Trading Arrangements and Industrial Development

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This article outlines a new approach for analyzing the role of trade in promoting industrial development. It offers an explanation as to why firms are reluctant to move to countries with lower labor costs and shows how trade liberalization can change the incentives for firms to locate in developing countries. It models economic development as the spread of concentrations of firms from country to country. Different trading arrangements may have a major impact on this development process. By changing the attractiveness of countries as a base for manufacturing production, they can potentially trigger—or postpone—industrial development. The analysis shows that unilaterally liberalizing imports of manufactures can promote industrialization but that membership in a preferential trading arrangement is likely to create larger gains. South-South preferential trading arrangements will be sensitive to the market size of member states, while North-South arrangements seem to offer better prospects for participating southern countries, if not for excluded countries.

How do different trading arrangements influence the industrialization process in developing countries? Can preferential trading arrangements (PTAs) be superior to multilateral liberalization or, at least, be an alternative when multilateral liberalization proceeds slowly? If so, what form should the PTAs take? Should developing countries seek PTAs with industrial countries or among themselves?

Traditional analysis answers these questions using the ideas of trade creation and trade diversion. For example, consider two developing countries. Based on their comparative advantage, they each produce agricultural products and a different manufactured good, export only agricultural products, and import manufactured goods from an industrial country. Can a PTA between these developing countries promote industrialization? The answer is yes: they can trade their manufactures instead of importing them from the industrial country. The two countries will increase their production of manufactures through trade diversion. The PTA and consequent trade diversion may reduce welfare if they create regional import substitution (see de Melo, Panagariya, and Rodrik 1993).

The problem with this analysis is that it starts by assuming a pattern of comparative advantage. In the initial situation, the analysis assumes that the devel-
oping countries import manufactures only because the industrial country has a comparative advantage in manufactures. Given this assumption, the analysis concludes that PTAs promote industrialization in the developing countries by working against their comparative advantage. In sharp contrast, the apparently changing comparative advantage of newly industrialized countries suggests the need for an analysis of potentially flexible comparative advantage, in which developing countries can develop and converge to industrial economies in both income and economic structure.

How can we extend the analysis to allow for the dramatic changes in relative income and in industrial structure that have occurred in some developing countries? One way is to build a model of trade and growth and then see how trading arrangements change the incentives for factor accumulation and hence countries' rates of growth and relative factor endowments. Although a small literature analyzes the growth effects of PTAs, the writings in this area do not yet have sufficient microfoundations to discriminate convincingly between different types of trading arrangements (for a survey, see Baldwin and Venables 1995).

An alternative approach is to suppose that countries have few fundamental differences that generate immutable patterns of comparative advantage. Instead, history determines most of the pattern of trade and development in the world economy. Cumulative causation has created concentrations of industrial activity in particular locations (industrial countries) and left other areas more dependent on primary activities. According to this approach, economic development can be thought of as the spread of these concentrations from country to country, and different trading arrangements may have a major impact on this development process. By changing the attractiveness of countries as a base for manufacturing production, they can potentially trigger—or postpone—industrial development.

In this article we develop this alternative approach and illustrate how trading arrangements can shape economic development. We use building blocks from new trade theory and from somewhat older development economics. As in new trade theory, we focus on the location of firms using technologies with increasing returns and operating in imperfectly competitive environments. From development economics, we take the ideas of forward and backward linkages between firms. Combining these linkages with imperfect competition creates pecuniary externalities between firms, thus providing the mechanism for cumulative causation. The pecuniary externalities support existing agglomerations of industrial activity and provide a mechanism for the "takeoff" of newly industrializing economies.

Throughout the article, we concentrate exclusively on the trade flows generated by these agglomeration forces and assume that countries have no underlying differences in technology or relative factor endowments. This is clearly an extreme position that abstracts from traditional comparative advantage. By abstracting from such differences, we do not mean to suggest that they are not important. Rather, we seek to focus on the way in which agglomeration forces
can determine industrial location and on how trade policy may change this determination.

Section I provides an overview of the analytical framework, and the appendix presents more detail. Section II runs through a series of experiments, simulating the effects of different trading arrangements on the industrialization process and showing how alternative arrangements can lead to quite different patterns of development. It shows how trade liberalization may have dissimilar impacts on similar member economies, creating internal tensions within a PTA. Section III draws out the policy implications of our findings and discusses evidence of the empirical relevance of the forces captured by this framework. Section IV summarizes the main conclusions.

I. ANALYTICAL FRAMEWORK

This section provides an informal overview of the key features of the model; the appendix gives further details. We assume that each country may have two sectors—agriculture and industry. The agricultural sector is a perfectly competitive commodity sector. It produces output using a sector-specific factor (land) and a sectorally mobile factor (labor). For simplicity we assume that the agricultural product is traded freely. A more realistic model of the agricultural sector including trade costs would not alter the main results of the article but would shift the focus away from our main concern here, the effects of trade policy on industrialization. Fujita, Krugman, and Venables (1997) explore the effects of agricultural trade costs in a model of this type. We also assume that agriculture does not use intermediates; Pande (1997) relaxes this assumption.

We focus the analysis on the other sector, industry, although the two sectors interact in general equilibrium. As industry relocates, agriculture adjusts to release or absorb labor and to maintain balance of payments; the wage in a country is higher, the smaller is that country’s agricultural employment.

The industrial sector takes the form of a monopolistically competitive industry in which firms produce differentiated products. We model this as Dixit-Stiglitz (1977) monopolistic competition, in the form applied to international economics by Helpman and Krugman (1985) and others. We generalize the model to include intermediate goods, along the lines of Krugman and Venables (1995) and Puga and Venables (1996, 1997). That is, each firm’s output is used both as a final good and as an intermediate good, and each firm uses as inputs both labor and the output of other firms. The presence of intermediate goods combined with imperfect competition generates the forward and backward linkages that are central to our approach. Rather than working with a full input-output structure (as in Puga and Venables 1996), we work with a single aggregate sector that uses its own output as input. Corresponding to our assumption that there is a single manufacturing sector, there is also a single trade policy instrument—tariffs on imports of the manufactured goods.
Firms enter and exit in response to short-run profit opportunities, giving a long-run zero profit equilibrium that determines the level of industrial activity in each country. Four forces determine the short-run profitability of firms in a particular country. The first is factor market competition. A country that has a lot of industry will have higher wages, reducing the profitability of firms. The second is product market competition. Given some trade barriers, other things being equal, a country with more industry will have lower output prices, also reducing profitability. These standard neoclassical forces work to disperse activity and to encourage firms to locate where labor is cheap and where there is little supply from other firms.

