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# An Overview of PRC's Emergence and East Asian Trade Patterns to 2020

David Roland-Holst

October 2002

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The PRC will be East Asia's largest trading nation by 2020 and its expansion will open unprecedented market opportunities for the region's exporters. Japan, for example, will become the PRC's largest individual source of imports.

Using a sophisticated global forecasting model, this paper examines a variety of important trade liberalization scenarios for East Asia, with special reference to the PRC's WTO accession.

For the PRC, the author finds complex incentives governing its regional trade relations and negotiations. For its East Asian trade partners, the challenges will be to keep pace with its WTO initiative, while reorienting their industrial policies and marketing capacities towards the world's fastest growing consumer society.

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Trade Patterns to 2020**

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**David Roland-Holst**

## About the Author

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Additional copies of the paper are available free from the Asian Development Bank Institute, 8<sup>th</sup> Floor, Kasumigaseki Building, 3-2-5 Kasumigaseki, Chiyoda-ku, Tokyo 100-6008, Japan. Attention: Publications. Also online at [www.adbi.org](http://www.adbi.org)

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## PREFACE

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The growing prominence of the PRC economy and that country's recent initiatives in domestic and external policy have attracted a high level of attention, yet the long-term implications of PRC's economic emergence are not yet well understood. For this reason, the ADB Institute is undertaking empirical research to improve visibility for policy makers and interested observers about how trade and other economic relations will evolve inside and outside the East Asian region.

This paper is the first of three studies of East Asian trade patterns in the context of PRC's economic emergence. A synopsis of the policy findings also appears as ADBI Research Policy Brief No. 3 [[www.adbi.org/PDF/RPB/RPB03.pdf](http://www.adbi.org/PDF/RPB/RPB03.pdf)]

Under its general research project on development paradigms, the ADB Institute Research Paper Series disseminates works-in-progress to advance general understanding of important research issues, inform interested parties, and invite comments and questions.

I trust that this series will facilitate constructive dialogue among policymakers as well as among researchers about the most beneficial course of development and growth for the Asian economies.

Masaru Yoshitomi  
Dean  
ADB Institute

## ABSTRACT

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PRC's accession to the WTO has profound implications for East Asian trade relations, and many of the more established regional agreements (ASEAN, etc.) are being re-examined in light of this initiative by a prominent trading partner. PRC has already established new standards for sustained growth and dynamic resource allocation by a large economy, and further PRC domestic and external liberalization will redefine trade relations in ways that are only beginning to be understood.

Initial reactions of regional partners, who perceive PRC as a strong export competitor and magnet for FDI, have been somewhat defensive. These sentiments could undermine multilateralism and retard the dramatic historical progress of regional trade and economic growth. Our research reveals a more complex picture of PRC's emergence, however: one that presents as many opportunities as threats to East Asian policy makers.

Because of its sheer size and stage of development, PRC will play two roles in the region with unusual prominence. First, it will stiffen regional export competition in a broad spectrum of products. Because it is still in the early stages of an export-oriented growth strategy, this aspect of PRC's economy has attracted the most attention and contributed to a threateningly competitive image. Secondly, PRC's long-term growth trajectory will make it a prominent importer in East Asia. Because PRC's internal economy is still emerging, this aspect has attracted less attention. Thus PRC interposes itself between the rest of East Asia and the Rest of the World as both an export competitor and an emerging importer but, because of its early stage of development, regional perceptions have been biased. More attention is currently focused on the export (threat) side and the import (opportunity) side is underestimated.

This paper presents an empirical analysis of PRC's regional economic emergence, intended to improve longer term visibility for policy makers, helping overcome the threat-bias and better identify the horizon of opportunity for other East Asian economies. A multi-country dynamic forecasting model is used to elucidate regional and domestic adjustments that will ensue from PRC's WTO accession over the next two decades. Generally speaking, PRC growth is found to produce a variety of dramatic adjustments in East Asia, but that the benefits for every regional partner can outweigh the costs if multilateral trade policies are accommodating.

Primarily because of its size, PRC appears to be in a unique position to "go it alone" on the path to globalization, i.e. most of its own benefits from multilateralism can be captured by unilateral liberalization. At the same time, a large part of the aggregate regional benefits

from growth arise from PRC's unilateral initiative. For example, we predict that, by 2020, PRC will develop a large structural trade surplus with Western OECD economies, but a structural deficit of about equal magnitude with East Asia as a whole. This surplus "transfer effect" implies that the region can continue leveraging external demand to meet its growth objectives, but the composition of this growth will depend upon bilateral balances.

Thus the future benefits and costs for individual East Asian economies will depend upon the extent to which they adapt to more open multilateralism, regionally or globally joining efforts to reduce barriers to trade. Only in this way can they avoid crowding out from their established export markets and fully capture new export opportunities. The latter are represented mainly by PRC, directly in terms of its burgeoning domestic demand, and indirectly as it absorbs intermediate goods to meet export demand from the Rest of the World.

As an example of this, we forecast the consequences of a widely discussed regional trade arrangement, AFTA plus PRC. By enlisting PRC in its regional liberalization, the ASEAN economies leverage PRC's growth to their advantage. AFTA alone might be beneficial, but inclusion of PRC provides essential economic diversity, scale opportunities, and indirect market access via PRC absorption for export production. The result of AFTA plus PRC is accelerated ASEAN trade expansion, sometimes at the expense of other East Asian economies.

For one country in particular, the response to PRC's WTO initiative will be decisive. Our forecasts indicate that, in the absence of new protectionism, PRC will be Japan's largest trading partner by 2020, exceeding all other bilateral sources of imports and export markets. This represents an unprecedented opportunity for the Japanese economy, but to realize it will require a fundamental reorientation of industrial policy, away from traditional (western OECD) export destinations and toward the world's fastest growing consumer society.

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## Executive Summary

PRC's economic emergence over the last two decades, and in particular its recent WTO accession initiative, portend a dramatically changed landscape for East Asian trade. This has aroused concern around the region, where PRC's success as an exporter poses a threat to other economies that rely on external demand as an essential source of growth. At the same time, the early stage of PRC's development understates the opportunities its internal market will ultimately offer exporters, particularly in East Asia. The resulting bias in perceptions could undermine multilateralism and retard the dramatic historical progress of regional trade and economic growth. Our research reveals a more complex picture of PRC's emergence, however, one that presents as many opportunities as threats to East Asian policy makers. In this first of three studies, we forecast the evolution of East Asian trade patterns under a variety of alternative policy scenarios. Our main findings in summary are:

1. PRC will be East Asia's largest trading nation by the year 2020, and that its growth over the intervening period will dramatically change the regional economy. Contrary to the view that PRC exports will stifle competitiveness and growth among its neighbors, however, we find that PRC's expansion, particularly when accelerated by its WTO initiative, will open unprecedented market opportunities for East Asian exporters. Indeed, while PRC will become the region's largest exporter only in 2010, it will be the largest East Asian importer by 2005.
2. During these two decades of sustained and dynamic growth, PRC will develop a structural trade surplus with the western OECD economies, and a deficit of about the same magnitude with East Asia. In other words, most of the net benefits of PRC's export successes will ultimately accrue to its regional neighbors. This fact reveals the mercantilist fallacy of the PRC competitive threat argument, and our results further indicate that the spillover effects of PRC growth and trade expansion will far outweigh any trade diversion effects on the rest of East Asia. Finally, although there is not necessarily a link between the regional components of current and capital account balances, the PRC "surplus transfer" phenomenon is likely to have significant implications for regional capital markets.
3. Along similar lines, the growth of PRC's internal market will accelerate other East Asian export and income growth and create historic opportunities for regional investors. To capture these opportunities, the economies of the region, individually and perhaps collectively, will need to re-examine their domestic and external policies toward capital allocation.
4. On both the current and capital accounts, the optimal response to PRC's WTO initiative is neither protectionism nor passivity. Provided East Asian economies do not isolate themselves from the process of PRC trade liberalization, the net effect of PRC's growth will be hugely positive, as PRC absorption emerges to dominate regional demand. Failure to adapt to more open multilateralism will undermine

competitiveness, leading to lower domestic productivity growth and crowding out from export markets.

5. PRC's situation in the East Asian trading region appears to be unique in several important respects. Because of the sheer size and growth momentum of this economy, it apparently is in a position to "go it alone" on the path to globalization, i.e. most of its own benefits from multilateralism can be captured by unilateral liberalization. This fact not only strengthens its resolve to follow that path, but limits any incentive to be drawn into regional agreements.
6. At the same time, a large part of the benefits to other East Asian economies arise from PRC's initiative, whether or not it is unilateral, but the regional incidence of these benefits may depend upon bilateral relations with PRC itself. Our results indicate that significant trade diversion can occur among regional exporters, at the expense of those countries who opt out of either an FTA including PRC or unilateral trade liberalization.
7. Because of the complex incentives governing its situation, PRC possesses two carrots and one stick in regional negotiations. The carrots are access to its own domestic market and, by joining PRC in an FTA, greater market access to the rest of the world (a "PRC bandwagon" effect). The stick, obviously, is one of the carrots, used instead as a club: trade diversion arising from direct export competition by PRC and its partners. Clearly, the mercantile PRC perspective is too simplistic, but this country still holds a special position in the regional negotiating environment, and other East Asian economies must take account of this fact.
8. Even under status quo policy assumptions, PRC is forecast to be Japan's largest trading partner by 2020. In terms of both exports and imports, PRC will become Japan's largest bilateral partner. Japan will also be PRC's largest individual source of imports. For these reasons, the previous policy conclusions are of special relevance to Japan.

# **An Overview of PRC's Emergence and East Asian Trade Patterns to 2020<sup>†</sup>**

David Roland-Holst

## **1. Introduction**

Accession of PRC to the World Trade Organization (WTO) is a watershed event for the global economy and for the East Asia region in particular. PRC has already established new standards for sustained growth and dynamic resource allocation by a large economy, and further Chinese domestic and external liberalization will redefine trade relations in ways that are only beginning to be understood. Initial reactions among most regional partners, who perceive PRC as a strong export competitor and magnet for FDI, have been rather defensive. These sentiments could undermine both regional and global multilateralism and retard the progress of trade-induced growth in the region.

Because of its sheer size and stage of development, PRC will play two roles in the region with unusual prominence. First, it will stiffen regional export competition in a broad spectrum of products. Because it is still in the early stages of an export-oriented growth strategy, this aspect of PRC's economy has attracted the most attention and contributed to a threateningly competitive image. Secondly, PRC's long-term growth trajectory will make it a prominent importer in East Asia. Because PRC's internal economy is still emerging, this aspect has attracted less attention. Thus PRC interposes itself between the rest of East Asia and the Rest of the World as both an export competitor and an emerging importer but, because of its early stage of development, regional perceptions have been biased. More attention is currently focused on the export (threat) side and the import (opportunity) side is underestimated.

This paper presents an empirical analysis of PRC's regional economic emergence, intended to improve longer term visibility for policy makers, help overcome the threat-bias, and better identify the horizon of opportunity for other East Asian economies. Using a multi-country dynamic forecasting model, we elucidate regional and domestic adjustments that will ensue from PRC's WTO accession over the next two decades. Generally speaking, we find that PRC growth produces a variety of dramatic adjustments in East Asia, but that the benefits for every regional partner can outweigh the costs if regional trade policies are accommodating.

For example, our main findings indicate that PRC will not become East Asia's largest exporter until 2010, but it will become the region's largest importer by 2005. This being the case, its economic neighbors should place higher priority on policies that facilitate Chinese market access than on those that combat perceived threats from PRC's exports. We also find that PRC will develop a large structural trade surplus with Western OECD economies, but a structural surplus with East Asia of about the same

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<sup>†</sup> This is the first of three studies of East Asian trade patterns in the context of PRC's recent economic emergence. Special thanks are due to Dean Masaru Yoshitomi for giving intellectual impetus to this project and to Iwan Azis for ongoing advice and insight. The results presented here draw upon prior work with Dominique van der Mensbrugghe, a frequent co-author in this area who made indispensable contributions to the modeling effort. Opinions expressed here are those of the author and should not be attributed to his affiliated institutions.

magnitude. In other words, PRC's export success is all Asia's export success. Again, these trends imply that opportunities from PRC's growth will be many. The challenge to its neighbors is to capture these by reorienting their export capacity toward the fastest growing of all import markets.

Preoccupation with PRC's emergence has been more than an individual exercise for national policy makers. The sheer size of this emergent economy is also inspiring a re-examination of East Asia's established regional trading arrangements and some, including ASEAN are already being challenged to include PRC directly. At the same time, adoption of the WTO agenda by this most populous of formerly nonaligned countries has given special impetus to globalization as the prevailing standard for multilateralism, calling into question the concept of nonalignment in the political sphere and central economic tenets of regionalism. For these reasons, East Asia's existing trade arrangements will, in all likelihood, undergo significant change in the coming years.

While PRC's growing prominence and commitment to the WTO invite a reappraisal of regionalism, the real effects of changes in existing arrangements would be far reaching and important to policy makers. For example, including PRC in ASEAN, could induce dramatic trade diversion across the region and with respect to economies outside East Asia. Conversely, an East Asian economy that chose to follow PRC's current "globalization first" trade orientation could seriously compromise domestic and bilateral interests embedded in existing regional arrangements. Both approaches would influence domestic and foreign policy agendas in ways that are difficult or impossible to anticipate by intuition alone.

To facilitate better understanding and policy dialogue on these important issues, this paper also evaluates two alternatives to PRC's unilateral initiative. Using a multi-country, dynamic CGE model, we look at the evolution of trade patterns and domestic economic structure in eleven prominent East Asian economies and several regional and global aggregate trading partners. In the first instance, we assess the consequences of global trade liberalization (GTL) over the period to 2015, as this would be captured by universal tariff abolition. We then compare this WTO-type reference case to an example of a new regional arrangement that has been widely discussed, AFTA plus PRC (AFTAPC).

Generally speaking, we find that global trade liberalization (GTL) would increase overall trade more than three times as much as any arrangement confined to East Asia. While AFTAPC realizes only a fraction of these global gains, there are very significant benefits for ASEAN members and PRC (particularly the former). Having said this, AFTAPC and GTL appear to give rise to different adjustment patterns, within the region, between it and the rest of the world, and outside the region. For this reason, the argument that regionalism constitutes a gradualist approach to globalization may not be defensible. This finding also implies that the political economy supporting regionalism and globalization may differ in nontrivial ways.<sup>1</sup>

Thus we find that further East Asian regionalism may not be "on the path" to globalization, since patterns of structural adjustment and trade may differ between AFTAPC and GTL. It has been argued elsewhere by the author, however, that the main impetus toward deeper regionalism may be its relative certainty and expedience by

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<sup>1</sup> These regional issues will be the subject of more detailed investigation in the second paper of this series.

comparison to WTO-based GTL.<sup>2</sup> In other words, the risk-adjusted present value of a regional agreement is higher for regional members. To the extent that RTL and GTL are not mutually exclusive, one might also advocate “intermediate regionalism” for the precedence, institution building and standard setting it confers on member countries.<sup>3</sup> Certainly, some of these institutional arguments are valid, but in the East Asian context PRC’s initiative creates a special momentum toward globalization.

Indeed, the role of PRC is at the heart of a dilemma for East Asian regionalism. Our results show that this country would enjoy about the same benefits from unilateralism as from joining AFTA. For ASEAN, however, the difference between AFTA and AFTAPC is very significant indeed. This fact has important strategic implications for the course of regional negotiations and might also be of relevance to non-ASEAN regional economies that might want to discourage this FTA.

Despite this strategic uncertainty, the path of regionalism in East Asia is already well-trodden. Whether or not it points toward or diverges from the road to globalization, it is already conferring gains on its members and could be expected to do more of this with regional extension and deepening. It is clear from our results, however, that more attention to the structural details of liberalization, adjustment, and growth will be needed to realize the full potential of East Asian regional trade and to facilitate an eventual transition to more liberal global trade. Empirical simulation models of the kind presented here can support this evolving policy in essential ways, identifying both the opportunities and challenges that lie ahead for more open multilateralism.

In the next section, we give a brief overview of the global CGE model. This is followed in Section 3 by discussion of the baseline data and forward scenario to which the model was calibrated. Section 4 presents the results for alternative trade scenarios, followed by concluding remarks in Section 5.

## **2. The Dynamic Forecasting Model**

The complexities of today’s global economy make it very unlikely that policy makers relying on intuition or rules-of-thumb will achieve anything approaching optimality in either the international or domestic arenas. Market interactions are so pervasive, and market forces so powerful in determining economic outcomes that more sophisticated empirical research tools are needed to improve visibility for both public and private sector decision makers. The preferred tool for detailed empirical analysis of economic policy is now the Calibrated General Equilibrium (CGE) model. It is ideally suited to trade analysis because it can detail structural adjustments within national economies and elucidate their interactions in international markets. The model is more extensively discussed in an annex below and the underlying methodology is fully

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<sup>2</sup> See Roland-Holst and van der Mensbrugge (2002).

<sup>3</sup> These fringe benefits are espoused by a variety of authors, and the general issues are synthesized nicely in World Bank (2000). Compare also Hoekman and Leidy (1993) and Lawrence (1996). In the case of ASEAN, these arguments may have special relevance. The recent agreement between Japan and Singapore is also an example of “standards driven” regionalism.

documented elsewhere, but a few general comments will facilitate discussion and interpretation of the scenario results that follow.<sup>4</sup>

Technically, a CGE model is a system of simultaneous equations that simulate price-directed interactions between firms and households in commodity and factor markets. The role of government, capital markets, and other trading partners are also specified, with varying degrees of detail and passivity, to close the model and account for economywide resource allocation, production, and income determination.

The role of markets is to mediate exchange, usually with a flexible system of prices, the most important endogenous variables in a typical CGE model. As in a real market economy, commodity and factor price changes induce changes in the level and composition of supply and demand, production and income, and the remaining endogenous variables in the system. In CGE models, an equation system is solved for prices that correspond to equilibrium in markets and satisfy the accounting identities governing economic behavior. If such a system is precisely specified, equilibrium always exists and such a consistent model can be calibrated to a base period data set. The resulting calibrated general equilibrium model is then used to simulate the economywide (and regional) effects of alternative policies or external events.

The distinguishing feature of a general equilibrium model, applied or theoretical, is its closed-form specification of all activities in the economic system under study. This can be contrasted with more traditional partial equilibrium analysis, where linkages to other domestic markets and agents are deliberately excluded from consideration. A large and growing body of evidence suggests that indirect effects (e.g., upstream and downstream production linkages) arising from policy changes are not only substantial, but may in some cases even outweigh direct effects. Only a model that consistently specifies economywide interactions can fully assess the implications of economic policies or business strategies. In a multi-country model like the one used in this study, indirect effects include the trade linkages between countries and regions which themselves can have policy implications.

