors. A natural sufficient condition is that $\Omega < \alpha/(\sigma - 1)$.

4.2.1. Global welfare analysis

Another natural question concerns total world welfare. To keep things simple we abstract from tariff revenue considerations.[8] Let us define the world welfare measure as the simple sum of East and West utility levels, that is, $V^G[\phi, \phi^E] = \nu[\cdot] + \nu^E[\cdot]$. As before, we compare the liberalization schemes by taking the ratio of V^G evaluated under the asymmetric and symmetric liberalization rules. The ratio is

$$\Delta^G \equiv \frac{\nu_a^G[\phi^E(\phi)]}{\nu_s^G[\phi]} = \lambda\Delta + (1-\lambda)\Delta^E;$$

$$\lambda \equiv \frac{s_I^{\sigma/(\sigma-\alpha)}}{s_I^{\sigma/(\sigma-\alpha)} + (1-s_I)^{\sigma/(\sigma-\alpha)}}. \qquad (16)$$

Given the non-linearity of (16), there are few analytical results available. First, when $\phi = \phi^{rev}$, Δ^G equals unity, since both Δ and Δ^E do (as we showed above). Moreover, numerical simulations (available from authors upon request) show that Δ^G exceeds unity for $\phi < \phi^{rev}$. In words, for this range of trade free-ness, we find that an asymmetric liberalization can be a good idea from a global utilitarian point of view. This means that there are particular circumstances when the no-delocation rule, teamed with international income transfers, could be Pareto improving. In this range, however, the asymmetry prevents delocation of firms from the large nation to the small (since the competition effect outweighs the market-size effect when $\phi < \phi^{rev}$). In the range of ϕ that is more relevant to the sort of arrangements discussed in the introduction, namely, where $\phi > \phi^{rev}$ (and asymmetry blocks incipient small-to-large delocation), we find that Δ^G is less than unity. In other words, symmetric liberalization is superior from a global perspective, although asymmetry may be adopted for political reasons.

We turn next to evaluating an alternative policy – namely, international income transfers – that could yield the same no-delocation effect as asymmetric protection.

5. Avoiding delocation via international transfers

Particularly in Europe, but also elsewhere, economic disparities are viewed as a danger to social and political cohesion. Reflecting this, the European Union (EU) spends about 30 per cent of its budget on so-called structural programs that are

8 When tariff revenue considerations are allowed, numerical simulation reveals that global welfare results are very sensitive to parameter values, especially σ and Ω.

aimed at encouraging economic activity in Europe's peripheral and disadvantaged regions. When it comes to extra-EU transfers, the Union is much less generous, but it applies the same logic in the form of, for example, its PHARE program spending in Central and Eastern Europe. It seems natural, therefore, to investigate the magnitude of transfers that would be necessary to offset delocation. As we shall see, the size of the required transfers would appear to make this solution infeasible.

Throughout this section, we abstract from tariff-revenue considerations by viewing the barriers as frictional barriers. Let us define international transfers, T, in units of Y that the West gives to the East. Transfers alter aggregate expenditure patterns, and since the equilibrium price of Y is unity, we have

$$E_{net} = L + rK - T, \quad E^E_{net} = L^E + rK^E + T. \tag{17}$$

Our task is to characterize the level of T that is necessary to allow liberalization without delocation, in the sense of (9). To focus on key issues, we consider only symmetric, reciprocal liberalization, as in section 3, so $\phi = \phi^E = \phi^G$. Using (17) to define the West's post-transfer relative market size (i.e., $[E - T]/E^G$), plugging the result into (5), and imposing the no-delocation condition (9) endogenizes T as a function ϕ^G. It proves convenient to express this endogenous transfer as a share of global income E^G:

$$t = \frac{\kappa(\phi^G - \phi^{rev})/\phi^{rev}}{1 + \phi^G}; \qquad t \equiv \frac{T}{E^G}. \tag{18}$$

Observe that the necessary transfer is negative for low levels of trade free-ness – specifically for $\phi < \phi^{rev}$ – but positive for high levels of openness. This is intuitively obvious, given the section 4 results; the competition effect dominates with high barriers (so firms would tend to move Eastward) but the market-size effect dominates with low trade barriers (so firms would tend to move Westward).