The last two forces—cost (forward) and demand (backward) linkages—work in the other direction. Cost linkages occur because having more firms in a location means that more intermediate inputs are available locally, reducing costs and raising short-run profits. Demand linkages arise because having more firms in a location increases intermediate demand, raising the sales and profitability of other firms. Both these forces mean that firms want to set up in the same country as existing firms. They are centripetal forces working to concentrate industry in a single location.

Tension among the four forces determines the equilibrium pattern of location. If the first two forces are more powerful than the last two, then it is generally the case that industry will operate in all locations. This situation represents a standard “new trade theory” world. In this case, the model does not generate a distinction between industrial and developing countries. Assuming that all countries have the same relative endowments, technologies, and preferences, then they all will have similar industrial structures and patterns of trade. Differences in market size may give rise to net trade (see, for example, Krugman 1980).

If the last two forces are more powerful than the first two, then equilibrium will involve agglomeration of manufacturing in a subset of countries. Under these circumstances, the presence of an extra firm will raise the short-run profitability of existing firms in the country. Because firms enter in response to short-run profits, the increased profitability will attract more firms, generating a cumulative process of industrial agglomeration.

In this case, equilibrium will not be unique. The model does not determine in which country or countries the industrial agglomeration will locate. However, equilibria have the property that, without assuming differences in underlying comparative advantage, some countries will have industry and other countries will not. Real income differences are associated with this uneven pattern of industrialization. The countries with industry will be richer for two reasons: the demand for labor in industry raises wages, and the local supply of manufactures reduces the consumer price index. They will also have a larger market, arising both from consumer and intermediate demands. And they will have a better supply of intermediate goods, showing up as a lower price index for these goods. At equilibrium there may be quite large differences in wages and unit labor costs between the industrial and developing countries; however, despite these differ-
ences, it is not profitable for a firm to relocate to a developing country. If a firm were to do so, it would benefit from lower wages and from being the only local supplier in this market (factor-market and product-market competition effects). But it would forgo the benefits of proximity to its suppliers and its industrial customers (the forward and backward linkages).

How does trade liberalization affect this situation? In this model, whether agglomeration occurs depends critically on the level of trade barriers. With extremely high barriers (autarky), agglomeration does not occur; each country must have industry to supply its consumers. And under perfectly free trade, agglomeration does not occur because proximity to industrial suppliers and consumers has no economic significance if trading across space is costless. Agglomeration takes place only when trade barriers are between these extremes. Changing trade barriers may cause agglomerations to develop and to disappear (see Krugman and Venables 1995 and Puga 1998).

In this article, we explore a variety of trade liberalization experiments. Three main mechanisms are at work. The first mechanism has to do with the barriers incurred in exporting from a developing country. Reducing these barriers reduces one of the disadvantages of developing countries and makes it cheaper to export from the developing country to the large industrial-country market. Therefore, we expect to see reductions in import barriers in industrial countries, facilitating the spread of industry to developing countries. The second and third mechanisms have to do with import barriers in developing countries. Opening markets to increased competition from foreign firms in product markets reduces the potential profitability of local firms. But lower import barriers make it cheaper to import intermediate goods and thus raise potential profitability. The combination of these mechanisms often produces an effect that is, in some sense, greater than the sum of the parts. It can trigger cumulative causation, leading to quite large changes in levels of industrial activity. (The model does not allow trade liberalization to change the technology in use or to change the price markups through strategic interaction between firms. As a consequence equilibrium firm scale is constant.)

Different PTAs offer a variety of combinations of reductions in trade barriers that affect differently countries with different amounts of established industry, different wage rates, and markets of different sizes. The next section looks at how the balance among market access, import competition, wage differentials, and linkages is affected by different PTAs. We study whether trade policy can make industry spread to developing countries and, if so, what trading arrangements are most conducive to this spread.

II. TRADING ARRANGEMENTS

In this section, we go fairly rapidly through a set of trade policy experiments and postpone a fuller discussion of policy issues until section III. In all our experiments, we work with four countries, assumed to be of equal size, that is,
having the same factor endowments. We assume values for the parameters such that there is an initial equilibrium in which manufacturing is concentrated in just two of the countries. Within the formal structure of the model, which two countries is indeterminate. We simply label the two countries that have industry North, and the two that do not South. We base the analysis on four countries because for the questions addressed we require two southern economies and because having four countries allows for symmetry between regions. In the general case of a large number of different-size economies, although generally industry will only operate in a subset of countries, there are many possible equilibrium assignments of industry to countries.

We set the following structure of trade barriers between economies. All trade flows in manufactures have an equal level of real trade costs per unit that can be thought of as the costs incurred when doing business at a distance. In the initial equilibrium, we assume that ad valorem tariffs are zero between the two northern economies and positive and equal on all other manufactured trade flows. The distinction between real trade costs and tariffs is that only tariffs generate revenue. Changes in either type of barrier have similar effects on the location of industry. In this section, we report the results of experiments that reduce some or all of the tariff barriers, corresponding to different trade liberalization packages. In all the experiments, we assume that the two northern economies follow identical policies and keep identical economic structures (the reason for this is simply to focus on the South). We consequently refer to the North as a single policymaker.

All the results presented are based on numerical simulations of the model. The appendix discusses the parameter values underlying the simulations. We do not report a systematic sensitivity analysis in the article, but we do comment at a number of points on how changing the model's parameters affects the results. Judging by the research we have undertaken, the qualitative conclusions we present are quite robust.