The present ADBI global modeling facility has been constructed according to generally accepted specification standards, implemented in the GAMS programming language, and calibrated to the GTAP global database.<sup>5</sup> The result is an eighteen-country/region, eighteen-sector global CGE model, calibrated over a twenty-four year time path from 1997 to 2020.<sup>6</sup> Apart from its traditional neoclassical roots, an important feature of this model is product differentiation, where we specify that imports are differentiated by country of origin and exports are differentiated by country of destination (e.g., de Melo and Tarr, 1992). This feature allows the model to capture the pervasive phenomenon of intra-industry trade, where a country is both an importer and exporter of similar commodities, and avoids tendencies toward extreme specialization.

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<sup>4</sup> The model used here is typical of modern global models and is based on the LINKAGE model developed at the World Bank (van der Mensbrugghe: 2001).

<sup>5</sup> See e.g. Meeraus et al (1992) for GAMS and Hertel et al (2001) for GTAP.

<sup>6</sup> The present specification is one of the more sophisticated examples of this empirical method, already applied to over 50 individual countries or combinations thereof (see e.g. Francois and Roland-Holst, 1997; Lee and Roland-Holst, 1995, 1997, 1998ab; Lee et al., 1999).

### 3. Baseline Data and Scenario

As has already been mentioned, this model is calibrated to a 1997 reference global database obtained from GTAP Version 5. While these data are generally available to the research community, we reproduce some of this information in the present section for the convenience of the reader. For example, to give a general indication about trade patterns in the base data, Tables 3.1 and 3.2 summarize base year trade flows for selected regions included in the model.

**Table 3.1. Base Year Export Flows**  
(percentages, 1997)

	Developing East Asia					High Income East Asia				
	Share	EAP	HYA	CUS	ROW	Share	EAP	HYA	CUS	ROW
Wheat	0.3	33.4	22.1	12.1	32.4	0.0	0.0	59.8	3.4	36.8
Other grains	0.1	78.8	5.3	0.7	15.2	0.3	40.0	12.7	0.0	47.3
Oil seeds	0.0	16.7	43.4	0.0	39.9	0.0	11.4	66.8	4.0	17.8
Sugar	0.2	50.5	23.2	7.4	19.0	0.1	30.5	23.9	37.6	8.0
Other crops	1.0	14.5	36.6	15.7	33.2	0.4	29.4	31.9	6.8	31.8
Livestock	0.3	6.4	55.0	9.8	28.7	0.4	27.2	18.0	5.7	49.2
Energy	4.3	27.7	57.8	4.1	10.4	2.0	38.8	38.5	2.6	20.1
Processed foods	3.9	13.6	43.5	14.8	28.1	2.1	19.5	37.9	14.5	28.1
Textile	6.6	20.7	32.8	10.8	35.7	2.9	53.6	11.7	13.7	21.0
Wearing apparel	6.1	2.9	33.7	28.7	34.8	1.3	15.9	7.9	48.6	27.6
Leather goods	4.7	6.8	14.2	44.6	34.3	0.4	35.3	16.6	15.2	33.0
Basic manufacturing	17.2	22.9	32.9	17.2	27.0	16.2	40.9	22.4	17.8	18.8
Motor vehicles	2.1	8.6	14.2	19.4	57.8	8.8	11.6	9.8	45.9	32.7
Other transp equipment	1.7	9.0	11.5	10.3	69.2	2.5	10.3	13.9	15.7	60.1
Electronic equipment	22.7	10.6	32.4	32.4	24.6	24.3	23.9	19.8	32.7	23.6
Other manufacturing	15.6	10.8	27.0	29.3	32.8	21.7	31.3	18.9	23.0	26.7
Construction	0.1	1.3	24.3	2.7	71.8	0.8	8.2	2.7	4.1	85.0
Services	12.9	8.8	11.3	18.6	61.3	15.7	7.6	9.6	21.7	61.1
<b>Total</b>	<b>100.0</b>	<b>13.6</b>	<b>29.0</b>	<b>23.4</b>	<b>34.0</b>	<b>100.0</b>	<b>25.3</b>	<b>17.7</b>	<b>25.2</b>	<b>31.8</b>

- Notes:
1. The first column represents the sectoral share in aggregate exports. The following four columns provide the sectoral destination shares.
  2. The regional acronyms are Developing East Asia (EAP), High-income East Asia (HYA), Canada and the United States (CUS), and Europe and the rest of the world (ROW).

Source: GTAP Version 5.0.

**Table 3.2. Base Year Import Flows**  
(percentages, 1997)

	Developing East Asia					High Income East Asia				
	Share	EAP	HYA	CUS	ROW	Share	EAP	HYA	CUS	ROW
Wheat	0.1	96.5	0.0	0.8	2.7	0.1	62.5	16.0	16.9	4.6
Other grains	0.7	17.8	23.2	49.4	9.6	0.6	1.0	6.4	88.3	4.3
Oil seeds	0.3	2.4	0.9	76.7	20.0	0.4	3.9	3.4	77.8	14.9
Sugar	0.2	60.0	17.6	0.0	22.4	0.1	48.6	24.4	0.0	27.0
Other crops	1.0	15.6	15.6	32.3	36.5	1.1	26.6	11.4	29.9	32.0
Livestock	0.4	4.9	37.5	35.7	21.8	0.4	36.0	21.1	23.7	19.2
Energy	7.2	17.7	15.8	2.7	63.8	8.8	22.8	9.7	4.3	63.2
Processed foods	3.1	18.6	19.5	18.4	43.5	5.4	25.8	16.5	24.5	33.2
Textile	4.5	32.7	50.5	3.7	13.1	2.9	60.9	12.9	5.6	20.6
Wearing apparel	0.6	29.2	44.5	3.7	22.6	2.4	70.7	4.6	3.8	20.9
Leather goods	0.8	40.8	23.2	9.7	26.3	1.0	53.1	6.8	5.6	34.4
Basic manufacturing	23.7	17.8	40.6	13.8	27.8	18.9	24.3	21.2	21.1	33.4
Motor vehicles	2.5	7.7	59.2	8.7	24.4	3.4	7.3	28.3	20.4	44.0
Other transp equipment	2.7	6.0	13.9	44.5	35.7	2.2	7.1	17.4	57.0	18.4
Electronic equipment	16.0	16.0	52.5	20.5	11.0	16.6	36.1	32.0	19.6	12.3
Other manufacturing	20.8	8.7	47.5	14.9	28.9	17.4	19.7	26.0	24.0	30.3
Construction	0.4	0.3	23.3	9.6	66.8	0.9	2.2	2.6	13.5	81.6
Services	14.9	8.2	11.5	21.6	58.7	17.5	6.8	9.5	25.2	58.5
<b>Total</b>	<b>100.0</b>	<b>14.5</b>	<b>36.6</b>	<b>16.4</b>	<b>32.5</b>	<b>100.0</b>	<b>23.5</b>	<b>19.4</b>	<b>21.2</b>	<b>35.8</b>

Second only to baseline trade flows in their importance for the policy outcomes we consider in this paper are prior patterns of import protection. The next three tables present this information, representing a variety of perspectives on trade price distortions. For selected regions, Tables 3.3. and 3.4. give import protection levels by origin and destination, respectively. This helps reveal asymmetries in market openness for aggregate commodity groups. Table 3.5., on the other hand, gives a matrix of trade weighted import barriers by country and region, indicating (fairly significant) asymmetries in overall domestic market access under current (1997) patterns of trade. Table 3.6. summarizes the country and regional abbreviations used in tables throughout the paper.

**Table 3.3. Applied Tariffs by Region of Origin**  
(percent)

	Developing East Asia					High Income East Asia				
	EAP	HYA	CUS	ROW	Total	EAP	HYA	CUS	ROW	Total
Wheat	50.8	..	0.0	0.0	49.2	109.5	256.8	409.0	293.2	192.7
Other grains	191.0	28.3	95.4	76.6	96.1	30.8	210.1	66.2	28.8	72.7
Oil seeds	76.4	78.9	86.5	87.0	86.3	69.7	76.4	56.3	64.0	58.7
Sugar	9.4	14.1	..	15.9	11.6	81.6	56.9	..	89.1	77.8
Other crops	43.6	18.1	23.3	17.6	23.7	20.0	16.5	22.4	17.7	19.6
Livestock	5.4	10.6	8.7	11.8	9.9	2.0	11.3	20.9	15.2	11.0
Energy	5.0	9.2	4.0	3.6	4.8	0.4	1.0	1.2	-0.5	0.0
Processed foods	30.3	26.8	32.7	32.5	31.0	28.2	39.1	34.6	33.5	33.3
Textile	21.5	23.5	13.9	13.9	21.3	5.5	3.3	6.2	6.3	5.5
Wearing apparel	16.8	29.6	12.0	12.0	21.1	9.9	7.1	10.3	10.8	10.0
Leather goods	10.3	9.6	8.2	6.6	9.0	12.1	5.3	10.7	10.7	11.1
Basic manufacturing	10.4	10.8	8.6	7.9	9.6	2.1	2.0	1.7	1.6	1.8
Motor vehicles	50.5	34.4	15.0	27.4	32.2	6.5	7.6	3.7	4.1	5.2
Other transp equipment	9.6	16.3	1.4	3.4	4.7	1.1	0.7	0.3	0.2	0.4
Electronic equipment	6.9	7.0	5.4	6.8	6.6	0.4	0.7	0.5	0.8	0.6
Other manufacturing	9.5	9.6	8.8	7.7	8.9	1.6	2.0	1.4	1.4	1.6
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>13.3</b>	<b>11.4</b>	<b>10.3</b>	<b>7.0</b>	<b>10.1</b>	<b>4.7</b>	<b>4.4</b>	<b>6.7</b>	<b>3.1</b>	<b>4.5</b>
<b>Agriculture &amp; food</b>	<b>51.1</b>	<b>23.2</b>	<b>49.7</b>	<b>31.8</b>	<b>38.9</b>	<b>28.5</b>	<b>43.3</b>	<b>43.8</b>	<b>32.0</b>	<b>36.7</b>
Energy	5.0	9.2	4.0	3.6	4.8	0.4	1.0	1.2	-0.5	0.0
Textile & apparel	19.2	23.2	12.1	12.0	19.6	8.3	4.3	8.2	8.9	8.1
Other manufacturing	10.0	10.6	7.1	8.2	9.3	1.4	1.9	1.3	1.6	1.5
Other goods & services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes: 1. The first column represents the sectoral share in aggregate exports. The following four columns provide the sectoral destination shares.

2. The regional acronyms are Developing East Asia (EAP), High-income East Asia (HYA), Canada and the United States (CUS), and Europe and the rest of the world (ROW).

Source: GTAP Version 5.0.



**Table 3.4. Applied Tariffs by Region of Destination**  
(percent)

	Developing East Asia					High Income East Asia				
	EAP	HYA	CUS	ROW	Total	EAP	HYA	CUS	ROW	Total
Wheat	50.8	109.5	3.5	40.9	54.8	..	256.8	0.0	34.8	169.5
Other grains	191.0	30.8	0.0	8.4	155.0	28.3	210.1	..	14.4	45.2
Oil seeds	76.4	69.7	..	6.5	45.8	78.9	76.4	0.0	0.0	61.6
Sugar	9.4	81.6	54.0	19.1	31.2	14.1	56.9	22.9	23.7	28.1
Other crops	43.6	20.0	16.0	15.6	21.5	18.1	16.5	6.5	18.9	17.0
Livestock	5.4	2.0	0.0	9.9	4.3	10.6	11.3	0.0	11.1	10.4
Energy	5.0	0.4	0.0	8.4	2.5	9.2	1.0	0.0	5.1	5.0
Processed foods	30.3	28.2	10.5	29.5	26.3	26.8	39.1	14.0	53.0	36.9
Textile	21.5	5.5	11.4	15.1	12.9	23.5	3.3	12.4	12.7	17.6
Wearing apparel	16.8	9.9	13.5	14.5	12.8	29.6	7.1	13.8	12.8	15.5
Leather goods	10.3	12.1	15.5	13.5	14.0	9.6	5.3	10.8	8.6	8.7
Basic manufacturing	10.4	2.1	3.6	9.5	6.2	10.8	2.0	3.6	8.8	7.2
Motor vehicles	50.5	6.5	2.3	15.9	14.9	34.4	7.6	2.9	13.4	10.5
Other transp	9.6	1.1	3.8	5.5	5.2	16.3	0.7	1.8	10.8	8.6
Electronic equipment	6.9	0.4	1.2	6.3	2.8	7.0	0.7	1.1	5.2	3.4
Other manufacturing	9.5	1.6	2.6	7.5	4.7	9.6	2.0	2.7	6.3	5.7
Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Services	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.4	0.2
<b>Total</b>	<b>13.3</b>	<b>4.7</b>	<b>4.6</b>	<b>8.4</b>	<b>7.1</b>	<b>11.4</b>	<b>4.4</b>	<b>2.6</b>	<b>6.6</b>	<b>6.4</b>
Agriculture & food	51.1	28.5	11.6	25.6	29.3	23.2	43.3	13.2	36.1	32.7
Energy	5.0	0.4	0.0	8.4	2.5	9.2	1.0	0.0	5.1	5.0
Textile & apparel	19.2	8.3	14.1	14.5	13.2	23.2	4.3	13.1	12.2	16.3
Other manufacturing	10.0	1.4	2.1	8.1	4.8	10.6	1.9	2.2	7.8	6.0
Other goods & services	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.4	0.2

**Table 3.5. Bilateral, Trade Weighted Tariffs**  
(percent)

<i>Exporter</i>	<i>Importer</i>																											
	<i>prc</i>	<i>hkg</i>	<i>idn</i>	<i>jpn</i>	<i>kor</i>	<i>mys</i>	<i>phl</i>	<i>sgp</i>	<i>tha</i>	<i>twn</i>	<i>vnm</i>	<i>anz</i>	<i>can</i>	<i>eur</i>	<i>lac</i>	<i>sas</i>	<i>usa</i>	<i>row</i>	<i>Total</i>	<i>eap</i>	<i>eax</i>	<i>nie</i>	<i>ean</i>	<i>eat</i>	<i>lmx</i>	<i>hiy</i>	<i>lmy</i>	
<i>PRC</i>	<i>prc</i>	..	.0	7.0	8.6	25.1	8.9	11.3	.3	15.9	5.0	26.2	11.2	8.7	5.7	13.8	27.4	5.7	14.4	8.3	9.6	9.6	4.5	8.7	9.1	8.5	7.0	9.0
<i>Hong Kong</i>	<i>hkg</i>	18.2	..	6.5	4.6	5.6	2.8	2.7	.0	7.8	5.4	46.5	.0	12.4	5.2	4.4	15.4	4.2	2.4	6.3	13.4	4.3	2.9	11.2	10.9	3.6	4.9	6.8
<i>Indonesia</i>	<i>idn</i>	10.1	.0	..	5.4	5.3	10.7	6.0	.0	15.1	4.4	7.5	3.3	5.5	6.3	10.4	22.2	7.3	11.9	7.0	6.1	5.6	4.9	5.9	5.8	9.5	6.0	7.5
<i>Japan</i>	<i>jpn</i>	15.2	.0	9.6	..	7.6	8.3	6.2	.0	16.8	5.2	17.1	5.4	3.7	3.6	12.0	27.0	2.3	8.6	6.1	9.8	6.6	6.2	8.6	8.5	4.2	5.5	6.6
<i>Korea</i>	<i>kor</i>	16.4	.0	19.0	6.0	..	3.0	6.3	.0	13.4	4.5	18.0	6.4	3.0	3.9	13.3	25.4	2.9	11.6	7.7	9.6	5.8	4.5	8.7	8.8	7.6	6.1	8.7
<i>Malaysia</i>	<i>mys</i>	16.3	.0	6.6	1.8	5.4	..	4.9	.2	10.9	3.9	18.5	2.8	1.7	3.5	8.2	27.5	1.7	11.8	4.3	5.0	2.7	2.0	3.4	3.4	6.2	2.9	5.6
<i>Philippines</i>	<i>phl</i>	9.4	.0	1.1	5.2	8.9	1.4	..	.0	8.3	2.9	.0	1.5	1.3	2.4	1.8	2.3	3.8	4.8	3.3	4.6	4.3	2.4	3.9	3.8	4.0	2.3	4.2
<i>Singapore</i>	<i>sgp</i>	11.1	.0	4.4	1.2	6.2	5.0	4.0	..	11.0	3.7	14.6	1.4	.0	2.2	6.2	20.6	1.1	6.7	4.2	4.5	3.3	6.9	4.9	4.9	4.4	3.7	4.5
<i>Thailand</i>	<i>tha</i>	19.3	.0	7.8	13.4	8.0	7.1	3.4	.2	..	4.1	24.2	4.3	4.4	5.7	7.5	22.9	4.9	9.4	7.2	10.9	9.6	.7	8.1	8.2	6.8	4.6	8.9
<i>Taipei, China</i>	<i>twn</i>	16.4	.0	7.9	4.5	8.0	5.4	8.8	.2	15.4	..	17.2	3.5	4.2	3.9	10.6	20.6	3.2	7.7	7.1	10.5	4.6	5.6	9.8	9.8	4.1	5.4	7.8
<i>Vietnam</i>	<i>vnm</i>	5.8	.0	.0	11.1	10.1	22.4	20.8	.0	8.5	7.9	..	1.4	10.4	10.0	9.7	.0	8.9	12.1	9.2	10.7	11.3	4.6	9.2	8.6	9.8	8.0	10.5
<i>Australia and New Zealand</i>	<i>anz</i>	14.4	.0	5.8	20.2	5.7	6.8	7.5	1.8	12.3	6.3	8.0	.0	7.9	9.2	8.6	11.4	3.0	20.5	10.3	13.4	13.2	6.3	12.2	10.7	10.7	6.9	12.4
<i>Canada</i>	<i>can</i>	22.6	.0	1.5	19.4	4.4	1.3	3.0	.0	4.2	2.9	.0	1.6	.0	3.3	9.1	7.6	.4	12.7	2.6	13.8	12.5	2.2	12.2	11.7	1.0	4.1	2.3
<i>Western Europe</i>	<i>eur</i>	11.0	.0	4.5	3.7	5.9	4.4	3.5	.1	9.5	7.3	10.7	3.4	3.8	.5	9.3	18.8	2.2	11.1	3.1	5.0	3.8	4.8	4.9	4.8	7.8	1.2	7.1
<i>Latin America and the Caribbean</i>	<i>lac</i>	19.9	.0	3.0	10.4	16.6	2.8	4.3	.5	11.8	3.1	.0	1.6	2.6	7.6	12.9	16.5	2.7	15.6	7.1	11.6	10.0	4.2	10.3	10.0	4.3	9.5	5.5
<i>South Asia</i>	<i>sas</i>	9.5	.0	3.7	10.2	8.6	8.4	5.8	.0	10.7	1.8	.0	8.1	8.9	7.3	7.8	19.5	7.0	13.9	8.7	8.4	8.1	3.4	7.3	7.3	10.6	7.0	10.0
<i>United States</i>	<i>usa</i>	13.9	.0	4.8	9.3	14.2	3.1	4.7	.1	8.7	4.2	5.1	2.8	.8	2.7	6.2	15.5	.0	8.7	5.1	9.4	8.6	3.4	8.1	7.7	9.2	3.1	9.3
<i>Rest of the World</i>	<i>row</i>	5.3	.0	2.7	1.8	5.2	3.8	1.2	.1	3.7	2.6	8.6	1.9	2.1	4.4	4.7	24.5	2.1	8.2	5.1	3.0	2.7	1.7	2.8	2.8	7.3	4.1	5.9
<i>Total</i>	<i>Total</i>	13.9	.0	6.6	7.0	9.4	5.4	5.0	.1	11.3	5.0	15.8	3.6	1.9	1.9	8.9	20.9	2.4	10.3	4.8	7.9	6.3	4.3	7.1	6.9	6.4	3.0	6.9
<i>Developing East Asia</i>	<i>eap</i>	15.6	.0	10.6	6.7	11.3	7.2	6.7	.1	15.2	4.9	19.4	6.2	4.7	4.3	12.1	25.8	3.5	10.0	6.6	9.1	6.9	4.8	7.9	7.9	5.9	5.5	7.4
<i>Developing East Asia ∕ PRC</i>	<i>eax</i>	15.6	.0	11.2	4.8	7.2	6.9	5.9	.1	15.2	4.9	17.0	4.8	3.6	3.8	11.6	25.3	2.8	8.7	6.1	9.0	5.7	4.8	7.7	7.6	5.1	5.1	6.9
<i>Newly industrialized economies</i>	<i>nie</i>	15.6	.0	6.0	6.6	7.2	5.4	5.4	.2	12.8	3.8	17.4	2.8	3.0	3.7	8.7	21.0	2.9	7.7	6.0	8.3	5.1	4.6	7.7	7.7	4.8	4.5	6.8
<i>Developing East Asia &amp; NIEs</i>	<i>ean</i>	15.6	.0	9.5	6.6	10.8	6.4	6.4	.1	14.7	4.7	18.7	5.4	4.3	4.1	11.6	24.6	3.4	9.6	6.5	8.9	6.4	4.8	7.8	7.9	5.7	5.3	7.2
<i>East Asia</i>	<i>eat</i>	15.5	.0	9.1	8.4	10.2	6.4	6.6	.2	14.6	4.9	18.5	4.5	4.6	4.5	11.4	23.3	3.4	10.3	6.7	9.3	7.1	4.8	8.1	8.1	5.9	5.4	7.5
<i>Low- and middle-income ∕ East Asia</i>	<i>lmx</i>	10.7	.0	4.0	6.4	10.1	3.6	3.6	.1	6.6	3.9	5.7	2.8	1.0	3.7	6.1	21.6	2.9	8.7	5.2	7.0	6.4	2.9	6.2	6.0	8.1	3.6	7.6
<i>High-income</i>	<i>hiy</i>	14.0	.0	4.8	7.6	6.9	5.0	4.6	.2	10.7	6.0	14.2	2.7	3.7	1.0	10.7	18.2	1.9	11.4	3.9	7.5	5.9	4.7	7.0	6.8	5.9	2.1	6.4
<i>Low- and middle-income</i>	<i>lmy</i>	13.9	.0	8.1	6.5	10.6	5.8	5.3	.1	11.7	4.5	17.1	4.4	1.4	3.9	7.4	23.2	3.4	9.0	5.8	8.1	6.6	4.1	7.1	7.0	7.0	4.2	7.5