As before, the expression is simplified in the size-asymmetry-only case (i.e., when κ and thereby ϕ^{rev} are zero), namely, (18) becomes $t = 2(s_I - 1/2)\phi^G/(1 + \phi^G)$. Here, we see that the size of the required transfer is increasing with trade free-ness for all ϕ^G.

5.1. Feasibility

To get some idea of the massiveness of the implied transfers, consider (18) in the neighbourhood of free trade when the nations differ only in terms of size. In this case, the required t approximately equals $(s_I - 1/2)$, so the implied T as a fraction of Western income is $(s_I - 1/2)/s_I$. If the West's pre-transfer income were three-quarters of world income, then the West would have to transfer one-third of its income to the East in order to stymie Westward delocation. Since this is roughly equal to the existing tax burden in advanced industrialized nations, the transfer scheme would require a radical reorientation of spending policies or a hefty tax rise. The least we can say is that it is difficult to imagine that the population of rich countries would agree to pay such a price for allowing trade integration to proceed without delocation.

6. Conclusion

Small and poor nations often fear that free trade agreements with larger, richer nations will erode their industrial base. Although the reverse concern also can be heard, large, rich nations often implicitly recognize the concerns of their smaller partners by allowing the small nation to maintain higher trade barriers during the transition to free trade. In Europe, this principle is explicitly incorporated in the Europe Agreements (the EU phased out its tariffs more rapidly than the Central and Eastern European countries, although both go to zero). In other cases, the asymmetry occurs automatically. Under the U.S.-Mexico FTA, for example, progressive tariff cuts are specified as percentages of the remaining tariff levels. Although these percentage cuts are symmetric, Mexican tariffs on U.S. exports were initially four times higher (on average) than U.S. barriers against Mexican exports. As a result, Mexico's tariff levels will be higher than those of the United States during the entire transition phase (both eventually go to zero on most products).

In this paper we posit a two-nation model that allows us to take the delocation fears of small and large countries seriously. In our model, a progressive liberalization that is symmetric in levels leads to delocation of industry from the small country to the large country – eventually leaving the small nation without industry. The delocation is not monotonic, however, when the big country is also relatively well endowed with capital. In particular, when trade barriers are quite high, delocation occurs from the rich nation the poor nation, since the pro-dispersion local-competition effect outweighs the pro-agglomeration market-size effect. Furthermore, we show that if tariff-revenue effects are negligible, such a market opening is good for both nations despite any liberalization-induced delocation. Nevertheless, many policymakers view de-industrialization per se as unfavourable. This may reflect sophisticated concerns, such as technological externalities and national security issues, which are excluded from our simple model, or it may reflect political economy factors.

Taking the desire to avoid delocation to heart, we use our model to derive how asymmetric protection levels would have to be to prevent delocation during a gradual move to bilateral free trade. We show that when trade is already quite free, the liberalization-without-delocation scheme requires that the small nation maintain higher barriers than those of the large nation (since in this range of trade free-ness the market-size effect dominates). The asymmetry, however, is reversed (the big, rich nation needs higher barriers) when trade barriers are sufficiently close to prohibitive, since the local-competition effect dominates. From a welfare point of view – abstracting from tariff revenue effects – the no-delocation liberalization scheme is always superior to no liberalization, but the comparison with symmetric liberalization is more complex. At high levels of protection, the large nation prefers the asymmetric scheme, while the small country prefers the symmetric one. At low protection level, which seems to correspond more closely to modern trade barrier levels, the small country prefers asymmetry, while the large country prefers symmetry. This suggests that there is an element of 'enlightened altruism' in large countries' willingness to pursue asymmetric liberalization.

We also consider the scope for using international transfers – rather than asymmetric protection – for avoiding delocation. Since the required transfers are huge, this approach seems infeasible.

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