A series of figures illustrates the outcomes of the experiments. The level of tariffs is denoted $T$, such that $T = 1$ is free trade and $T - 1$ is the ad valorem tariff rate. The initial value, $\bar{T}$, is the same for all manufacturing trade flows involving a southern economy. Liberalization will reduce some (or, in the case of multilateral liberalization, all) of these tariffs, with those not affected by the liberalization held at $\bar{T}$. The figures are constructed by reducing tariffs from their initial level in a series of small steps. At each step, there is a change in the short-run profitability of firms, and we let our entry and exit dynamic work until a new long-run equilibrium is established. The tariff is then reduced at the next step, and the procedure is repeated. The figures therefore trace values of the variables along a stable equilibrium path from the initial equilibrium, and we describe the evolution of the economy along this path. This procedure is necessary because, in general, the model exhibits path dependence.

Each subsection presents a figure with two graphs. In each figure, the first graph plots the share of world industry in each of the two southern economies
against the level of tariffs, and we use this graph to demonstrate the way in which liberalization causes industry to relocate. The second graph plots real income per worker against the level of tariffs. Real wages include tariff revenue (distributed to workers in a lump-sum manner) for the two southern countries and for the North. Real wages change because of changes in the demand for labor, the consumer price index in each country, and level of tariff revenue. The evolution of real wages excluding tariff revenue is similar to that presented in the figures.

**Multilateral Liberalization**

We take as the benchmark case multilateral trade liberalization among all countries. At the initial level of tariff barriers, \( T = 1.15 \) for all North-South and South-South trade, while there is free North-North trade. At this level, the whole of industry is agglomerated in the North; in figure 1, lines \( S_1 \) and \( S_2 \) show that the share of each of the southern economies in world trade is zero. At this equilibrium, real wages in the South are approximately 65 percent of those in the North despite the fact that there are no differences in technology, labor skills, or relative endowments.

As global tariffs \( T \) are reduced, at a point around 1.14 it becomes profitable for some firms to relocate in the South. This occurs when the more open market reduces the short-run profitability of southern firms (potential, if not yet actual firms), but the fall in the price of imported intermediate goods and easier access to the large northern market increase it. The last two forces—combined with the large initial wage difference—dominate, causing industry to move to the South. It is a general property that if trade barriers—real as well as tariff barriers—are low enough, then agglomeration in a subset of economies is unsustainable and industry will operate in all countries (see Puga 1998). The agglomeration of industry in the North will be sustainable over a wider range of tariffs if the northern economies are larger (relative to those in the South) or more integrated (that is, intranorthern trade barriers are lower).

However, industry initially operates only in one of the southern countries. If the two southern countries are identical, the choice of which is entirely a matter of chance; we label it \( S_1 \). This uneven spread of industry occurs because the first firms to set up create cost and demand linkages to other firms in the same country. They also raise wages, but the linkage effects are stronger than the wage effects, so the second industrial agglomeration forms in just one of the developing countries.

To understand further why industry spreads to just one country, note that there is a second equilibrium with industry operating in both \( S_1 \) and \( S_2 \), but this equilibrium is unstable. If \( S_1 \) has slightly more firms than \( S_2 \) then it will have higher short-run profits, attracting more firms and raising profits further. Other mechanisms may reinforce this result—most obviously a confidence factor created by the success of early entrants. The extent and form of divergence between southern economies depend on model specifications. In a full input-output
Figure 1. *Multilateral Liberalization*

*Share of world industry in the southern countries*

![Graph showing share of world industry in the southern countries and the North.](image)

**Note:** \( S_1 \) and \( S_2 \) denote southern countries 1 and 2; \( N \) denotes the North.

**Source:** Authors' calculations.
structure in which not all sectors are tightly linked, each southern economy may develop agglomerations in different sectors. Even so, there is always a tendency for unequal development in the aggregate.

In the range of tariffs from around 1.14 to 1.10 industry operates in one southern country and not the other, but as tariffs are reduced below this range, it becomes profitable for manufacturing firms to establish themselves in the other developing country, $S_2$. This process is very abrupt and occurs partly at the expense of $S_1$, which experiences a small fall in its share of world industry. At tariffs below this point, the two southern economies are identical, and further reductions in $T$ bring a steady relocation of industry to the southern economies. At completely free trade, each of the now-developed southern countries has 25 percent of world industry (equal to its share of the world endowment).

Figure 1 illustrates the corresponding real wage situation. Although welfare effects are not caused directly by the evolution in country shares of industry, they are closely related. Countries with more industry have higher labor demand and have to import fewer varieties of goods that are subject to trade barriers. Both the welfare and labor demand effects support the real income differences in figure 1. As wages increase in southern economies, real wages in the northern economies decline, although this result is not general. The combined effect of changing labor demand and price indexes on northern wages is ambiguous, with the balance of decline and increase depending quite sensitively on parameter values.

Figure 1 illustrates two main messages. First, trade liberalization breaks down existing agglomerations of activity. Lower trade costs make firms more footloose and more sensitive to international differences in factor prices and drives the convergence in the figure. Second, the benefits do not necessarily flow equally to the two southern economies. It follows directly from the presence of agglomeration forces in the model that as the northern agglomeration starts to break down, new agglomerations may develop.

**Unilateral Liberalization**

In the case of unilateral liberalization, a single southern economy ($S_1$) engages in unilateral import tariff liberalization, with all other barriers held constant (at value $\bar{T} = 1.15$). The solid lines in figure 2 (and all remaining figures) outline the process, and the dashed lines represent the reference case of multilateral liberalization.

In figure 2, openness to imports of manufactures causes manufacturing production to start (see Venables 1996). Import competition obviously has a negative effect through the product market, particularly because access to the northern market is not liberalized. But the cheaper supply of imported intermediate goods becomes the dominant force, enabling industry to become established. This result is not general—for example, if the southern economies are very small and face high export barriers, unilateral liberalization does not cause industry to develop. But providing this is not the case, we find that the combination of low
Figure 2. *Unilateral Liberalization*

**Share of world industry in the southern countries**

![Graph showing the share of world industry in the southern countries.](image)

**Real income per worker in the southern countries and the North**

![Graph showing the real income per worker in the southern countries and the North.](image)

*Note:* $S_1$ and $S_2$ denote southern countries 1 and 2; $N$ denotes the North.

*Source:* Authors' calculations.
wages and low-cost intermediates (due to import liberalization) is sufficient to lead to industrialization. In the cases we have studied, industry will develop sooner and at larger scale (that is, the $S_1$ curve will be higher) the greater is the share of intermediates in production, and the larger is the market in the liberalizing economy.