Notes: PRC and Hong Kong, China are disaggregated in the 1997 GTAP 5 dataset.  
All regional and "Total" averages are trade-weighted ad valorem equivalent rates.

It is essential to note, even in passing, that we are not modeling significant agricultural protection in the present exercise. This means our results will generally understate the effects of trade liberalization at the aggregate level and do not fully capture sectoral adjustments, particularly in primary activities. This will be the subject of further research.<sup>7</sup>

As mentioned in the previous section, the dynamic CGE model is calibrated to a baseline time series reflecting a business-as-usual (BAU) scenario over the period 1997-2020. For reference, Table 3.7. presents these baseline values of selected variables in the initial and terminal years.

**Table 3.6. Country and Regional Definitions**

<b>Abbreviation</b>	<b>Name</b>
chn	PRC
hkg	Hong Kong, China
idn	Indonesia
jpn	Japan
kor	Korea
mys	Malaysia
phl	Philippines
sgp	Singapore
tha	Thailand
twn	Taipei,China
vnm	Vietnam
anz	Australia and New Zealand
can	Canada
eur	Western Europe
lac	Latin America and the Caribbean
sas	South Asia
usa	United States
row	Rest of the World
eap	Developing East Asia
eax	Developing East Asia x/ PRC
nie	Newly industrialized economies
ean	Developing East Asia & NIEs
eat	East Asia total
lmx	Low- and middle-income x/ East Asia
hiy	High-income
lmy	Low- and middle-income
wlt	World total

<sup>7</sup> See, e.g. OECD (1990), Goldin, Knudsen, and van der Mensbrugghe (1993), and van der Mensbrugghe and Guerrero (1998) for indications about treatment of agricultural liberalization in this framework.

**Table 3.7. Summary of Baseline Scenario**  
(\$1997 billion, unless stated otherwise)

	<i>High-income</i>	<i>Low- and middle-income</i>	<i>Developing East Asia</i>	<i>High-income East Asia</i>	<i>Rest of high-income</i>	<i>Rest of the world</i>	<i>World total</i>
<b>Aggregate statistics in base year (1997)</b>							
Real GDP	22,181	6,802	1,874	4,775	17,406	4,928	28,983
Population (millions)	867	4,946	1,705	157	710	3,242	5,814
Labor force	12,049	2,888	783	2,456	9,593	2,105	14,937
Capital stock1	8,468	3,088	835	1,681	6,787	2,254	11,557
Exports	4,492	1,704	661	806	3,686	1,044	6,196
Imports	4,585	1,820	651	758	3,826	1,169	6,405
GDP per capita (\$1997)	25,575	1,375	1,099	30,352	24,516	1,520	4,985
GDP share (% of world)	76.5	23.5	6.5	16.5	60.1	17.0	100.0
Population share (% of world)	14.9	85.1	29.3	2.7	12.2	55.8	100.0
Parity index2	513	28	22	609	492	30	100
<b>Aggregate statistics in final year (2020)</b>							
Real GDP	35,233	14,462	5,227	6,877	28,356	9,235	49,695
Population (millions)	911	6,199	1,985	161	751	4,214	7,110
Labor Force	12,517	3,897	955	2,259	10,257	2,942	16,414
Capital stock1	14,755	6,462	2,489	3,179	11,576	3,973	21,217
Exports	7,220	3,567	1,610	1,333	5,887	1,956	10,786
Imports	7,581	3,620	1,555	1,352	6,229	2,065	11,201
GDP per capita (\$1997)	38,664	2,333	2,634	42,826	37,773	2,192	6,990
GDP share (% of world)	70.9	29.1	10.5	13.8	57.1	18.6	100.0
Population share (% of world)	12.8	87.2	27.9	2.3	10.6	59.3	100.0
Parity index2	553	33	38	613	540	31	100
<b>Average annual growth rate, 1997-2020 (percent)</b>							
Real GDP	2.6	4.3	5.9	2.0	2.7	3.6	3.0
Population (millions)	0.3	1.3	0.8	0.1	0.3	1.5	1.1
Labor Force	0.2	1.7	1.1	-0.5	0.4	1.9	0.5
Capital stock	3.1	4.2	6.3	3.6	3.0	3.2	3.4
Exports	2.7	4.2	5.1	2.8	2.6	3.6	3.1
Imports	2.8	3.9	5.0	3.3	2.7	3.2	3.2
GDP per capita (\$1997)	2.3	3.0	5.0	1.9	2.4	2.1	1.9
GDP share3	-5.6	5.6	4.1	-2.6	-3.0	1.6	0.0
Population share3	-2.1	2.1	-1.4	-0.4	-1.7	3.5	0.0
Parity index4	7.8	21.0	70.9	0.6	9.9	2.8	0.0

Notes: 1) Capital stock is normalized to base year prices  
2) Parity index measures the ratio of per capita income to world average  
Source: GTAP 5.0 and model simulation results.

Now we look at the baseline scenario projections in more detail. Recall that these represent a so-called “business as usual” policy regime, meaning in particular that protection levels are maintained for all countries/regions at their initial levels. In the Baseline case, we calibrate the dynamic model to consensus forecasts for real GDP obtained from independent sources (e.g. IMF, DRI, and Cambridge Econometrics). The model is then run forward to meet these targets, making average capital productivity growth for each country/region endogenous. This calibration yields productivity growth that would be needed to attain the macro trajectories, and these are then held fixed in the model under other policy scenarios. Other exogenous macro forecasts could have been used, but this is the standard way to calibrate these models.<sup>8</sup>

The general macroeconomic properties of the baseline scenario are summarized for aggregate countries/regions in Table 3.8. Here we see the real GDP growth rates obtained from outside sources, as well as the implied (annualized) growth rates of some other important macro aggregates. These differences are quite revealing, both of the underlying domestic and international adjustment mechanisms (see Annex B). For example, it is generally true that faster growing economies experience faster growing absorption, as would be expected. Trade growth is more complex, however. Faster growing economies generally experience real exchange rate depreciation because: 1) their export capacity is growing faster than the absorptive capacity of the Rest of the World (ROW, on average); and 2) their imports are growing faster than export capacity of the ROW. Apart from these observations, it is rather difficult to generalize because so much depends on the sectoral and geographic composition of trade.

What are the consequences of baseline GDP growth rates at the macro level? Figures 3.1. and 3.2. depict real GDP growth, first indexed to the year 2000 (=100) to show rates of growth, and then in terms of aggregate real US dollars. Both series are again exogenous to the model, but it is revealing to see how the above average PRC growth rates translate into aggregate convergence. PRC is projected to exceed two-thirds of Japan’s GDP by 2020, against today’s 26%. Recall however, that in per capital terms, PRC GDP will remain less than 5% of its Japanese counterpart.

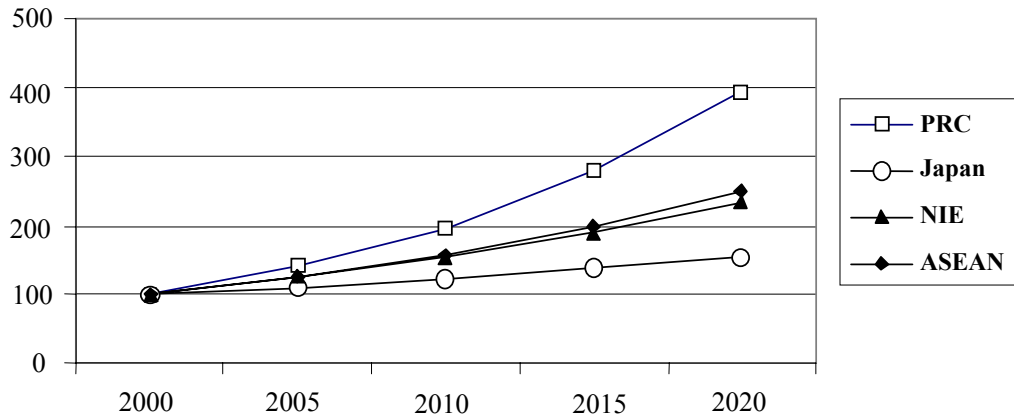
The trade implications of this macro growth are summarized in the next two figures, where the most arresting feature is PRC’s overtaking of its regional neighbors in both exports and imports. Figure 3.3. indicates that PRC will become the region’s largest single exporter around 2010, surpassing Japan and widening its lead continuously for the next decade. Obviously, this trend is at the root of the PRC-threat sentiments, which view this economy as an unstoppable competitor in nearly all product categories.

This perception is neither logically reasonable nor supported by our evidence, however, as will be seen in the next figure and in results throughout this paper.

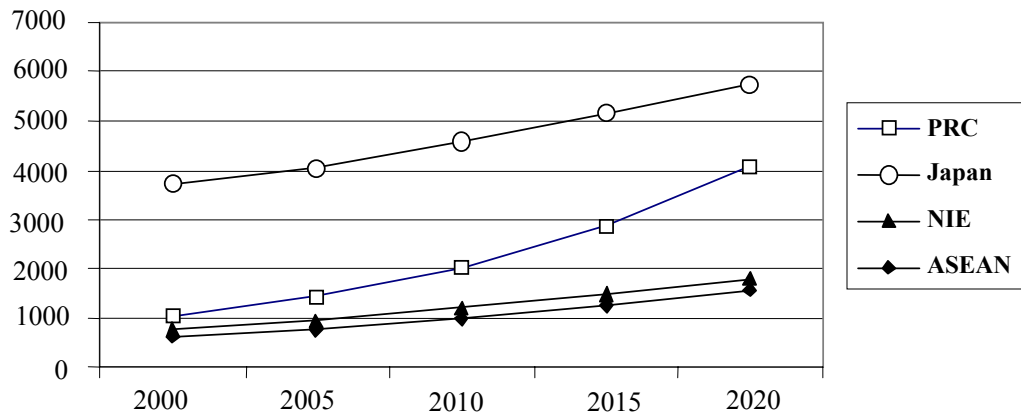
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<sup>8</sup> The baseline calibration of the model is described in greater detail in Annex B.

**Figure 3.1. Real GDP Trends**  
(normalized to 100 in 2000)



**Figure 3.2. Real GDP Trends**  
(billions of 1997 USD)



Like the flawed logic of mercantilism, the universal exporter view of PRC is compromised by the ‘Fallacy of Composition.’<sup>9</sup> PRC cannot sustain large and rapidly growing current account surpluses indefinitely for two reasons:

1. Chronic surpluses would induce exchange rate appreciation, undermining the very export competitiveness that created the surpluses.
2. PRC is a nation rich in some resources (especially labor), but not particularly well endowed with a wide variety of others. Expanding Chinese export capacity at the rates implied by GDP growth forecasts will necessitate rapidly growing imports of goods and resources of all kinds.

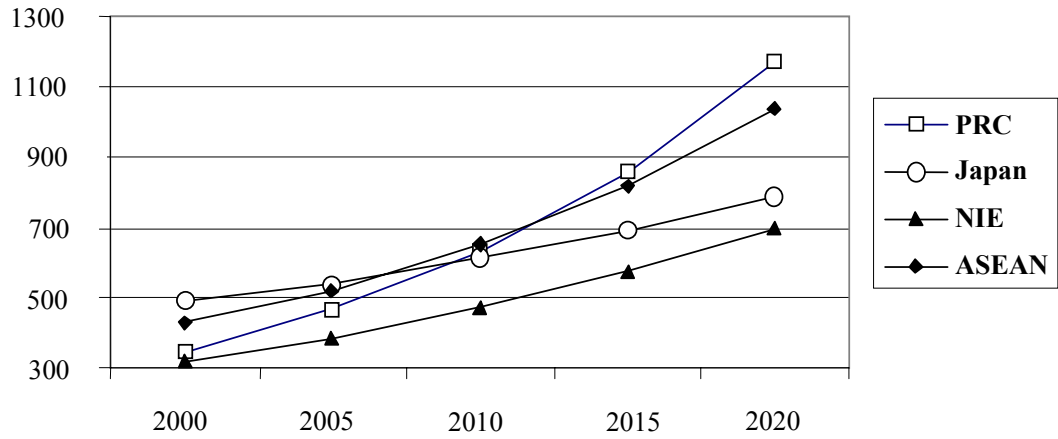
Given that export and import growth are necessarily linked in any sustainable scenario of PRC’s long-term growth, what then can be said about the latter? We make a special effort to answer this question in all three papers of this series, because in that answer resides the great opportunity of PRC economic growth for its neighbors.

Beginning at the aggregate level, Figure 3.4. indicates that, in the Baseline scenario, PRC will become the region’s largest individual importer by 2005, even before it takes first place in exports. Thus one might conclude that the PRC-threat perspective is especially misguided, since PRC as an opportunity will actually take precedence over its aggregate export dominance. Indeed, when we look at the regional composition of trade, it will become apparent that PRC’s regional export dominance is actually delayed by the rapid emergence of its dependence on imports from the region. Indeed, PRC itself offsets some or all of the adjustment costs for its competitors by creating a new market for them.

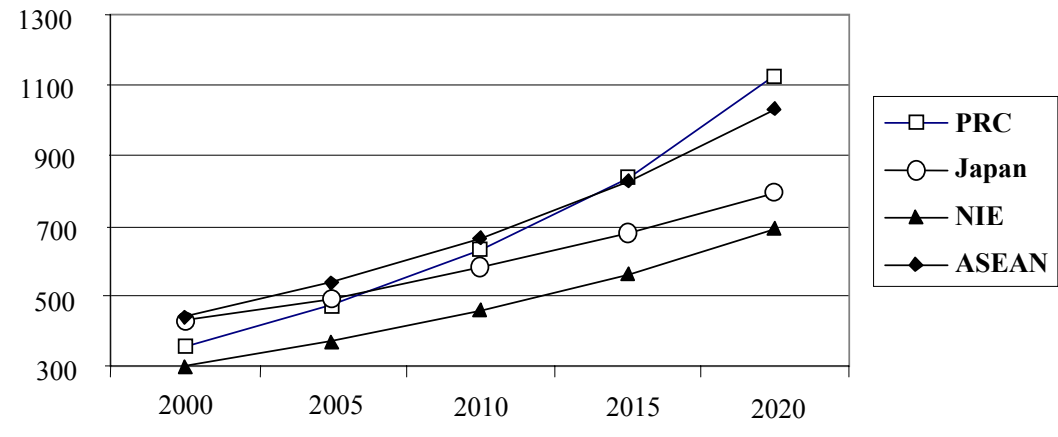
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<sup>9</sup> The current modeling framework avoids this conceptual trap by using a base year, balance of payments constraint. For each economy, total foreign capital inflows in base year USD are held fixed, and thus the real exchange rate must adjust to maintain a sustainable trade balance over time. See Annex B for more details.

**Figure 3.3. Real Export Trends**  
(billions of 1997 USD)



**Figure 3.4. Real Import Trends**  
(billions of 1997 USD)





This market transfer effect has important implications about the ultimate consequences of, and best policy responses to, PRC's globalization. To better see this, consider the bilateral trade flow results in Tables 3.8. and 3.9. below. In the first table, we present annualized growth rates for bilateral trade between the countries and regions listed. Note first of all how variegated they are, depending as they do on growth rates of each of two countries, subject to composition of both import demand and export supply. Suffice to say for the moment that this is fertile ground for the political economy of trade negotiations, but closer inspection is still rewarding. For example, note that PRC's superior export growth to individual markets is generally reciprocated with superior rates of growth in Chinese import dependence. Exceptions to this are exporters with slower growth rates who experience adverse terms-of-trade shifts, such as Japan and the U.S., allowing their bilateral imports to grow faster than exports.

Now compare these results with baseline bilateral trade imbalances, expressed in Table 3.9. for the year 2020 in 1997 constant USD billions. Again there is significant variability in bilateral ties, but another central policy conclusion of this analysis emerges from one systematic feature of this table. Note that, by 2020, PRC exhibits a significant trade surplus with respect to Western OECD economies, but a trade deficit of about equal magnitude with respect to East Asia (shown in ellipses). This turns out to be a robust feature of the Baseline and other scenarios in the present analysis, and it has profound implications for both current and capital accounts in the region. This "structural" transfer indicates that most of the benefits of PRC's expanded trade eventually accrue to its East Asian neighbors, and that PRC's export capacity is to a significant extent a pass-through activity that leverages its lower (labor) resource costs to more fully exploit other regional resources.

To better understand the trade flow adjustments, a few general observations about the adjustment process might be helpful. Generally speaking, there are three primary drivers for the trade results:

1. Macro growth rates.
2. Calibrated patterns of supply and demand for each country.
3. Changes in protection patterns.

All three interact to produce the adjustment results in both the baseline and liberalization scenarios. In the case of PRC, a high baseline growth rate is accelerated by export competitiveness and efficiency gains from removing price distortions (WTO). Removing protection induces real exchange rate depreciation and tips the supply orientation further toward exports (see explanation on exchange rates below). Both the ASEAN-PRC and Triangle results depend on these factors.

For example, note the bilateral trade growth rates in Table 3.8. These vary significantly. From a macro perspective, one might expect each bilateral trade flow to grow in proportion to the average growth of the importer and exporter. In reality, bilateral trade growth depends on trade shares at the sectoral, not the aggregate level. This adjustment is much more complex and variegated geographically. Indeed, one can see total trade falling while some bilateral trade rises, and vice-versa, as we see in regional experiments that induce trade diversion.

PRC's absorption is also growing at above average rates and, conversely, faster growing economies increase their market share in PRC. This is especially true for ASEAN, Korea, and Taipei,China. PRC's overall absorption also does not grow uniformly, but in response to changing domestic and export demand patterns. Composition of its import demand is likewise shifting in directions more favorable to Asian partners.

The trade triangle arises from a combination of differences in macro growth rates, supply/demand patterns, and real exchange rate adjustments. Because the United States and EU both have relatively low growth and low protection, they are pushed into further deficits with respect to the faster growing, more dramatically liberalizing East Asian region. PRC's deficits with other East Asian economies arise from its capacity requirements to meet Western demand, especially on the heels of its real exchange rate depreciation (see further at Annex B).

Of course, this insight alone is not enough to allay regional fears about PRC's export competitiveness.<sup>10</sup> At least two more issues must eventually be addressed:

1. How will the market transition take place in terms of detailed product categories?
2. What will be the value-added composition of these new trade flows?

On the first point, there are real concerns that established East Asian exporters will be crowded out of Western markets and forced to incur substantial adjustment costs to redirect exports to PRC. Secondly, there are widespread fears that other regional economies, particularly in Southeast Asia, will be "knocked down the value added ladder," i.e. their exports will be subordinated in the supply chain, meaning that redirected exports to PRC will have lower (especially labor) value added than established exports to third parties. These questions are critical to the ultimate assessment of the regional impact of PRC's trade growth, but can only be answered (even in part) with more detailed analysis.

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<sup>10</sup> Moreover, the balances at the sectoral level vary more with the policy scenarios. This issue is examined in more detail in the second paper of this series.

**Table 3.8. Bilateral Trade Growth, Baseline Scenario**  
(percentage annualized growth rates, 2000-2020)

<i>Exporter</i>	<i>Importer</i>							<i>Total</i>
	<i>PRC</i>	<i>Japan</i>	<i>NIE</i>	<i>ASEAN</i>	<i>USA</i>	<i>EU</i>	<i>ROW</i>	
<i>PRC</i>	.0	5.5	7.6	7.1	6.2	6.3	6.4	6.4
<i>Japan</i>	4.7	.0	2.8	2.6	1.4	1.5	2.0	2.4
<i>NIE</i>	6.2	3.9	4.3	4.3	2.3	2.6	3.4	4.0
<i>ASEAN</i>	7.4	3.6	4.7	5.2	2.9	3.6	5.0	4.5
<i>USA</i>	5.7	2.3	4.2	3.7	.0	2.6	2.9	3.1
<i>EU</i>	5.0	2.1	3.8	3.6	2.2	2.0	2.6	2.4
<i>ROW</i>	6.3	2.8	3.9	4.6	2.8	3.5	3.8	3.5
<i>Total</i>	5.8	3.1	4.2	4.3	2.9	2.6	3.3	3.2

**Table 3.9. Bilateral Trade Balances Baseline Scenario**  
(year 2020 in billions of 1997 USD)

<i>Exporter</i>	<i>Importer</i>							<i>Total</i>
	<i>PRC</i>	<i>Japan</i>	<i>NIE</i>	<i>ASEAN</i>	<i>USA</i>	<i>EU</i>	<i>ROW</i>	
<i>PRC</i>	0	-5	-135	-41	166	66	71	122
<i>Japan</i>	5	0	-39	20	23	-15	-50	21
<i>NIE</i>	135	-39	0	19	-32	-32	-12	40
<i>ASEAN</i>	41	-20	-19	0	18	8	12	41
<i>USA</i>	-166	-23	32	-18	0	48	-40	-168
<i>EU</i>	-66	15	32	-8	-48	0	34	-41
<i>ROW</i>	-71	50	12	-12	40	-34	0	-16
<i>Total</i>	-122	-21	-40	-41	168	41	16	0

As a final note on the Baseline trade balances, note that East Asian economies as a group generally maintain their competitiveness vis-à-vis the Western OECD economies and the ROW aggregate. Although the latter have some bilateral surpluses with individual East Asian economies, they sustain a deficit with the region as a whole. The dominant source of this deficit as a whole is PRC.

Before moving on to the trade liberalization scenarios, it is worth noting a few more general characteristics of the Baseline. These are summarized in Table 3.10., which details some important macro aggregates by country/region as forecast in the Baseline for the year 2020. First, the GDP composition figure indicates that, despite optimistic growth rates, PRC will still lag behind the United States, EU, and Japan in aggregate real GDP. However, its share of total world trade (exports + imports), will nearly equal the U.S. and significantly exceed Japan. PRC's exports by destination will be directed primarily at the U.S. and EU, but Japan will be its largest East Asia export market by 2020. For more than half of its imports, PRC will rely on East Asia for more than half its imports, and Taipei,China and Korea combined will be the largest regional source of these, followed by Japan and ASEAN. Finally, PRC will become Japan's largest trading partner (but nearly equal to the U.S.) in terms of both imports and exports.

**Table 3.10. Selected Macroeconomic Indicators, Baseline Scenario**  
(percentage annualized growth rate, 2000-2020)

	Real GDP Absorption		Exports	Imports	Exp PI	Imp PI	Real ER
<b>PRC</b>	7.10	6.94	6.27	5.85	-.22	-.18	-.04
<b>Japan</b>	2.20	2.12	2.37	3.15	.22	-.13	.35
<b>NIE</b>	4.34	4.42	4.01	4.21	-.09	-.08	-.01
<b>ASEAN</b>	4.75	4.55	4.46	4.25	-.26	-.13	-.13
<b>USA</b>	2.62	2.61	3.07	2.94	.12	-.09	.21
<b>EU</b>	2.52	2.63	2.37	2.60	.13	.01	.13
<b>ROW</b>	3.65	3.65	3.69	3.40	-.19	-.09	-.11

#### 4. Simulation Results

Using the multi-country model and baseline information discussed above, we conducted a set of empirical policy experiments reflecting more liberal East Asian trade regimes. The Baseline scenario reflects projected macro growth under “business as usual” policies, but in this section we compare this status quo with alternative scenarios that reflect varying degrees of commitment to further globalization. In particular, we examine the case where PRC implements its WTO commitments unilaterally, essentially abolishing import barriers by 2005 while the Rest of the World remains with status quo policies. Secondly, we simulate the formation of an AFTA, or ASEAN Free Trade Area, including PRC as has been discussed in the region recently. The third and final scenario is a reference case of global trade liberalization (GTL), in this case meaning global abolition of import tariffs.

The results obtained make more apparent both the potential rewards of further liberalization and the complex incentives facing East Asian participants in regional and global negotiations. Three general results are worthy of emphasis:

1. Global trade liberalization (GTL) confers far greater aggregate gains, not only on the world but on every country/region considered. Globalization may be an elusive goal but, largely because of East Asian reliance on extra-regional demand, it is far more rewarding than regionalism.
2. The AFTA plus PRC (AFTAPC) would, in the absence of other negotiating initiatives, benefit most FTA member countries, but less so than globalization, and would induce significant trade diversion, particularly for Japan, Korea, and Taipei,China, both within East Asia and with respect to the Rest of the World.
3. PRC’s role in regional liberalization is governed by unique incentives. Primarily because of its size, PRC appears to be in a position to “go it alone” on the path to globalization, i.e. most of its own benefits from multilateralism can be captured by unilateral liberalization. At the same time, a large part of the aggregate regional benefits from growth arise from PRC’s unilateral initiative, giving this country unusual influence on those with whom it trades in the East Asian region.

While these conclusions have interesting implications for trade negotiations, East Asian regionalism and globalization need not be considered as mutually exclusive, and indeed the former might simply provide impetus to, and ultimately be superseded by the latter. Trade divergence and discrimination (*de jure* or *de facto*) induce real economic adjustments, however, and they can complicate the larger negotiating environment in nontrivial ways. If WTO momentum to globalization were to slow, however, this might sharpen the incentives toward regionalism.<sup>11</sup>

At the national level, we also examine unilateral liberalization for PRC only. Compared to other scenarios where bilateral partners reciprocate, we find that PRC

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<sup>11</sup> On the former issue, see e.g. Hoekman and Kosteci (1995).

enjoys about the same aggregate benefits it would under an FTA with ASEAN. Less surprising, however, is the result that trade composition effects differ, especially for other East Asian economies. Other East Asian economies appear to benefit much more from PRC's participation in regional initiatives than does PRC itself. This finding reveals the existence of a very complex mosaic of incentives for bilateral negotiation in the region.

Before examining the detailed simulation results, it is worth reviewing an essential feature of the baseline data, calibrated protection levels. In Tables 3.3. to 3.5. of the previous section, a variety of estimates was presented, including detailed bilateral and regional trade barriers. In Table 4.1. below, we summarize trade-weighted import protection levels for trading regions that will be focus of the simulation results.

**Table 4.1. Tariff and Tariff-equivalent Import Protection**  
(ad valorem percentages, trade weighted)

	<b>PRC</b>	<b>Japan</b>	<b>NIE</b>	<b>ASEAN</b>	<b>USA</b>	<b>EU</b>	<b>ROW</b>	<b>Ave</b>
<b>PRC</b>	0.0	7.9	13.7	7.1	5.4	5.6	13.6	8.1
<b>Japan</b>	12.4	0.0	6.5	7.4	2.3	3.6	11.3	6.4
<b>NIE</b>	13.4	5.3	3.1	6.7	3.0	3.9	10.7	7.2
<b>ASEAN</b>	10.9	4.7	5.3	4.3	3.3	3.9	8.3	5.2
<b>USA</b>	11.4	9.3	9.4	3.6	0.0	2.7	6.8	6.0
<b>EU</b>	9.0	3.7	6.5	4.0	2.2	0.0	9.3	2.6
<b>ROW</b>	11.7	12.4	5.8	3.8	3.0	6.4	9.1	6.5
<b>Ave</b>	11.5	7.8	7.2	5.0	2.9	1.8	8.9	4.8

These figures elucidate the regional patterns of trade distortions in ways that reward close inspection. Here we see real protection levels presented by importers in corresponding columns, while corresponding rows reveal protection levels faced by exporting countries/regions. Being weighted by base year trade flows, these average protection levels provide a cross-sectional portrait of the origination and incidence of trade distortions that mere statutory knowledge or intuition could not capture. For example, the following salient features can be noted with respect to Table 4.1:

1. PRC faces above average (and above western OECD) protection from East Asia and reciprocates (see ellipses).
2. Intra-Asian protection is generally above average.
3. East Asia presents higher barriers to the west than it faces.<sup>12</sup>

Taken together, these results indicate that there are significant potential gains from liberalization for PRC and East Asia generally.

<sup>12</sup> Note again that Japanese and Korean agricultural protections are not included.

#### **4.1. Trade Flow Adjustments**

We now examine trade flow adjustments arising in three scenarios for trade liberalization. The first of these represents PRC unilateralism, as this would follow from abolition of its trade taxes and subsidies by 2005. This is then contrasted with a widely discussed East Asian regional scenario, AFTA plus PRC (AFTAPC).<sup>13</sup> A third reference scenario is Global Trade Liberalization (GTL), modeled here as global abolition of all import and export tariffs, taxes, and subsidies (excluding agriculture) by 2005. Many other scenarios could be studied with the same methodology, but these three serve to elucidate the salient issues regarding PRC's WTO accession, globalization, and East Asian regionalism.<sup>14</sup>

Table 4.2. presents the basic trade flow results for all three scenarios, as percentage changes from Baseline trends in 2020. The first sub-table indicates how bilateral and inter-regional trade patterns would change, by 2020, if PRC followed its WTO initiative alone and other economies reacted passively, holding to their Baseline or status trade quo policies. On an annual basis, these results indicate that PRC's real exports would be 34 percent higher, its imports 26 percent higher.<sup>15</sup> These results accord with conventional intuition about unilateral liberalization, where real exchange rate depreciation accelerates exports and import absorption increases from a combination of tariff reduction, income growth, and domestic capacity expansion.

Trade expansion is much greater when the Rest of the World reciprocates PRC's initiative to liberalize, raising world trade 17 percent in 2020 instead of just 3 percent. Of course, such a policy scenario assumes the resolution of a long and difficult bargaining process, in Geneva and elsewhere, and this makes the scenario rather more of a hypothetical reference case. What is more remarkable, however, is that PRC can get most of the benefits of the GTL scenario unilaterally by conforming to WTO standards, or "going it alone." This fact has important implications for its negotiating position and for the region as a whole.

Of more detailed interest are the compositional adjustments, where it is apparent that PRC's trade growth comes largely at the expense of the rest of East Asia. Indeed, these results show very substantial trade diversion, with other East Asian exporters being crowded out by PRC not only in Western OECD and ROW markets, but within the region itself. Indeed, the only significant export expansion for this group is toward the PRC market. While new opportunities in the expanding PRC market just about offset diversion elsewhere, it is difficult to contemplate the losses in so many established markets. Clearly, East Asian passivity does not appear to be an optimal policy response to PRC's WTO initiative.

The alternatives facing PRC's East Asian regional trading partners are three. Excluding a trade war (which would be inferior to passivity), they can choose between greater regionalism and globalization, i.e. unilateral liberalization like PRC's. The second two scenarios represent examples of these more activist responses.

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<sup>13</sup> Note that, because we are using a 1997 database, the Hong Kong economic region is disaggregated from PRC. All results in this paper aggregate these two economic areas into a single one, PRC.

<sup>14</sup> The second paper in this series examines a much larger variety of East Asian trade arrangements.

<sup>15</sup> The inequality results from real exchange rate depreciation, compounded by the baseline depreciation discussed in Section 3.

**Table 4.2. Bilateral Trade Growth Rates**  
(percentage change from Baseline scenario in 2020)

Scenario: PRC WTO

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	37	43	36	31	35	32	34
<i>Japan</i>	38	0	-4	-6	-7	-5	-5	3
<i>NIE</i>	32	-10	-7	-11	-13	-10	-10	3
<i>ASEAN</i>	28	-4	-1	-2	-5	-3	-4	1
<i>USA</i>	24	-1	1	-1	0	-1	-1	1
<i>EU</i>	22	0	1	-1	-2	-1	-2	0
<i>ROW</i>	13	0	2	2	-2	-1	-1	0
<i>Total</i>	26	5	6	2	2	0	1	3

Scenario: AFTA plus PRC

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	34	42	66	29	32	30	35
<i>Japan</i>	36	0	-5	12	-10	-7	-7	4
<i>NIE</i>	30	-13	-10	12	-15	-12	-13	4
<i>ASEAN</i>	39	14	12	22	8	11	5	16
<i>USA</i>	24	-1	2	1	0	-1	-2	1
<i>EU</i>	22	0	2	4	-2	-2	-2	-1
<i>ROW</i>	13	0	3	1	-2	-1	-1	0
<i>Total</i>	27	7	7	15	2	0	1	5

Scenario: GTL

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	35	51	51	27	40	65	43
<i>Japan</i>	43	0	15	16	-3	9	22	16
<i>NIE</i>	42	15	8	22	-4	5	22	21
<i>ASEAN</i>	38	21	16	18	10	19	21	20
<i>USA</i>	32	9	18	6	0	8	2	8
<i>EU</i>	38	14	33	17	12	-9	28	5
<i>ROW</i>	29	31	21	17	4	41	47	29
<i>Total</i>	37	22	25	20	9	7	28	17



Rather than simply re-directing their exports to PRC from everywhere else in the world, it would clearly be preferable for East Asia to participate more fully in the growth and international market opening exemplified by PRC. One way a subset of regional economies could achieve this would be by forming an FTA with PRC, and the second scenario captures this case for ASEAN. Although ASEAN has a long and relatively harmonious history, this group has yet to seriously commit itself to the discipline of free trade. Like APEC, its policy coordination has emphasized consensus and non-statutory agreements of principle. The idea of an ASEAN Free Trade Area (AFTA) has been adrift in the trade policy debate for some time, and has been given some new impetus by PRC's WTO accession.