Furthermore, the unilateral reduction in tariffs on imports unambiguously raises wages in the liberalizing country. Before industrialization takes off, there is a slight decrease in real wages in the liberalizing economy because of falling tariff revenue. But as soon as the country starts to attract some industrial production, real wages inclusive of tariff revenue rise unambiguously. The unilateral liberalization policy has no direct effect on the other southern economy because it has no industry to benefit from $S_1$'s liberalization. However, the other economy does experience a slight increase in real wages because the terms of trade improve due to the increased world supply of manufactures.

Under unilateral liberalization the continuing barriers to developing countries' exports mean both that it takes a lower tariff rate to start industrialization and that, once industrialization has started, $S_1$ has a lower share of manufacturing than it would in the multilateral case. In addition, real wages are lower in $S_1$ than they would be in the case of multilateral liberalization.

**South-South PTA**

In the case of a South-South PTA, the two southern economies reduce trade barriers between each other, with import barriers to and from the North held constant. Figure 3 illustrates this case.

Once again, the trade liberalization is sufficient to cause industry to become established in the developing countries, but the mechanism is completely different from the case of unilateral tariff reductions. In that case, industry started in response to cheaper intermediate inputs. In a South-South PTA, in the initial position tariff reductions do not affect intermediate goods. Instead, the effective market enlargement caused by reducing intra-South barriers drives the industrialization. Similar to the multilateral case, industry spreads unevenly to developing countries, initially developing in one of the countries and only spreading to the second at lower trade barriers.

In the case of a South-South PTA, both the southern economies attract less industry than they would with multilateral liberalization because they do not benefit from better access to northern markets or intermediate goods produced in the North. Compared with unilateral liberalization, the South-South arrangement attracts industry later, although as tariffs become very small, the gain is larger. Similar to the unilateral case, with the South-South PTA, real wages are lower than they would be in the case of multilateral liberalization.

Different mechanisms trigger industrialization in the case of a South-South PTA and in the case of unilateral liberalization. In the former, local demand triggers industrialization, which occurs earlier the higher is this demand. In the latter, forward linkages from imports trigger industrialization, and the timing
Figure 3. *South-South Preferential Trading Arrangement*

**Share of world industry in the southern countries**

![Graph showing the share of world industry in the southern countries with the following points highlighted:
- $S_1 = S_2$
- $S_1$
- $S_2$
- $S$]

**Real income per worker in the southern countries and the North**

![Graph showing real income per worker with the following points highlighted:
- $N$
- $S_1 = S_2$
- $S_1$
- $S_2$
- $S$]

*Note:* $S_1$ and $S_2$ denote southern countries 1 and 2; $N$ denotes the North.

*Source:* Authors' calculations.
depends on the strength of these linkages. If the linkages are weak and southern demand is large, then a South-South PTA might attract industry at a higher value of $T$ than would happen with a unilateral liberalization.

**Concerted Most-Favored-Nation Southern Liberalization**

In the case of concerted most-favored-nation (MFN) liberalization by both southern economies, all southern import tariffs are reduced, so only northern tariffs remain (see World Bank 1994). This case amounts to a South-South PTA plus liberalization of southern imports from the northern economy. Figure 4 illustrates the results.

The evolution of industry is similar to that in a South-South PTA. Industrialization starts first in one southern country, then in the other. The process of industrialization starts sooner (at higher levels of $T$) in one of the countries than it would in the case of unilateral liberalization. This difference occurs because the relationship between South and North is the same under both arrangements, but in the case of concerted MFN liberalization, there are the additional gains from southern liberalization. Compared with a South-South PTA, industrialization occurs earlier in the example in figure 4. However, this result is not general. Liberalization with the North benefits the South through forward linkages, but it also raises the costs of import competition, whose net effect is ambiguous.

At low tariff levels, concerted MFN southern liberalization gives a higher level of real income compared with unilateral liberalization, but real income is lower than it would be under a South-South PTA or multilateral liberalization. The difference in real income occurs because of the asymmetry in North-South trading arrangements. With a concerted MFN southern liberalization, southern exports to the North still face a tariff barrier, while the South’s imports from the North are untaxed.

**North-South PTA**

In the case of a North-South PTA, one of the southern countries forms a PTA with the North. (Recall that the North is assumed to be a single policymaking agent, so the PTA is with both northern economies.) Figure 5 summarizes the results.

A North-South PTA spreads a larger share of industry to the liberalizing southern economy and gives this economy higher real wages than any of the other arrangements we have considered. Figure 5 compares this case with the multilateral case given by the dashed lines. The spread of industry is larger because the southern economy benefits from both improved access to the large northern market and the low cost of northern intermediates. The liberalizing southern economy suffers from more competition from northern firms, but, because southern wages are lower, the balance of the improved reciprocal access to markets favors the South. This spread of industry is associated with a large fall in the North’s share of industry (and also a fall in real wages in the North). Compared with the other arrangements, the other (not liberalizing) southern economy loses
Figure 4. *Concerted Most-Favored-Nation Southern Liberalization*

**Share of world industry in the southern countries**

- **Industry share**
  - 0.35
  - 0.30
  - 0.25
  - 0.20
  - 0.15
  - 0.10
  - 0.05
  - 0.00

- **Tariffs, $T$**
  - 1
  - 1.025
  - 1.050
  - 1.075
  - 1.100
  - 1.125
  - 1.150

- **$S_1 - S_2$**
- **$S_1$**
- **$S_2$**
- **$N$**

**Real income per worker in the southern countries and the North**

- **Real income per worker**
  - 1.0
  - 0.9
  - 0.8
  - 0.7

- **Tariffs, $T$**
  - 1
  - 1.025
  - 1.050
  - 1.075
  - 1.100
  - 1.125
  - 1.150

*Note:* $S_1$ and $S_2$ denote southern countries 1 and 2; $N$ denotes the North.
*Source:* Authors' calculations.
Figure 5. *North-South Preferential Trading Arrangement*

**Share of world industry in the southern countries**

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<th>Tariffs, $T$</th>
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<td>1.100</td>
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*Note:* $S_1$ and $S_2$ denote southern countries 1 and 2; $N$ denotes the North.
*Source:* Authors’ calculations.
Figure 6. *Hub-and-Spoke Arrangement*

**Share of world industry in the southern countries**

![Graph showing the share of world industry in the southern countries.](image)

**Real income per worker in the southern countries and the North**

![Graph showing real income per worker.](image)

*Note:* $S_1$ and $S_2$ denote southern countries 1 and 2; $N$ denotes the North.

*Source:* Authors' calculations.
because it does not attract any industry and experiences only a slight increase in real wages through the rise in world industrial production.

**Hub-and-Spoke Arrangement**

In the case of a North-South PTA, the North forms a PTA with just one southern economy. An interesting alternative is that in which the North forms a bilateral PTA with each of the southern economies, but the barriers between the southern economies remain unchanged. In this trade policy arrangement, the North (that is, both northern economies jointly) represents the “hub” in a hub-and-spoke arrangement. Figure 6 represents such a case.

A hub-and-spoke arrangement brings relatively rapid and strong industrialization to the South for the same reasons that applied in the case of a bilateral North-South PTA. Both southern economies are affected, although initially they diverge. The spread of industry to the South is less pronounced than it would be under multilateral liberalization because location in each of the southern economies is penalized by the barriers between the southern economies. The barriers in the South enable the North to maintain a higher real wage in this case than in either of the other two experiments involving northern liberalization.

**III. Policy Issues**

Are the forces captured in this framework relevant in practice? Is there evidence to support the argument that PTAs cause such changes in the production structure of nations? We are aware of only one study that directly addresses these issues, Hanson’s work on Mexico. Hanson (1998) uses data on Mexico and finds support for the hypothesis that agglomeration is associated with increasing returns. He also shows that integration with the United States has had strong effects on the location of industry in Mexico (Hanson 1997). Industry has shifted toward states with good access to the U.S. market (demand linkages). At the same time, employment growth has been higher in regions that have larger agglomerations of industries with buyer/supplier relationships (cost linkages).

We are not aware of any empirical work on the importance of demand and cost linkages under specific trading arrangements. Nevertheless, we believe that the experiments in section II shed light on some of the trade policy choices currently facing developing countries. This section discusses the main implications.

**Unilateral and Concerted Liberalizations**

In recent years many developing countries (in particular East Asian economies) have undertaken unilateral trade liberalization. However, others (including some members of the Asia-Pacific Economic Cooperation—APEC—process) have been reluctant to lower their tariffs without receiving reciprocal concessions. What are the benefits of unilateral liberalization? Can countries expect to do better by concerted action?
Unilateral liberalization can attract industry and bring a real gain in income. Although more intense import competition has an adverse effect on profitability in the liberalizing economy, import supply creates beneficial forward linkages to domestic production and promotes industrialization. In the model, these linkages arise just from the use of imported goods as inputs; in reality these linkages might come through several channels. A recent World Bank (1994: 7) study argues that

By opening their economies, countries gain access to more affordable consumer goods and to technologies and intermediate goods that help reduce production costs. Thus, by improving the climate for investment, liberalization also helps to attract foreign capital. Foreign investment, in turn, can provide the technology and financing required to establish a more efficient production structure.

Tybout and Westbrook (1995) find that trade liberalization in Mexico has reduced average costs in most industries. In more export-oriented industries, these cost reductions have been due mainly to the type of forces captured by our model (falling prices of intermediates). In sectors with higher import penetration, these cost effects apparently have been combined with relative productivity improvements. At the same time, increased import penetration has shifted downward the demand for domestic products.

In our analysis, we find that the balance between import competition and cost linkages, combined with low initial wages, tends to work in favor of the liberalizing economy, leading to industrialization, as in figure 2. However, the benefits of unilateral liberalization alone may be comparatively small; in our examples, full unilateral liberalization results in lower real income than any of the other experiments considered. What can developing countries do to promote industrialization through trade policy?

Our analysis suggests the strong likelihood of gains from concerted action, but two reservations have to be made. First, the gains from concerted action may not be divided equally between the members. Even in the case of concerted MFN liberalization, there may be some range of tariffs in which one country does worse than it would if it were the only country to liberalize. (We return to division of the gains in the subsection on southern disparities.) Second, even though all our simulations give greater gains from concerted action than from unilateral liberalization, there are no general theorems. All results are sensitive to specification of the model and of the experiment. In particular, North-South and South-South PTAs operate in quite different ways.

South-South and North-South PTAs

Should countries with highly developed industrial systems take part in concerted liberalization or be excluded from it? South-South PTAs work essentially by enlarging market size, and their success depends on whether the combined market size is large enough to attract industry. Analysis indicates that smaller
southern countries industrialize later and less (in the figures presented, the curves $S_1$ and $S_2$ move down and to the left). The mechanism is a form of trade diversion, but—unlike the traditional analysis outlined in the introduction—the diversion may successfully bring about a critical mass of activity that creates a viable, and welfare-improving, industrial base. Evidently, the market size of the group must reach a certain minimum size for this to work. The failure of many South-South PTAs can perhaps be attributed to inadequate scale. As Corden (1993: 457) puts it,

It is far better for Argentina to go for the world market—i.e., to liberalize unilaterally and in a nondiscriminatory fashion, as she has been doing—than just go for the Brazilian market. Brazil has the largest economy in the Third World, and yet it is smaller than Canada’s (as measured by the dollar value of GDP [gross domestic product]). And this applies even more to Brazil.

North-South PTAs work quite differently on the basis of improved access to the large northern market and improved supply of intermediate goods, offset by increased import competition in domestic markets. In the cases we have examined, North-South arrangements are better than South-South agreements from the point of view of the participating southern economies. The reasons for the success of these North-South agreements merit some thought. In many new trade models the argument is made that liberalization between economies of different sizes will draw industry into the country with the large market (the center) and away from smaller (peripheral) countries. However, the strength of these forces is greatest at intermediate levels of trade barriers, and at very low trade barriers, factor price differences can overturn these effects. How does this relate to our findings that liberalization will move industry out of the large economy to the small? Centripetal forces are present in the model we have developed. Indeed, they are amplified by forward and backward linkages. But these forces are precisely those that make for the North-South divide in the initial equilibrium; they create the initial wage differentials. Given this initial position and these wage differences, further liberalization then moves industry from the large and developed region to the less developed. The circumstances that are most conducive to the South benefiting from a North-South agreement of this type are, therefore, low remaining barriers to the northern market (secured, for example, by proximity, as in the North American Free Trade Agreement [NAFTA] or the European Union’s southern regions and prospective eastern regions), combined with low unit labor costs.