In this context, two types of advocates have emerged. One group sees AFTA as a defensive necessity, building a kind of "Fortress ASEAN" to realize economies of scale like the EU. Another group envisions a more pro-active stance, forming an ASEAN Free Trade Area including PRC, to capture or divert the gains from trade growth with respect to this large emergent economy. Our results indicate that the former would yield relatively small gains for the members, and might foster adverse external relations. The second sub-table of Table 4.1. presents bilateral trade flow adjustments in the AFTA plus PRC case, where ASEAN and PRC together abolish their mutual import protection, but maintain (rather than harmonize) individual protection with respect to the rest of the world.

These results indicate there would be little enthusiasm for an AFTA plus PRC arrangement outside East Asia since, like the other East Asian pacts, it actually reduces ROW trade even more than Chinese unilateralism (from so-called Export Godzilla to Export Hydra). The more detailed results also reveal unwelcome trade diversion with respect to East Asian neighbors, driving down total exports and imports for Japan, Korea, and Taipei,China.

The logic of AFTA plus PRC for ASEAN members is much more obvious. If they were to liberalize trade among themselves and draw PRC into the group, they would advance themselves, in terms of trade growth, most of the way to the gains of GTL. This is because of the sheer size of the PRC economy in the group, as well as the relatively low protection levels of ASEAN's other leading trade partners. Since this scenario is predicated upon the participation of what might be an unwilling partner, however, it remains quite speculative. We shall have more to say on this issue below.

Results in Table 4.2. indicate that the aggregate trade growth for PRC would be about the same as under unilateralism, but that ASEAN enjoys a significant "bandwagon" effect, successfully leveraging PRC growth and demand by drawing it into this regional arrangement. Rather than remaining neutral, ASEAN trade grows about 16 percent per year faster than it would in the Baseline (Table 4.1.) or in the absence of an agreement with PRC. Compositional results also indicate that ASEAN increases its share of all regional markets, joining in the crowding out of Japan and the NIE economies in the process.

Trade diversion effects are more geographically localized, but stronger for those economies left out of the regional arrangement. For example, Japanese exports to the U.S. and EU are reduced by 10 and 7 percent per year, respectively. Most affected by diversion are the NIE economies (Korea and Taipei,China), who are crowded out of both East Asian and Western markets. Their internal trade falls by 10 percent, while

exports to Japan, the U.S., and EU fall by 13, 15, and 12 percent annually by 2020. Despite these strong diversion effects, growth of import demand in PRC and ASEAN more than offset the lost export markets for Japan and the NIEs. Japan's total trade is about 4 percent higher, while that of the NIEs rises more negligibly.

Despite the offsetting benefits of exports to PRC and ASEAN, the promise of these new markets is tempered by the unwelcome adjustment costs from trade diversion. Again the problem for those economies being forced to adjust is their passivity in the face of liberalization by others. To get a more complete idea about the opportunity costs of inaction in the face of East Asian trade liberalization, consider the reference case of GTL. The third and final sub-table of Table 4.2. shows how bilateral trade flows would respond, with respect to Baseline trends, to abolition of trade barriers by all countries. The effects are somewhat predictable in both sign and magnitude, but many details are worthy of closer examination.

Looking back at the calibrated protection information in Tables 3.3.-3.5., and 4.1., it is apparent that the potential gains from global trade are still far from being realized. Were this protection to be abolished, our results indicate that East Asian trade would expand very dramatically, and that this trade growth would be much faster within the region than in relation to the rest of the world. Exports for PRC, the NIEs, and ASEAN expand by 43, 21, and 20 percent annually above 2020 Baseline levels, and even Japan's exports are 16 percent higher. Bilateral results in many cases are much larger, with exports to PRC being the most dynamic. In this area, Japan takes the lead (43% higher), followed by NIE (42%) and ASEAN (38%). Across this expanding field of international commerce, only exports to the US (from Japan and NIE) contract (and marginally).

It is worth emphasizing that there are two reasons for the dramatic trade expansion. First, each of the East Asian economies overcomes *de facto* discrimination by following PRC's first-mover initiative and liberalizing. This averts real exchange rate appreciation and its attendant trade diversion. Secondly, reducing East Asian trade barriers has multiplier effects on intra-regional trade because prior protection levels in the region were high by global standards. For this reason, unrealized gains from trade, both within and with respect to East Asia are higher. This fact also implies that broader and deeper commitments to regional liberalization could be quite rewarding.

Patterns of adjustment outside the region are complex, with both trade creation and diversion. The removal of an extensive set of tariffs within one region creates a new set of (*de facto*) trade preferences within the rest of the world, and we see modest offsetting ex-East Asia trade growth in most cases. Occasionally, however, small reductions in bilateral trade outside the region are probably induced by trade contraction with respect to East Asia (see e.g. ROW). Generally speaking, economies outside East Asia stand by and watch regional trade expand in the region and contract with respect to them, with only negligible adjustments to their other bilateral ties. Thus much of the trade growth within the East Asia region is offset by diversion.<sup>16</sup>

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<sup>16</sup> Results at the regional and global level can be compared with, e.g. Brown et al. (2001, 1992), Anderson, Francois, Hertel, Hoekman, and Martin (2000), Martin and Winters (1996), and Collado et al. (1995).

## 4.2. Incentive Properties

To better understand some of the incentive properties of the scenarios considered, cross-country comparisons are needed. To facilitate this, Table 4.3. restates regional trade flow adjustments in response to the three trade policy scenarios in constant base year US dollars with respect to the baseline levels forecast for 2020. For example, by the terminal year of these projections, global trade liberalization (GTL, the last scenario and sub-table) is estimated to increase global trade by \$2.192 trillion 1997 dollars.<sup>17</sup> Going down the rightmost column of sub-tables, it is apparent that the scenarios affect global trade (export totals) in a way analogous to their geographic/GDP scope. This is intuitive but, as we have already seen, the most arresting feature of the regional sub-tables is trade diversion, shown in the off-diagonal entries.

Two different perspectives on negotiating incentives emerge from these results, those relevant to all parties in a multilateral setting and those of greater relevance to PRC individually. In the first case, we see that trade diversion from both Chinese unilateralism and AFTA plus PRC could have significant multilateral repercussions. For example, PRC “going it alone” will significantly crowd other East Asian exports out of most Western and ROW markets, strongly supporting the PRC competitive threat argument. Moreover, it will reduce total trade *within* the Western economy—ROW group, further aggravating PRC’s image multilaterally.

In the case of AFTA plus PRC, the results just discussed (rightmost quadrants of the second sub-table) are qualitatively similar, except that ASEAN joins PRC as an apparent “export aggressor,” and the diversionary effects for the rest of East Asia are even greater. Even though there are new import markets in PRC and ASEAN that more than offset this diversion, the compositional effects of stronger preferential commitments to East Asian trade might strain negotiated relationships with Western capitals and in Geneva. Given the relatively weak nature of existing Asian regionalism, it is not clear that the benefits of deeper regional compacts would outweigh their political and economic opportunity costs.

Now we focus on the role of PRC. Given the prominence of this economy in the strategic landscape, as well as the regional adjustment process, we need to identify the material incentives for its participation in the agreements being considered. It can also be noted in passing that PRC’s accession to the WTO has inspired very animated discussion in the trade policy community. In particular, many regional observers have reacted defensively, speculating that the size and scope of an emergent Chinese economy will have adverse effects on regional trade partners. Our results, on the contrary, support a view that PRC’s global emergence represents both challenges and enormous opportunities for East Asian regional economies. The effectiveness of today’s policy makers in this context will be judged by their ability to identify both, facilitating timely adjustment to the former and proactive development of the latter.

PRC’s importance to the regional adjustment process is undeniable, with Chinese goods and services representing 21 to 90 percent of all trade growth across the three scenarios. However, a rather upbeat interpretation arises from the estimates for

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<sup>17</sup> These estimates can be compared with those obtained in other regional contexts, including Roland-Holst and van der Mensbrugge (2002) and World Bank (2002).

Chinese trade within the East Asian region. In every scenario (where it is excluded from AFTA), PRC imports from East Asia grow faster than its regional exports. Indeed, all three scenarios exhibit the same “surplus transfer” phenomenon seen in the Baseline forecasts. In each case, PRC’s trade deficit with East Asia and its surplus with the western OECD continue to expand simultaneously.<sup>18</sup>

At the same time, however, it should be noted that PRC’s exports to the ROW more than offset its East Asian imports. The aggregate outcome in every case is greater constant dollar growth of Chinese exports than imports. This happens because PRC presents higher prior protection than it faces within each of the trade groupings considered, and thus the Chinese real exchange rate depreciates in every liberalization scenario. The Rest of East Asia, on the other hand, faces higher protection than it presents, driving up its real exchange rate and sending real imports above exports in every scenario. Note that these are essentially macro responses to the prior burdens of trade distortion, and tell us very little about the underlying patterns of comparative advantage. The latter are only revealed in more detailed country and sector analysis.<sup>19</sup>

Before moving on to sectoral results, it is worth examining Table 4.3. more closely for incentive properties. We have already noted that total trade growth and trade diversion results appear to weaken the case for regionalism. More seriously, however, the results suggest serious negotiating challenges for PRC and its prospective regional partners. In every scenario, PRC is expected to expand exports outside the region while at the same time substantially reducing ROW imports—the obverse of the surplus transfer just discussed. The political feasibility of such trade patterns is open to serious question, but these results also challenge regional interests. It is apparent from the same sub-tables that PRC’s estimated export expansion to ROW occurs, at least implicitly, at the expense of other East Asian exports to the same destination, exactly the kind of market crowding out that some regional pessimists have foretold.

Can PRC please some of its regional partners at the expense of others? Basically, the trade composition results show that PRC possesses two so-called carrots and one stick in regional negotiations. The carrots are access to its own domestic market and, by joining PRC in an FTA, greater market access to the rest of the world (a “PRC bandwagon” effect). The stick, obviously, is one of the carrots, used instead as a club: trade diversion arising from direct export competition by PRC and its partners. Clearly, the mercantile PRC perspective is too simplistic, but this country still holds a special position in the regional negotiating environment, and other East Asian economies must take account of this fact.<sup>20</sup>

A more specific example, with general implications about the incentive problem facing PRC and the region, can be seen in the AFTA plus PRC scenario. AFTA without PRC has a small impact on regional and global trade compared to GTL and even PRC WTO unilateralism, and PRC would probably not be congenial to the

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<sup>18</sup> This process has very interesting, and as yet unstudied, implications for regional capital markets. Although the regional composition of capital flows need not mirror that of bilateral current account imbalances, long-term trends in the two must be correlated. Furthermore, capacity expansion for export to PRC will presumably become a very attractive foreign investment opportunity across the region.

<sup>19</sup> While some sector analysis is presented in the next subsection, a more detailed study of East Asian comparative advantage is planned for the third monograph of this series.

<sup>20</sup> The second paper in this series examines these issues across a broader spectrum of regional trade arrangements.

crowding out that would likely result from AFTA, in Southeast Asia and elsewhere. Thus both might gain if ASEAN could recruit PRC into an AFTA, and our assessment is that gains to ASEAN's current membership would generally be much greater if PRC joined. Ironically, however, PRC's gains are fairly small compared to unilateralism, and diverting its exports into a smaller regional market may even occasion adverse terms-of-trade effects.<sup>21</sup> At the same time, PRC import demand would be diverted away from important regional allies such as Japan and Korea. All in all, it is unclear why PRC would be attracted to such an arrangement, particularly given its assertive prior commitment to the WTO process. Thus gains to PRC's aspirant partners are evidently much greater than PRC's, reinforcing the incentive and negotiating asymmetries already discussed.

A final observation on incentive compatibility of trading arrangements concerns PRC's unilateralism, as reflected in the PRC WTO scenario. Having the ability to "go it alone" is no reason to do so, but the possibility itself is an important negotiating instrument. Spirited advocacy of WTO objectives notwithstanding, PRC's trade policy is clearly being implemented in a complex mosaic of bilateral and regional relations, and it is very doubtful that a simplistic rule-of-thumb like universal liberalism will prevail in this context. Indeed, it is not at all clear that the optimality of such a policy could be defended on theoretical grounds.

Since the seminal work of Viner on this subject over fifty years ago, there has been sustained debate about the incentive properties of unilateral, regional, and global trade liberalism.<sup>22</sup> Using theoretical models with two or three goods and three countries, a number of authors have argued that regional arrangements are strategically dominated, for individual countries, by unilateral liberalization, and that incentives must therefore be devised to effect voluntary participation in RTL.<sup>23</sup> In this section, we have seen that, for PRC at least, complexity is the rule and the perfectly competitive paradigm an abstraction of limited relevance. On the basis of this and other evidence presented in this paper, we recommend that the efficacy of trade agreements be decided empirically rather than with rules-of-thumb inferred from simplified theoretical models.<sup>24</sup>

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<sup>21</sup> This is one of the main findings of Roland-Holst and van der Mensbrugghe (2002), who question further East Asian regionalism in the wake of PRC's WTO accession.

<sup>22</sup> See e.g. Viner (1950), or a more modern statement in Kemp and Wan (1976).

<sup>23</sup> For recent writing in this vein, see e.g. de Melo, Panagariya, and Rodrik (1993), Hoekman and Leidy (1993), and Whalley (1996).

<sup>24</sup> In Roland-Holst and van der Mensbrugghe (2002), we reached the same conclusions in a Latin American context.

**Table 4.3. Bilateral Trade Flows**  
(change in 1997 USD billions from Baseline scenario in 2020)

**Scenario: PRC WTO**

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	52	39	37	92	84	70	374
<i>Japan</i>	56	0	-4	-7	-12	-7	-6	20
<i>NIE</i>	73	-6	-1	-10	-13	-9	-11	21
<i>ASEAN</i>	40	-3	-1	-5	-8	-6	-6	10
<i>USA</i>	31	-2	2	-2	0	-6	-10	14
<i>EU</i>	38	-1	2	-1	-9	-35	-16	-21
<i>ROW</i>	19	0	2	3	-17	-6	-6	-4
<i>Total</i>	257	40	38	15	33	16	15	414

**Scenario: AFTA plus PRC**

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	48	38	68	85	77	65	380
<i>Japan</i>	53	0	-5	14	-16	-9	-8	28
<i>NIE</i>	67	-8	-2	10	-16	-11	-14	27
<i>ASEAN</i>	57	13	9	50	13	20	8	169
<i>USA</i>	31	-2	2	1	0	-6	-12	15
<i>EU</i>	38	0	2	6	-9	-42	-18	-23
<i>ROW</i>	19	1	3	1	-18	-7	-7	-7
<i>Total</i>	265	52	47	151	38	22	15	590

**Scenario: GTL**

<u>Exporter</u>	<u>Importer</u>							<u>Total</u>
	<u>PRC</u>	<u>Japan</u>	<u>NIE</u>	<u>ASEAN</u>	<u>USA</u>	<u>EU</u>	<u>ROW</u>	
<i>PRC</i>	0	50	46	53	78	95	144	465
<i>Japan</i>	63	0	15	18	-5	11	24	127
<i>NIE</i>	94	10	2	20	-5	5	23	149
<i>ASEAN</i>	54	19	11	42	15	35	32	209
<i>USA</i>	42	13	25	9	0	35	12	136
<i>EU</i>	66	20	40	29	51	-214	246	237
<i>ROW</i>	44	50	25	25	32	348	346	869
<i>Total</i>	363	162	163	194	166	316	828	2192

### *4.3. Sectoral Trade Adjustments*

In this section, we briefly examine sectoral adjustments arising from the three trade scenarios. Since real trade policy is often made, not from the top down, but from the bottom up, these kinds of shifts can have important implications for the political economy of East Asian regional arrangements. We have already seen that, for liberalizing countries, removing price distortions confers efficiency and the result is aggregate output and trade expansion. Moderately positive aggregate changes, driven by a combination of efficiency gains and resource constraints in the basic model, are not the most important message of this analysis, however. Whether the aggregates move up a little or more substantially, there are often very dramatic adjustments taking place under the smooth veneer of the aggregate production possibilities frontier. In particular, as relative prices shift in response to removal tradeable price distortions, factor returns in these sectors adjust dramatically and resources are pulled toward other activities.

Just as was observed in the regional composition of trade patterns, sectoral exports and imports for each country will vary much more than their respective aggregates. The greater the level of sectoral detail, the greater the variance, and the more likely it is that tradeoffs will emerge. Having said this, the case of PRC is unusual because its export capacity growth can be expected to coincide with emergence of a very significant new source of world demand, and for this reason tradeoffs will be more limited. In particular, our evaluation of the sectoral results yields the following main insights:

1. PRC trade liberalization, along WTO lines, leads this economy to dominate sectoral trade expansion in all three scenarios, but it does so symmetrically between export and import growth. In this way, PRC's exploits external markets but also the internal market creates opportunity for trading partners in about equal measure.
2. Because of the sheer size of PRC as a liberalizing exporter and importer, expansionary effects are dominant in nearly every sector for every country.
3. At the level of aggregation presented, intra-industry trade is very prominent, with each country's expanding both exports and imports in each sector.

Figures 4.1.-4.3. present the sectoral results for PRC and Japan, as well as the aggregate NIE and ASEAN groups.<sup>25</sup> The three conclusions above can be drawn by casual inspection of the six charts contained in these three figures. Clearly, PRC's status as the largest trader in East Asia by 2020 makes it a dominant player in all three scenarios. Even in the case of globalization, PRC's export and import growth are well ahead of its regional partners in the three industrial sectors (Light and Heavy Manufactures, Electronics). Indeed, the rest of East Asia can only try to keep pace with

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<sup>25</sup> For the present discussion, we have aggregated the eighteen sector database into seven representative sectors. The results presented here are qualitatively consistent with the more detailed ones.

the PRC growth machine by following its example of trade liberalization. In the AFTA plus PRC scenario, for example, ASEAN shares PRC's momentum, but still there is some absolute crowding out of others.