At the same time, the North may lose in this framework. The breakdown of the industrial agglomeration in the northern economy may cause a decline in the North’s real income. Losses in the North are greatest in the case of South-South liberalization. In the arrangements where the North reduces barriers to southern imports, multilateral liberalization causes larger losses for the North than hub-and-spoke arrangements. Such losses in the North may explain why the European Union chose a bilateral rather than a multilateral approach to trade liberalization with its
neighbors. The bilateral association agreements that the European Union has established both in Central and Eastern Europe and in the Mediterranean have in effect turned it into the hub of a large web of trading arrangements.

The situation might not be better for the North if it did not reduce its barriers to southern imports. In fact, our analysis suggests three reasons why not liberalizing may be a worse option. First, the northern losses in this context are not general. All our experiments start from an equilibrium in which the South has no industry, so the North has no manufacturing imports and there are large differences in unit labor costs. With higher initial levels of development in the South and smaller initial differences in unit labor costs, real wages in the North will tend to rise instead (see Krugman and Venables 1995). (Also, we have excluded any gains from trade through comparative advantage that in practice would likely bring further benefits to northern consumers.)

Second, even if the North were to lose from opening its market to southern imports, it would lose more from remaining closed while southern economies liberalize among themselves. A comparison of South-South and multilateral liberalization shows that in either case industry spreads to southern countries, but under South-South liberalization, northern firms and consumers have to pay higher prices on the growing number of goods produced in the South, so real wages are lower in the North.

Third, falling real wage differences between the North and the South may reduce migration pressures. For example, proponents of NAFTA in the United States argue that it reduces illegal migration from Mexico. In fact, Hanson and Spilimbergo (1998) show that illegal migration from Mexico to the United States is very responsive to changes in relative wages.

Nondiscriminatory Liberalization and Southern Trading Blocs

The APEC process has raised hopes that integration in the Asia-Pacific region may develop in a less inward-looking way than in other geographical areas and may even catalyze deeper global trade liberalization. Calls for forming a regional trading bloc in Asia have received little support. The amount of trade covered by the Association of South East Asian Nations (ASEAN) remains small. The East Asian Economic Group (EAEG) has so far lacked the necessary backing to take off. Instead, inward-looking regional integration is giving way to APEC's vision of open regionalism.

In the report presented at APEC's 1994 annual summit in Bogor, the APEC Eminent Persons Group explained APEC's vision of open regionalism as follows (APEC 1994). First, APEC members should liberalize intra-APEC trade flows on a nondiscriminatory basis. Second, APEC should, as a group, treat nonmembers as it does members, provided that nonmembers make reciprocal offers. Third, any individual APEC member should have the choice to waive unilaterally the reciprocity requirement and extend its APEC liberalization to all nonmembers.

APEC's members have been divided over the last point. Although East Asian countries have favored openness toward nonmembers, the U.S. president, Bill
Clinton, made clear before APEC’s Bogor summit that any trade concessions would be reciprocal and that there would be no free riders. One year later at the Osaka summit, Australia’s trade minister, Bob McMullan, stressed that Australia would also give nothing for nothing.

Outside Asia, other countries have also seen the need to open their markets reciprocally. The main argument was highlighted by *The Economist* (“Getting Together: South America. Mercosur Gets Bigger and Stronger,” *The Economist*, 29 June 1996) after Chile signed its free trade agreement with Mercosur (a regional trade arrangement among Argentina, Brazil, Paraguay, and Uruguay): “Despite continued protectionist pressure from their weaker industries, Mercosur’s leaders all know that, to attract investment they need to compete in the wider world, their firms want a bigger home market.” However, Mercosur’s agenda does not include unilateral liberalization. Instead, its member countries are advancing toward a regional free trade agreement that will liberalize trade flows between members, but not imports from outsiders.

In the tradeoff between concerted MFN liberalization and a South-South PTA, nondiscriminatory liberalization brings beneficial cost linkages, but also more intense competition from outsiders. Comparison of figures 3 and 4 shows that the former effect dominates in the early stages of industrialization, and the latter dominates in determining real income once industry is established. Concerted MFN liberalization brings earlier industrialization, but at very low tariff levels a South-South PTA leads to more southern industry. These results are quite sensitive to parameter values. In particular, concerted MFN works better for small southern economies. With a small home market, most of their sales take place abroad, and protective tariffs provide little help. At the same time, extending liberalization unilaterally to nonmembers lowers the cost of intermediates and helps industrialization to take off. Thus it is not surprising that in Asia smaller countries push for unilateral liberalization, while larger ones insist on reciprocal concessions. The fact that more small than large countries have liberalized unilaterally can also be explained by smaller countries having less bargaining power to extract reciprocal concessions. What is striking is that smaller Asian countries not only tend to have more open regimes but also have generally expressed their preference for a more open approach to trade liberalization even if larger countries in APEC were not to do the same.

*Southern Disparities*

All the cases in which the two southern economies follow symmetric policies generate an asymmetric outcome for some interval of tariffs, with only one of the southern countries having industry. The theoretical model assumes that there are two identical southern countries, providing no basis for deciding which country has industry. In practice, differences between the two countries will decide the issue (possibly quite small differences). The mix of factors obviously includes institutional, political, and geographical considerations. Here we highlight just a few factors.
Geographical proximity to the existing industrial center benefits a country insofar as closeness is associated with lower natural trade barriers. (This provides an interesting way of thinking about the spread of industry from Japan through the newly industrializing economies.) Low unit labor costs and a larger home market also benefit a country because, other things being equal, they increase the attraction of a country as a base for industry.

The policy regime of the government may dominate the differences between the two southern countries. This situation creates several incentives for the government to take policy action to obtain a "first mover advantage" and attract industry before it becomes established elsewhere.