In fairness, however, it should be emphasized that much of the growth other East Asia does enjoy is a result of rapidly growing PRC demand. As the bilateral trade flow results indicated, dramatic PRC export growth does induce some (absolute) East Asian crowding out, but this would be much worse without the benefit of Chinese absorption. This effect leads to the second conclusion above. Through a combination of direct and indirect trade linkages, PRC is driving expansion around the region increasing net trade and income for its neighbors. This element of the PRC case is essential to offsetting contractionary influences of trade diversion, both within and outside the region. On the import side of the sectoral results, we see much more homogeneous expansion because of the positive overall growth (income) effects.

The only serious hindrance in this process, which could more accurately be called a PRC growth contagion than a PRC threat, is residual protection, as can be seen in the AFTA plus PRC and GTL scenarios. On current growth trends, it is apparent that PRC's exports and imports will dominate the expansion of East Asian supply and demand in most strategic manufacturing sectors. Provided East Asian economies do not isolate themselves from the process of PRC trade liberalization, the net effect of PRC's growth will be hugely positive. Failure to adapt to more open multilateralism, on the other hand, will undermine competitiveness, leading to lower domestic productivity growth and crowding out from export markets.

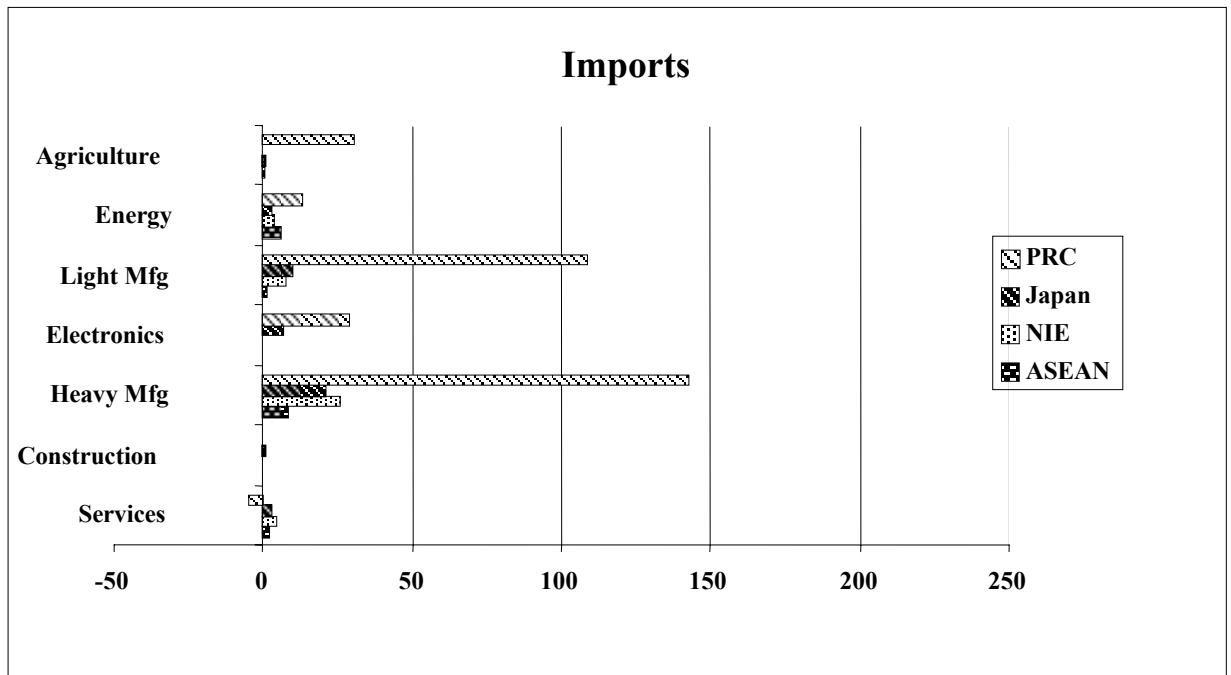
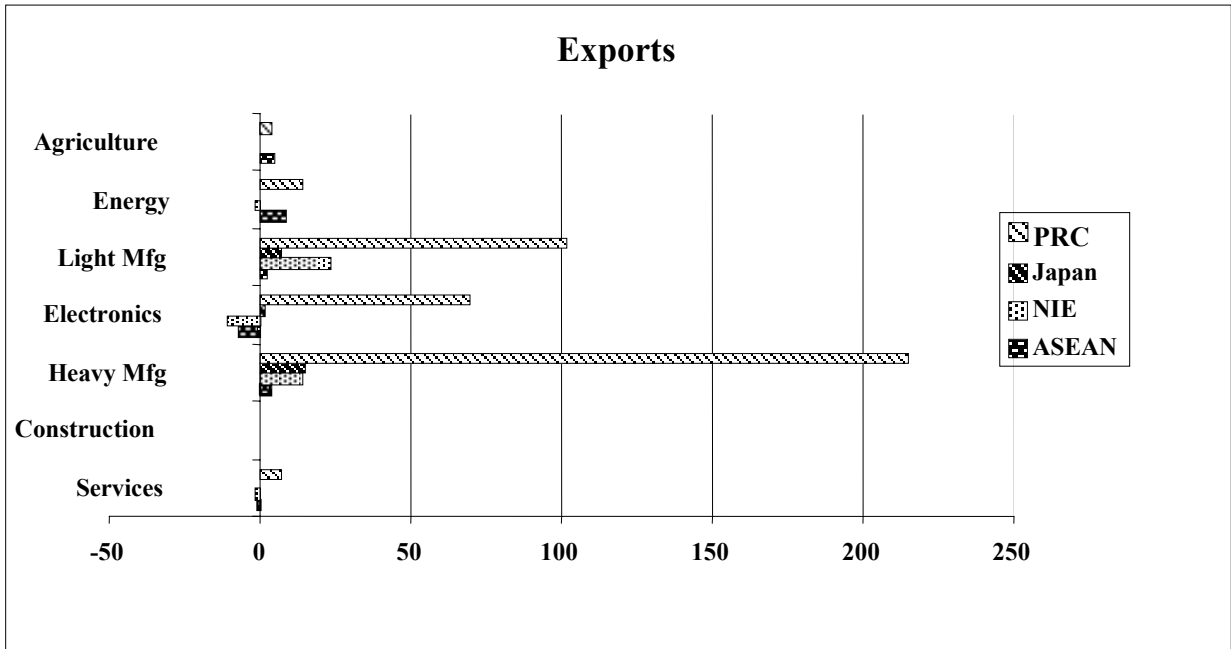
A more pro-active approach would include, for many East Asian economies, more extensive trade and capital account liberalization, coordinated with industrial policies that help re-orient exports toward this historic emerging market opportunity. Japan is an interesting case in point, since PRC is forecast to be its largest trading partner by 2020. If indeed PRC might become its largest future export market, how could this potential be realized? During the 1960s and 1970s, Japan established global standards for export market development, using a remarkably dynamic combination of entrepreneurial energy and government facilitating policies. The world has changed since then and continues to change, but it is interesting to speculate how the Japan of four decades past would respond to the genuinely unprecedented opportunity presented by PRC. A consumer society of PRC's magnitude, growing at sustained rates exceeding 7 percent, a fraction of the distance from markets where it has already established itself decisively, should prove an irresistible challenge.

Before concluding our discussion of the sectoral results, it must be emphasized that the current level of aggregation understates the adjustment challenges that policy makers and firms would face in each of these scenarios. In global competition as in life, the devil is in the details, and at very detailed ISIC levels it is reasonable to expect head-to-head competition and its attendant casualties, both within and outside the East Asian region. This kind of creative destruction is endemic to all economy progress, however, and should not obscure the aggregate and sustained benefits of greater efficiency. Having said this, it remains desirable for policy makers to identify those who are most affected by structural adjustments, both for the sake of consensus building and to devise facilitating and mitigating policies. For this reason, the third paper in this

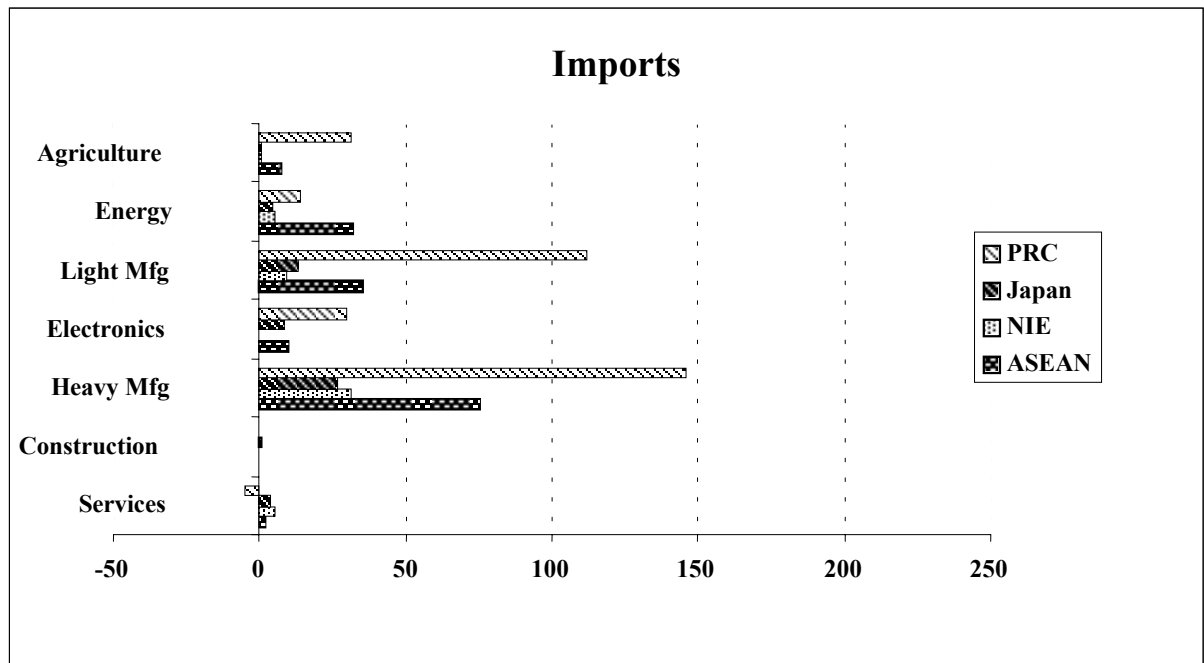
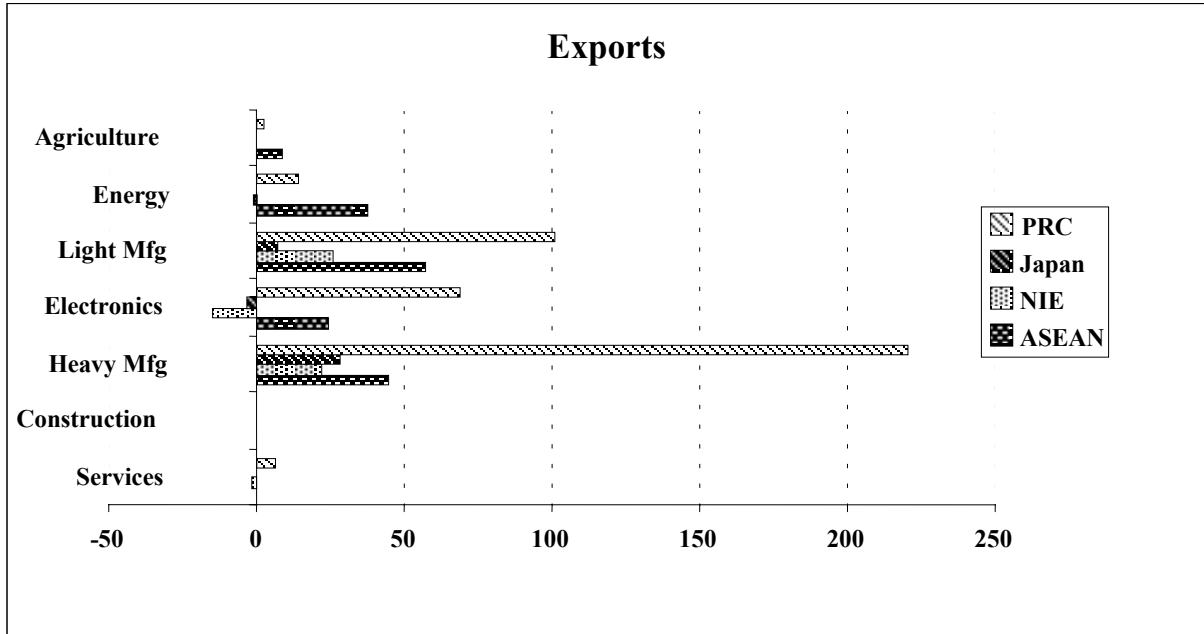


series plans to examine East Asian regional trade linkages and comparative advantage in much greater structural detail.

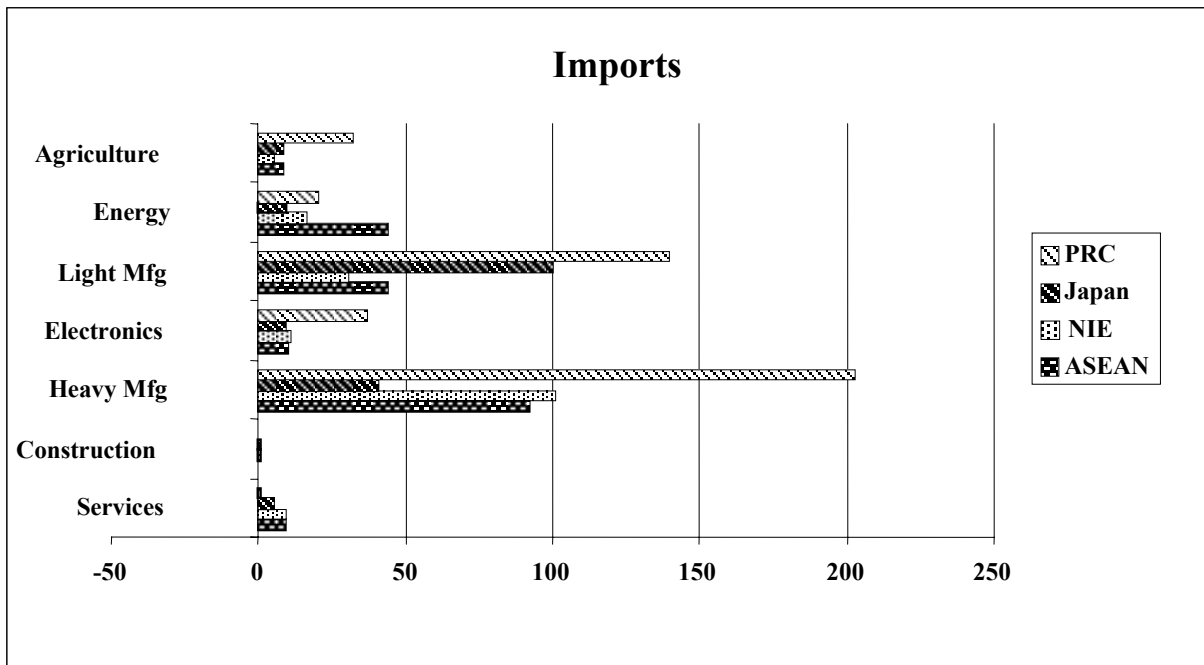
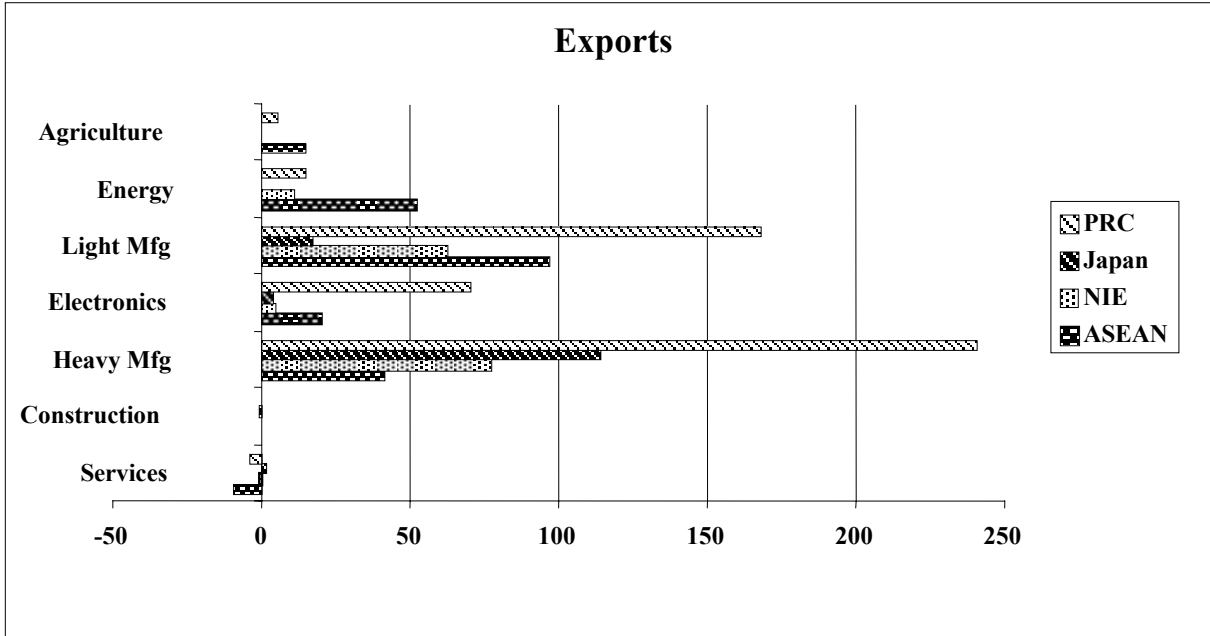
**Figure 4.1. Sectoral Trade Adjustments, PRC WTO**  
(change from 2020 in Billions of 1997 dollars)



**Figure 4.2. Sectoral Trade Adjustments, AFTA Plus PRC**  
 (change from 2020 in Billions of 1997 dollars)



**Figure 4.3. Sectoral Trade Adjustments, GTL**  
 (change from 2020 in Billions of 1997 dollars)



## 5. Conclusions and Extensions

In this paper, a global forecasting model was used to examine the economic emergence of PRC in the East Asian region over the next two decades. The projections reported here indicate that, by 2020, PRC will be the largest trading economy in East Asia, and that its growth over this period will dramatically change the regional economic landscape. Contrary to the view that PRC exports will stifle competitiveness and growth among its neighbors, however, we find that PRC's expansion, particularly when accelerated by its WTO initiative, will open unprecedented market opportunities for East Asian exporters. Indeed, while PRC will become the region's largest exporter only in 2010, it will be the largest East Asian importer by 2005.

Beyond dispelling the myth of PRC mercantilism, these results indicate that, over the next two decades, PRC will develop a large and sustained trade surplus with western OECD economies, but a nearly equal and sustained deficit with East Asia. Looked at this way, it is apparent that a large part of the economic benefits of PRC competitiveness, namely most of its current account surplus, will ultimately be distributed across the East Asian region. The final incidence of these benefits will of course depend upon the ability of individual regional economies to identify and capture opportunities in PRC itself. Thus PRC poses not a threat, but an opportunity to its neighbors, but the opportunity comes in the form of a challenge to re-orient production and marketing capacity to a new market of unprecedented potential. Japan and other dynamic Asian exporters have met this challenge before in western markets, and the stakes are high enough in the present context to justify a second effort.

In addition to the baseline forecasts, we examined a variety of trade liberalization scenarios for East Asia with reference to PRC's WTO accession. In particular, we compared unilateral Chinese liberalization with an example of East Asian regionalism (ASEAN Free Trade Area plus PRC) and one Global Trade Liberalization scenario that abolishes all tariffs. Our results are consistent with some conventional intuition and in other ways indicate the complexity of the regional negotiating environment.

As intuition would dictate, we find that GTL yields the greatest and most widespread benefits, both for the region and the rest of the world. The regional arrangement, AFTA plus PRC, is beneficial to all members and expands their trade within the region and with the rest of the world, but induces significant trade diversion away from nonmembers. Despite these problems, however, ASEAN's ability to leverage PRC growth would make this arrangement quite attractive to them.

PRC's role in all three scenarios is a unique one, however, and appears to be governed by complex incentives. First, it is apparent from the PRC WTO scenario that PRC is apparently in a position to "go it alone" with trade liberalization. In other words, the gains from unilateralism are for PRC comparable to those of the AFTA or GTL, and no other economy in the region appears to have this characteristic. Moreover, PRC gains much less in relative terms than either ASEAN in the AFTA or the rest of East Asia under GTL. The reason for this is that PRC can get most of the export benefits by eliminating its own protection, while a large part of the benefit to East Asia comes from PRC market access. Thus PRC possesses two so-called carrots and two sticks in regional negotiations. The carrots are market access to PRC and, by joining PRC in an

FTA, greater ROW market access (the “bandwagon” effect ASEAN enjoys in the AFTA plus PRC scenario). The sticks, obviously, are the same carrots used as bludgeons, denial of both kinds of market access. Clearly, the export-only PRC threat perspective is too simplistic: but this country still holds a special position in the regional negotiating environment.

PRC may have other reservations about regionalism that limit its willingness to take detours from the path to globalization. In particular, our results indicate that PRC might experience adverse terms of trade effects by diverting its trade into smaller trade zones delineated by East Asian regional preferences. Beyond this, it appears that most regional arrangements would reinforce PRC’s neo-mercantilist position vis-à-vis economies outside the region. In each scenario, PRC is estimated to increase ex-Asian exports more than it increases ex-Asian imports, while doing the opposite for East Asia. These two issues could make it difficult to recruit PRC into East Asian regional agreements, yet our results indicate its membership would be essential to the gains realized by other members. Barring PRC’s participation, most regional pacts would yield only small benefits and members would probably be better off going directly toward the goal of GTL. Thus PRC’s current orientation, GTL as reflected in its assertive WTO commitments, is the primary goal for this country and, subject to that, may ultimately be the best route for other East Asian economies.

The most salient lesson from this preliminary work, however, may be the essential role that detailed empirical analysis can play in support of strategic trade policy. It is obvious from the complexity of influences giving rise to our results that policy makers relying on economic theory, intuition, or rules of thumb alone are unlikely to adequately foresee the consequences of their actions. Not only are the magnitudes of induced adjustments difficult to ascertain because of the scope of indirect effects, but qualitative outcomes often directly contradict intuition or the predictions of highly simplified models, leading to the opposite results from the intended ones. Fortunately, models and data of the kind used here are now well established research tools. They can already be applied to a large universe of issues to better elucidate the economic consequences of policy before it is implemented.

The present work will be extended in two important directions in the second and third papers of this series. Using the same global forecasting model, a second monograph will examine the complex regional negotiating environment, comparing a wider spectrum of alternative regional trade arrangements. With this work, we hope to better elucidate the bargaining positions of the regional economies and the potential gains they might realize from a variety of intermediate steps toward globalization. A third and final paper will undertake a much more detailed analysis of PRC’s regional comparative advantage. Using multi-digit ISIC information on trade patterns and factor utilization, we will attempt to focus on the real trade-offs and structural adjustments that can be expected to ensue from more intense regional trade competition.

## Annex A—Model Summary

This paper uses a version of the LINKAGE Model, a global, multi-region, multi-sector, dynamic applied general equilibrium model.<sup>26</sup> The base data set—GTAP<sup>27</sup> Version 5.0—is defined across 66 country/region groupings, and 57 economic sectors. For this paper, the model has been defined for an aggregation of 16 country/regions and 18 sectors including sectors of importance to the poorer developing countries—grains, textiles, and apparel. The regional and sectoral concordances can be found in Tables 2.1. and 2.2. The remainder of this annex outlines briefly the main characteristics of supply, demand, and the policy instruments of the model.

### *Production*

All sectors are assumed to operate under constant returns to scale and perfect competition. Production in each sector is modeled by a series of nested CES production functions which are intended to represent the different substitution and complementarity relations across the various inputs in each sector. There are material inputs which generate the input/output table, as well as factor inputs representing value added.

Three different production archetypes are defined in the model—crops, livestock, and all other goods and services. The CES nests of the three archetypes are graphically depicted in Figures A-1 through A-3. Within each production archetype, sectors will be differentiated by different input combinations (share parameters) and different substitution elasticities. The former are largely determined by base year data, and the latter are given values by the modeler.

The key feature of the crop production structure is the substitution between intensive cropping versus extensive cropping, i.e. between fertilizer and land (see Figure A-1).<sup>28</sup> Livestock production captures the important role played by feed versus land, i.e. between ranch- versus range-fed production (see Figure A-2).<sup>29</sup> Production in the other sectors more closely matches the traditional role of capital/labor substitution, with energy introduced as an additional factor of production (see Figure A-3).

In each period, the supply of *primary* factors—capital, labor, and land—is usually predetermined. However, the supply of land is assumed to be sensitive to the contemporaneous price of land. Land is assumed to be partially mobile across agricultural sectors. Given the comparative static nature of the simulations which assumes a longer term horizon, both labor and capital are assumed to be perfectly mobile across sectors (though not internationally).<sup>30</sup>

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<sup>26</sup> The LINKAGE model is directly inspired by RUNS Model (see Burniaux and van der Mensbrugge, 1994), and the OECD GREEN Model (see van der Mensbrugge, 1994). Full model specification is available in van der Mensbrugge: 2001.

<sup>27</sup> GTAP refers to the Global Trade Analysis Project based at Purdue University. For more information see Hertel, 1997.

<sup>28</sup> In the original GTAP data set, the fertilizer sector is identified with the *crp* sector, i.e. chemicals, rubber, and plastics.

<sup>29</sup> Feed is represented by three agricultural commodities in the base data set: wheat, other grains, and oil seeds.

<sup>30</sup> This can be contrasted with, e.g. Fullerton (1983).

Model current specification has an innovation in the treatment of labor resources.<sup>31</sup> The GTAP data set identifies two types of labor skills—skilled and unskilled. Under the standard specification, both types of labor are combined together in a CES bundle to form aggregate sectoral labor demand, i.e. the two types of labor skills are directly substitutable. In the new specification, a new factor of production has been inserted which we call *human capital*. It is combined with capital to form a physical *cum* human capital bundle, with an assumption that they are complements. On input, the user can specify what percentage of the skilled labor factor to allocate to the human capital factor.

Once the optimal combination of inputs is determined, sectoral output prices are calculated assuming competitive supply (zero-profit) conditions in all markets.

### ***Consumption and Closure Rules***

All income generated by economic activity is assumed to be distributed to a single representative household. The single consumer allocates optimally his/her disposable income among the consumer goods and saving. The consumption/saving decision is completely static: saving is treated as a “good” and its amount is determined simultaneously with the demands for the other goods, the price of saving being set arbitrarily equal to the average price of consumer goods.<sup>32</sup>

Government collects income taxes, indirect taxes on intermediate and final consumption, taxes on production, tariffs, and export taxes/subsidies. Aggregate government expenditures are linked to changes in real GDP. The real government deficit is exogenous. Closure therefore implies that some fiscal instrument is endogenous in order to achieve a given government deficit. The standard fiscal closure rule is that the marginal income tax rate adjusts to maintain a given government fiscal stance. For example, a reduction or elimination of tariff rates is compensated by an increase in household direct taxation, *ceteris paribus*.

Each region runs a current-account surplus (deficit) that is fixed (in terms of the model numéraire). The counterpart of these imbalances is a net outflow (inflow) of capital, subtracted from (added to) the domestic flow of saving. In each period, the model equates gross investment to net saving (equal to the sum of saving by households, the net budget position of the government and foreign capital inflows). This particular closure rule implies that investment is driven by saving. The fixed trade balance implies an endogenous real exchange rate. For example, removal of tariffs which induces increased demand for imports is compensated by increasing exports which is achieved through a real depreciation.

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<sup>31</sup> This feature is not invoked in results reported here. Because of increased interest in labor markets and human capital in the Latin American context (see e.g. World Bank (2001)), we have developed this modeling capacity and are using it experimentally. For indications about modeling in this context, see Collado et al. (1995), Maechler and Roland-Holst (1997), and van der Mensbrugge (1998).

<sup>32</sup> The demand system used in LINKAGE is a version of the Extended Linear Expenditure System (ELES) which was first developed by Lluch (1973). The formulation of the ELES used in LINKAGE is based on atemporal maximization—see Howe (1975). In this formulation, the marginal propensity to save out of supernumerary income is constant and independent of the rate of reproduction of capital.

## *Foreign Trade*

The world trade block is based on a set of regional bilateral flows. The basic assumption in LINKAGE is that imports originating in different regions are imperfect substitutes (see Figure A-4). Therefore in each region, total import demand for each good is allocated across trading partners according to the relationship between their export prices. This specification of imports—referred to as the Armington<sup>33</sup> specification—implies that each region faces a downward-sloping demand curve for its exports. The Armington specification is implemented using two CES nests. At the top nest, domestic agents choose the optimal combination of the domestic good and an aggregate import good consistent with the agent's preference function. At the second nest, agents optimally allocate demand for the aggregate import good across the range of trading partners.<sup>34</sup>

The bilateral supply of exports is specified in parallel fashion using a nesting of constant-elasticity-of-transformation (CET) functions. At the top level, domestic suppliers optimally allocate aggregate supply across the domestic market and the aggregate export market. At the second level, aggregate export supply is optimally allocated across each trading region as a function of relative prices.<sup>35</sup>

Trade variables are fully bilateral and include both export and import taxes/subsidies. Trade and transport margins are also included, therefore world prices reflect the difference between FOB and CIF pricing.

## *Prices*

The LINKAGE model is fully homogeneous in prices, i.e. only relative prices are identified in the equilibrium solution. The price of a single good, or of a basket of goods, is arbitrarily chosen as the anchor to the price system. The price (index) of OECD manufacturing exports has been chosen as the numéraire, and is set to 1.

## *Elasticities*

Production elasticities are relatively standard and are available from the authors (e-mail: [info@adbi.org](mailto:info@adbi.org)). Aggregate labor and capital supplies are fixed, and within each economy they are perfectly mobile across sectors.

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<sup>33</sup> See Armington, 1969 and compare, e.g. de Melo and Robinson (1989) and Rutherford and Tarr (2001).

<sup>34</sup> The GTAP data set allows each agent of the economy to be an Armington agent, i.e. each column of demand in the input/output matrix is disaggregated by domestic and import demand. (The allocation of imports across regions can only be done at the national level). For the sake of space and computing time, the standard model specification adds up Armington demand across domestic agents and the Armington decomposition between domestic and aggregate import demand is done at the national level, not at the individual agent level.

<sup>35</sup> A theoretical analysis of this trade specification can be found in de Melo and Robinson, 1989.



### ***Equivalent Variation Aggregate National Income***

Aggregate income gains and/or losses summarize the extent trade distortions are hindering growth prospects and the ability of economies to use the gains to help those whose income could potentially decline.

Real income is summarized by Hicksian equivalent variation (EV). This represents the income consumers would be willing to forego to achieve post-reform well-being ( $u^p$ ) compared to baseline well-being ( $u^b$ ) at baseline prices ( $p^b$ ):

$$EV = E(p^b, u^p) - E(p^b, u^b)$$

where  $E$  represents the expenditure function to achieve utility level  $u$  given a vector of prices  $p$  (the  $b$  superscript represents baseline levels, and  $p$  the post-reform levels). The model uses the extended linear expenditure system (ELES), which incorporates savings in the consumer's utility function (see Lluch (1973) and Howe (1975)). The ELES expenditure function is easy to evaluate at each point in time. (Unlike the OECD treatment of  $EV$ , we use baseline prices in each year rather than base year prices. See Burniaux et al. (1993)). The discounted real income uses the following formula:

$$CEV = \sum_{t=2005}^{2015} \beta^{(t-2004)} EV_t^a / \sum_{t=2005}^{2015} \beta^{(t-2004)} Y_t^d$$

where  $CEV$  is the cumulative measure of real income (as a percent of baseline income),  $\beta$  is the discount factor (equal to  $1/(1+r)$  where  $r$  is the subjective discount rate),  $Y^d$  is real disposable income, and  $EV^a$  is adjusted equivalent variation. The adjustment to  $EV$  extracts the component measuring the contribution of household saving, since this represents future consumption. Without the adjustment, the  $EV$  measure would be double counting. The saving component is included in the  $EV$  evaluation for the terminal year. Similar to the OECD, a subjective discount rate of 1.5 percent is assumed in the cumulative expressions.

### ***Specification of Endogenous Productivity Growth***

Productivity in manufacturing and services is the sum of three components:

- a uniform factor used as an instrument to target GDP growth in the baseline simulation
- a sector-specific fixed shifter which allows for relative differentials across sectors (for example, manufacturing productivity two percentage points higher than productivity in the services sectors)
- a component linked to sectoral openness as measured by the export-to-output ratio

The latter takes the following functional form:

$$(1) \quad \gamma_i^e = \chi_i^0 \left( \frac{E_i}{X_i} \right)^\eta$$

where  $\gamma^f$  is the growth in sectoral productivity due to the change in openness,  $\chi^0$  is a calibrated parameter,  $E$  and  $X$  represent respectively sectoral export and output, and  $\eta$  is the elasticity. The parameter  $\chi^0$  has been calibrated so that (on average) openness determines roughly 40 percent of productivity growth in the baseline simulation, and the elasticity has been set to 1.

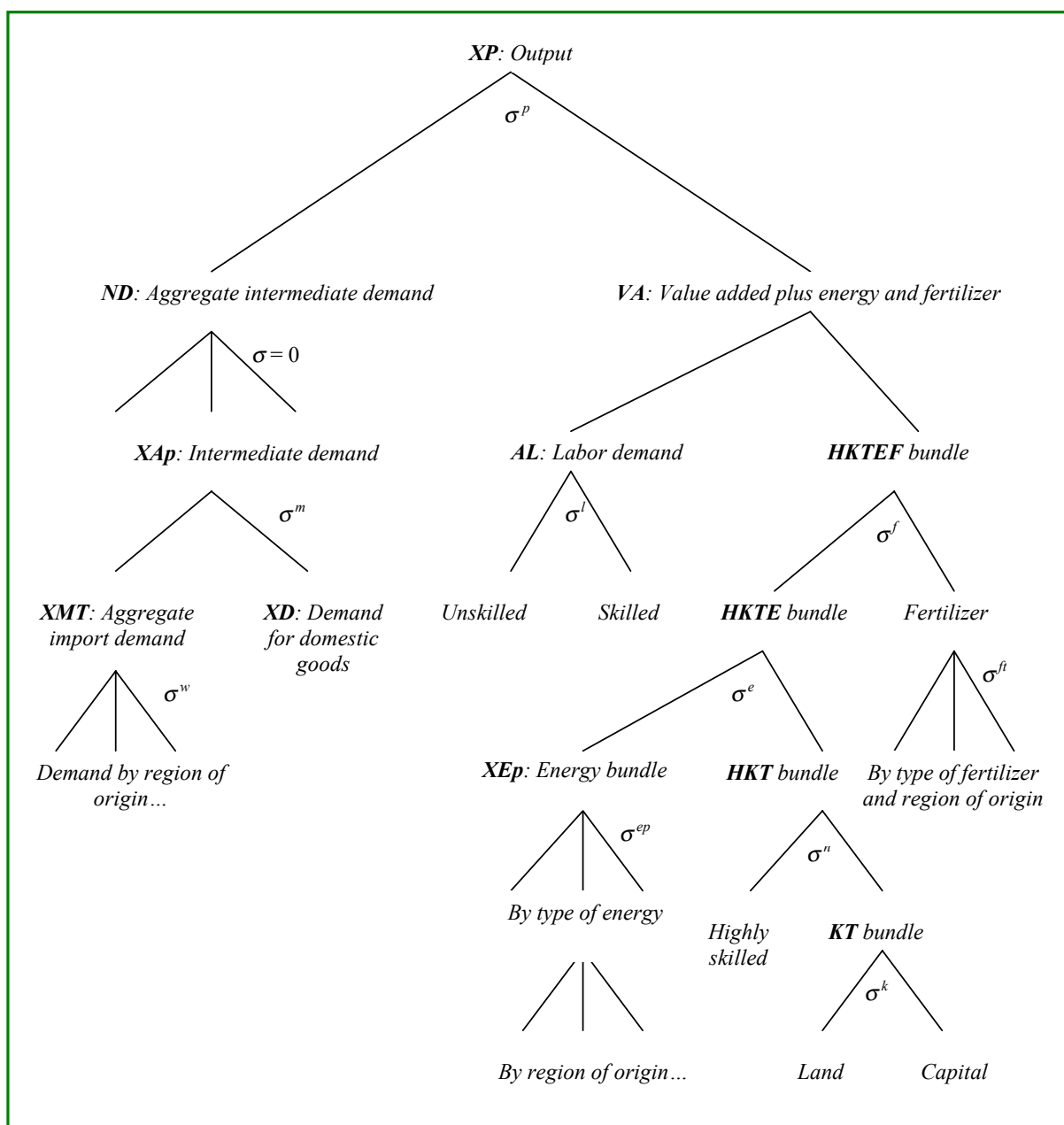
In agriculture, productivity is fixed in the baseline, set to 2.5 percent per annum in most developing countries (based on estimates found in the works of Martin and Mitra). However, a share of the fixed productivity is attributed to openness, using equation (1).