First, it creates an incentive for developing countries to establish trade links with industrial countries. North-South PTAs may effectively attract industry to the South. More generally, links with industrial countries may give a particular developing country the margin it needs to ensure that it becomes the first to industrialize in a South-South trading arrangement.

Second, it creates an incentive for a country to be a founding member of a PTA. Late entrants to a PTA will not be the first to attract industry.

Third, a reduction of barriers within a PTA can have a domino effect: it creates incentives for more countries to join the agreement. In figure 5, if $S_1$ forms a PTA with the North, tariffs on intra-PTA trade will gradually decrease. Once tariffs fall below $T = 1.1$, $S_2$'s real income will be higher if it also joined the agreement, because this will allow it to attract industry.

Baldwin (1993) models a different, but related, mechanism driving the domino pattern of PTA membership. In his model, a fixed number of firms in each country has a variable equilibrium scale of operation. Integration within the PTA increases the gains from membership for firms in excluded nations, leading them to exercise stronger pressure in favor of membership. Countries' idiosyncratic opposition to membership drives the sequence of entry. In our model, integration within the PTA makes it profitable to locate industry in the next country to join the PTA. Entry eliminates profits, fully passing on to consumers the benefits of membership. Sequential entry arises with homogeneous countries: once a country joins a PTA, it pays the next country to wait until barriers within the PTA are reduced further.

In addition to creating incentives for countries to attract industry, the possibility that industry will agglomerate in a subset of member countries may also create real tensions within the PTA. In the history of southern PTAs, many schemes have failed, often because of internal disputes over the location of industry and the design of compensation schemes for perceived losers in the arrangement. A typical example, the Treaty of Brazzaville was intended to create a customs union and a common currency area with the former French Central African countries. Foroutan (1993) shows that the distortionary nature of compensations undid any benefits from this PTA.

This article shows that differences between countries may be only transitional. In the figures, the differences disappear with sufficient reductions in tariffs.
However, there is no guarantee that the final liberalization will necessarily go far enough to iron out differences and secure the spread of industry to all participating southern economies, particularly if substantial differences underlie these economies.

IV. Conclusions

In this article, we have outlined a new approach for analyzing the role of trade in promoting industrial development. Interactions among imperfect competition, trade costs, and the input-output structure create incentives for firms to locate close to supplier and customer firms. Clustering of firms occurs so that only a few countries industrialize even if all countries have identical underlying structures. The industrializing countries have high wages, but the positive pecuniary externalities created by interfirm linkages compensate for the higher wage costs. Trade liberalization changes the attractiveness of countries as a base for manufacturing production and can trigger—or postpone—industrial development.

The process we describe abstracts from many important aspects of reality. The model disregards capital accumulation (physical or human) and interregional or international differences in technology and endowments. It has only a single policy instrument—a tariff that is unable to discriminate between different types of industrial imports. It does not explicitly model the political process that leads to a particular choice of policy or the policy games between governments. Even within this framework, the model is simple. For example, firms are modeled as single-plant operations, so multinationality and foreign direct investment are not considered. Also, firms are footloose and atomistic, which is helpful for focusing on long-run outcomes but abstracts from the costs of relocation and from strategic interaction. All these points create possible directions for future research, but, even at this level of abstraction, the model captures a number of important features of the world economy and provides new insights on the effects of trading arrangements on industrial development.

The analysis offers an explanation as to why firms are reluctant to move to economies that have lower wages and labor costs and shows how trade liberalization can change the incentives for the establishment of firms in developing countries. The analysis provides a mechanism through which import liberalization can have a powerful effect in promoting industrialization. It suggests that import liberalization may create or amplify differences between liberalizing countries, including possible political tensions. Although these features are consistent with the world economy, they of course fall far short of providing convincing empirical support for the approach.

From this analysis, we derive several conclusions about the effects of trade liberalization. First, unilateral liberalization of imports of manufactures can promote the development of local manufacturing industry. The development occurs through forward linkages from imported intermediates that may be part of a
wider package of linkages coming from these imports. Second, the gains from liberalization through PTA membership are likely to exceed those from unilateral action. South-South PTAs will be sensitive to the market size of member states, and North-South PTAs seem to offer better prospects for participating southern economies, if not for the North and excluded countries. Third, the effects of particular schemes (on, for example, the division of benefits between southern economies) depend on the characteristics of the countries and cross-country differences in these characteristics. We have not yet conducted a systematic investigation of the sensitivity of our results to such differences.

APPENDIX. DETAILS OF THE ANALYTICAL FRAMEWORK

We consider a world with four regions, two northern (N1 and N2) and two southern (S1 and S2). Each region is endowed with L workers and K units of arable land and can produce agricultural and industrial output. Both primary factors are immobile between regions. Arable land is used only by the agricultural sector, while labor is used both by agriculture and by industry and is perfectly mobile between sectors.

Agriculture

Agriculture is perfectly competitive and produces a homogenous output under constant returns to scale. We assume that the agricultural output is costlessly tradable and choose it as the numéraire. In each region, the agricultural production function is Cobb-Douglas in land and labor, with labor’s share $\theta$. If $L_{i}^{A}$ denotes agricultural employment, agricultural output is $(L_{i}^{A})^{\theta} K_{i}^{1-\theta}$, and the local wage is

$$w_{i} = \theta (L_{i}^{A})^{\theta-1} K_{i}^{1-\theta}.$$  

Industry

The industrial sector has imperfectly competitive firms producing differentiated goods under increasing returns to scale. Production of a quantity $x_{i}(k)$ of any variety $k$ in any country $i$ requires the same fixed, $\alpha$, and variable, $\beta x_{i}(k)$, quantities of the production input. That production input is a Cobb-Douglas composite of labor and a constant elasticity of substitution (CES) aggregate of the differentiated industrial goods. The cost function of a firm producing variety $k$ in country $i$ is

$$C(k) = q_{i}^{\mu} w_{i}^{(1-\mu)} [\alpha + \beta x_{i}(k)]$$

where $q_{i}$ is the price index of the aggregate, defined by

$$q_{i} \equiv \left( \sum_{j=1}^{4} \left[ \int_{0}^{T_{i,j}} p_{i}(h) (T_{i,j} \gamma)^{1-\sigma} dh \right]^{1/(1-\sigma)} \right)^{-1/(1-\sigma)}$$
The price index in each country depends on the local prices of individual varieties, which in turn are a function of the free on board (FOB) prices, real trade costs, and tariffs. The elasticity of substitution between varieties, \( \sigma (> 1) \), is assumed to be the same in all countries. \( N_j \) is the set of varieties produced in location \( j \), and \( p_j(h) \) is the FOB price of variety \( h \) shipped from country \( j \) to country \( i \). Real trade costs for the industrial goods take Samuelson's "iceberg" form: \( \tau \) units have to be shipped so that one unit arrives in another region. Industrial goods exported from \( j \) to \( i \) are also subject to an ad valorem tariff, \( T_{ji} \).