In the baseline, GDP growth is given. Agricultural productivity is similarly given, and equation (1) is simply used to calibrate the shift parameter,  $\chi^0$ , so that a share of agricultural productivity is determined by sectoral openness. Average productivity in the manufacturing and services sectors is endogenous and is calibrated in the baseline to achieve the given GDP growth target. The economy-wide (excluding agriculture) productivity parameter is endogenous. Equation (1) is used to calibrate the same  $\chi^0$  parameter, under the assumption that some share of sectoral productivity is determined by openness, for example 40 percent.

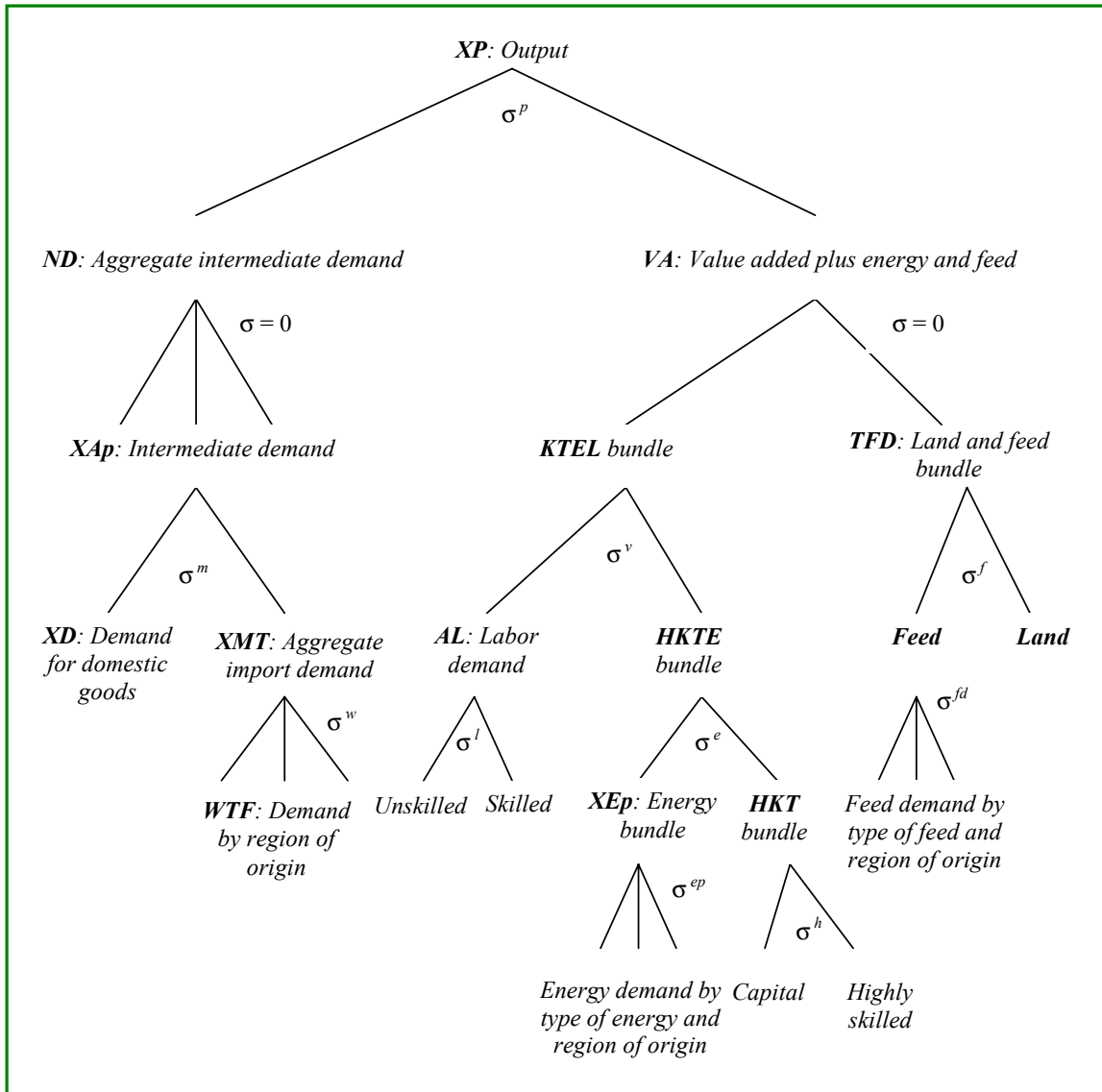
In policy simulations, the economy-wide productivity factor, along with other exogenous productivity factors (sector-specific shifters) are held fixed, but the openness-related part of productivity is endogenous and responds to changes in the sectoral export-to-output ratio. In the manufacturing and services sectors, the elasticity is set at 1. In the agricultural sectors it is set to 0.5.

Say sectoral productivity is 2.5 percent, and that 40 percent of it can be explained by openness, i.e. 1.0 percent, with the residual 1.5 percent explained by other factors. Assume sectoral openness increases by 10 percent. If the elasticity is 1, this implies that the openness-related productivity component will increase to 1.1 percent and total sectoral productivity will increase to 2.6 percent (implying that the total sectoral productivity increases by 4 percent with respect to the 10 percent increase in sectoral openness).

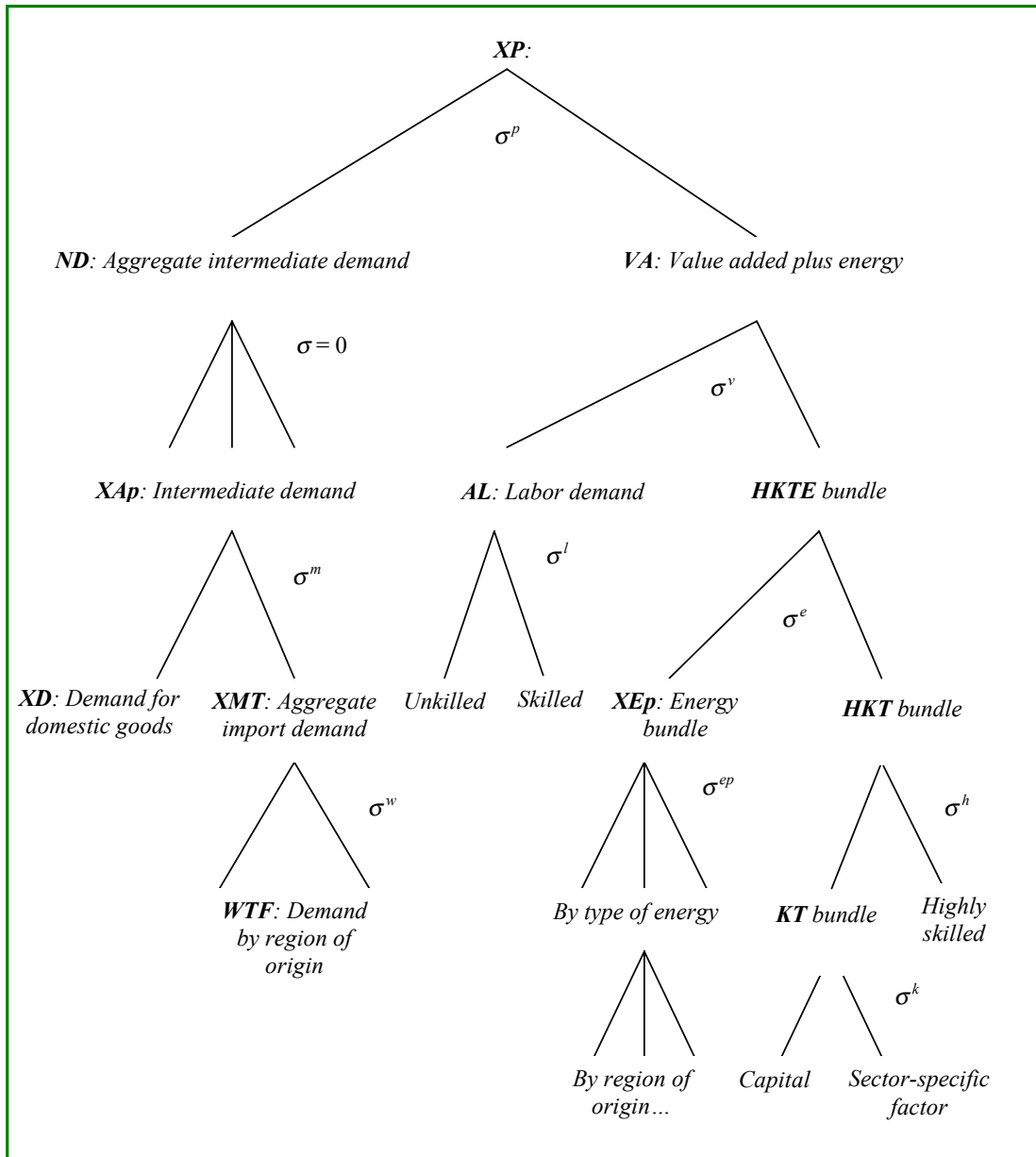
**Figure A-1. Production Function for Crops**



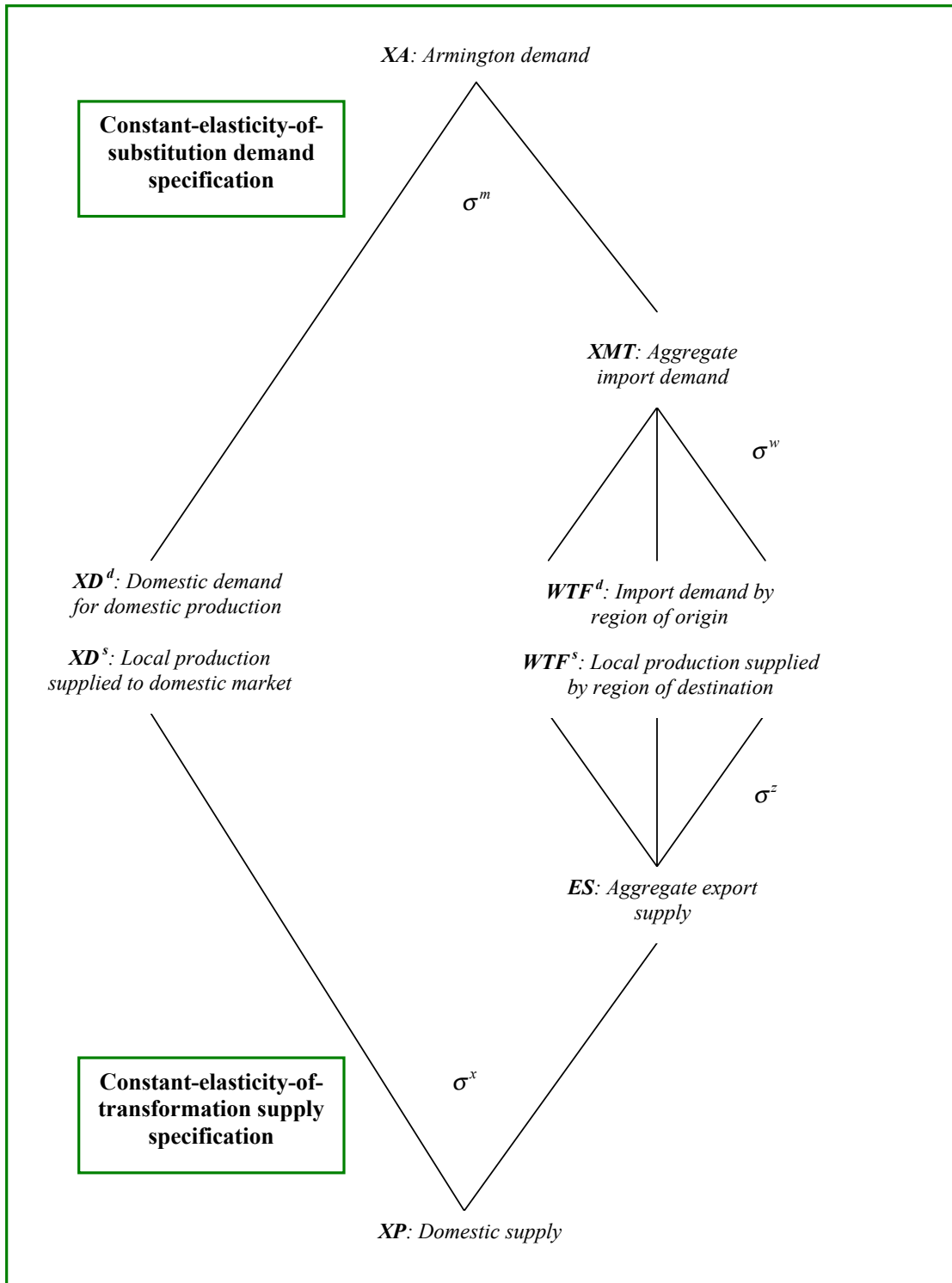
**Figure A-2. Production Function for Livestock**



**Figure A-3. Production Function for Non-agriculture**



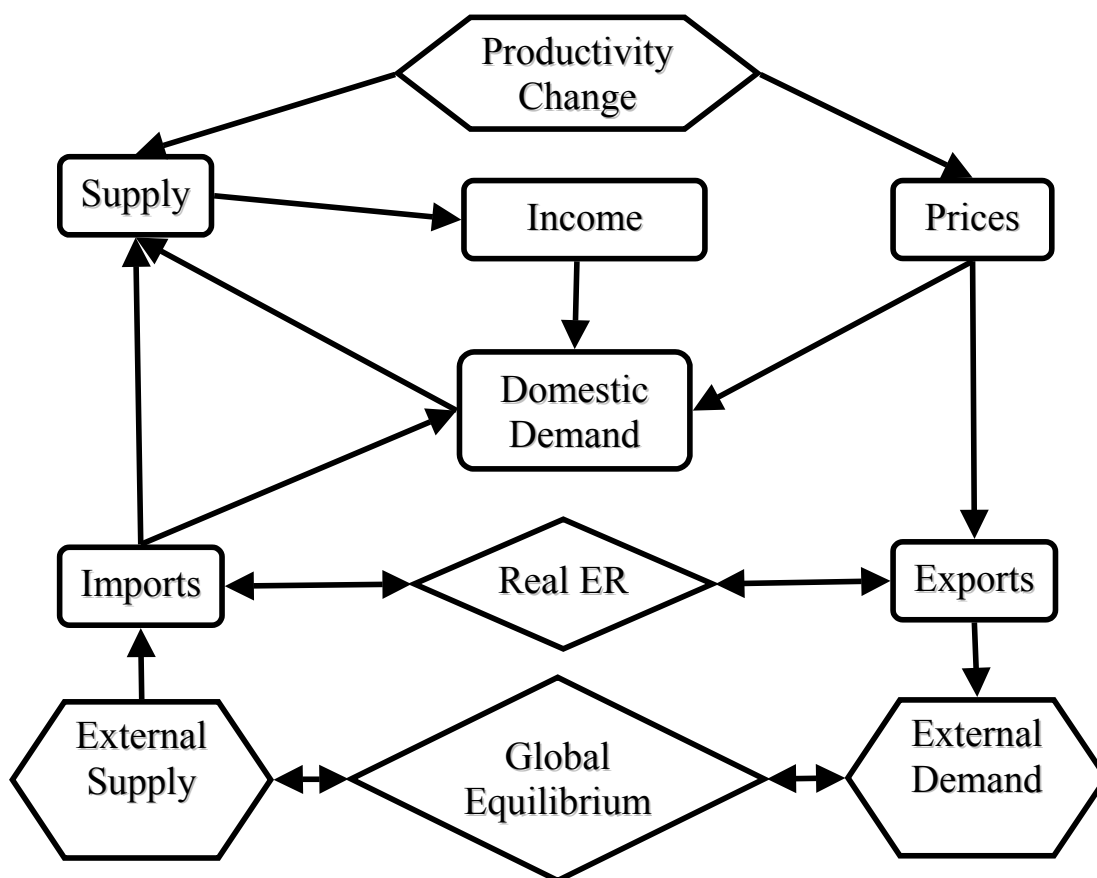
**Figure A-4. Trade Aggregation**



## Annex B—Model Calibration and Notes on the Adjustment Process

The model is calibrated to country and regional real GDP growth rates, obtained as consensus estimates from independent sources (DRI, IMF, Cambridge Econometrics). Using exogenous rates of implied TFP growth, the model computes supply, demand, and trade patterns compatible with domestic and global equilibrium conditions. Equilibrium is achieved by adjustments in the relative prices of domestic resources and commodities, while international equilibrium is achieved by adjusting trade patterns and real exchange rates to satisfy fixed real balance of payments constraints. The general process is schematically represented in the figure below.

Figure B-1. General Equilibrium Calibration Mechanism



The calibration procedure highlights the two salient adjustment mechanisms in the model (as well as the real economies), domestic and international prices. General equilibrium price adjustments are generally well understood by professional economists but, in the multilateral context, the role of exchange rates can be a source of confusion. Generally, in a neoclassical model like this one, there are no nominal or financial variables and the function of the exchange rate is only to equalize real purchasing power between different economies.

Because models like this do not capture the aggregate price level or other nominal quantities, there is no nominal exchange rate in the sense of traditional macroeconomics or finance. Since there is no money metric in the model, all prices are relative prices, and the exchange rate (the composite relative price of foreign goods) is no exception. If there were financial assets in the model, one could define a nominal exchange rate as the relative price of two international financial assets (money, bonds, etc.). Without them, the exchange rate is defined in terms of real international purchasing power, i.e. the relative price of tradeable to nontradeable goods. In a multi-sector setting, the real exchange rate is defined as the ratio of an index of the value of all tradeables (on world markets) to an index of the value of all nontradeables.

Since any tax (or other price elevating distortion) on an import is an implicit tax on all tradeable goods, trade liberalization causes tradeable goods prices to fall and the real exchange rate depreciates. Real exchange rate depreciation also makes exports more competitive, one of the principal motives for unilateral liberalization. The general implication of this is that trade will expand rapidly for a country removing significant import protection, and more rapidly for countries removing more protection. The pattern of trade expansion, and the domestic demand and supply shifts that accompany it, depend upon initial conditions and adjustments among trading partners.

It should also be noted that, even in a second-best world, removing price distortions also confers efficiency gains, increasing output potential and real incomes.



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