**Preferences**

Turning to the demand side, consumers have Cobb-Douglas preferences over the agricultural good and a CES aggregate of industrial goods. All industrial varieties produced enter consumers' utility function with the same constant elasticity of substitution with which they enter firms' technology. The indirect utility function of a worker in region \( i \) is then given by

\[
V_i = q_i^{-\gamma} 1^{-(1-\gamma)} w_i
\]

Landowners have the same preferences as workers but are assumed to be tied to their land.

**General Equilibrium**

Expenditure on manufactures in each region can be derived from equations A-2, A-3, and A-4 as

\[
e_i = \gamma \left[ \omega_i L_i + (1 - \theta)(L_i^A)^{\theta} K_i^{(1-\theta)} + \sum_{h \in N_i} \rho(h) dh + R_i \right] + \mu \sum_{h \in N_i} C(h) dh.
\]

The first term on the right-hand side is the value of consumer expenditure (including tariff revenue, denoted by \( R_i \)), and the second is the value of intermediate demand, because consumers spend a fraction \( \gamma \) of their income and firms a fraction \( \mu \) of their costs on manufactures.

The division of consumers' and producers' expenditure on each industry between individual varieties of industrial goods can be found by differentiating the price index with respect to the price of the variety. Total demand for a single variety produced in \( i \), \( x_h \), is

\[
x_i(k) = \tau^{(1-\alpha)} \sum_{j=1}^{\Delta} [p_i(k) T_{ji}]^{-\alpha} q_j^{(\sigma-1)} e_j.
\]

Because the producer of an individual good faces an elasticity of demand \( \sigma \), firms mark up prices over the marginal cost by the factor \( \sigma / (\sigma - 1) \):
The value of tariff revenue is

\[ R_i = \sum_{j=1}^{4} (T_{ij} - 1) n_j p_j x_j. \]

The profits of an individual manufacturing firm are, from expressions A-2 and A-7,

\[ \pi_i = \frac{P}{\sigma} (x_i - x) \]

where

\[ x = \frac{\alpha(\sigma - 1)}{\beta} \]

is the unique level of output giving firms zero profits. As usual in this type of model, equilibrium firm scale is a constant, depending only on demand and cost parameters.

Turning to the labor market, we can write the labor-market-clearing condition as

\[ L_i = (1 - \mu) n_i \frac{C_i}{w_i} - L_i^A \]

where \( n_i \equiv \#N_i \) denotes the mass (number) of firms in region \( i \). The first term on the right-hand side of equation A-11 is labor demand in manufacturing, obtained by applying Shephard's lemma to equation A-2, and the second term is labor demand in agriculture.

This completes the description of short-run equilibrium. At any given moment, we think of the economy as having a predetermined number of firms in each region. To this corresponds a short-run equilibrium defined as a set of wages and price indexes solving eight equations. The first four equations are the price indexes of manufactures in each of the four regions, obtained by substituting equation A-7 into equation A-3. The other four equations come from substituting A-1, A-2, and A-5 through A-10 into A-11, which gives the labor-market-clearing condition in each region. We can then express profits at the short-run equilibrium in terms of the number of firms by substituting equations A-1 and A-2, A-5 through A-8, and A-10 and the short-run equilibrium values of wages and price indexes into equation A-9.
A long-run equilibrium obtains when the number of firms in each country is such that there are zero profits in each country where there are a positive number of firms and negative profits (for potential, if not for actual, firms) wherever the number of firms is zero:

\[(A-12) \quad \pi_{i,n_i} = 0, \pi_i \leq 0, n_i \geq 0.\]

We assume a myopic entry and exit process, according to which firms enter and exit in response to profit opportunities. This is described by differential equations,

\[(A-13) \quad \dot{n}_i = \delta \pi_{i,n_i}, \quad n_i \geq 0,\]

where \(\delta > 0\) is the speed of adjustment.

The system of equations A-12 may support multiple equilibriums, and under the dynamics of equation A-13, some are stable and others unstable. Complete analysis of the structure of equilibriums and of the dependence of bifurcation points of the system is undertaken for the case of symmetric changes in trade barriers in Puga (1998) and Fujita, Krugman, and Venables (1997) and for asymmetric changes in trade barriers in Puga and Venables (1997).

Our approach in this article is to select the initial equilibrium in which two of the four economies have industry. For each experiment we take a small reduction in tariffs and then let the model adjust according to the dynamics given by equation A-13. Repeating this for successively lower tariffs traces out a path of stable equilibriums and gives the relationship between tariffs and the endogenous variables illustrated in figures 1-6.

Computation was undertaken using GAUSS code written by the authors, and this is available on request.

Parameters and Experiments

Values of parameters are \(\gamma = 0.5, \theta = 0.8, \mu = 0.55,\) and \(\sigma = 4.\) At the starting point in all our experiments, there are real trade costs of \(\tau = 1.1\) between all four regions, an ad valorem tariff of 15 percent (\(\bar{T} = 1.15\)) for all North-South and South-South trade, and free trade between the two northern economies (\(T = 1\)). These values are such that at the initial level of tariff barriers there is a stable equilibrium in which all industry is split between the two northern economies (qualitatively the same initial equilibrium can be supported by a range of values for either type of barrier).

The experiments look at the evolution of this equilibrium as some (or, in the case of multilateral liberalization, all) of these tariffs are brought down to zero (\(T = 1\)), with those not affected by the liberalization held at \(\bar{T}\). Real barriers are kept unchanged (reductions in real barriers instead of reductions in tariffs have effects very similar to those presented, although no revenue is forgone).
REFERENCES

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