# External Liberalization, Poverty, and Inequality in Vietnam: The Role of Price Dispersion

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## Introduction

In parallel with the domestic reforms, Vietnam has begun opening up to regional and global economic forces that can be potent catalysts for growth and poverty alleviation. Vietnam's initiative to enter the WTO has far reaching implications for its domestic economy, as well as for its place in regional and global trade. If the current offers by Vietnam are successfully negotiated in Geneva and implemented by the government, there will very substantial alignment between international and domestic prices. If WTO standards for market openness and institutional transparency are also implemented, both domestic and international economic interests can be expected to dramatically increase their commitment to accelerated and sustained economic growth in the country. In a regional context, Vietnam's membership in ASEAN implicates in into AFTA and other regional initiatives to promote integration and growth. Vietnam's past isolation belies geographic features that can make it a dynamic regional growth pole, including centrality in ASEAN and very extensive potential for maritime transport access.

To elucidate these issues, we use a new calibrated general equilibrium (CGE) model to project changing patterns of domestic supply, demand, and trade effects arising from external policy changes. Generally speaking, our evidence indicates that trade liberalization is beneficial to Vietnam. However, and not surprisingly, we find that compositional adjustments in the economy are much more complex and often more dramatic than aggregate ones. For

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this reason, is important to examine these closely. Here we give particular attention to microeconomic incidence via local differences in economic structure and prices. From this more detailed perspective, it is apparent that, in the agricultural sector in particular, realizing the fullest benefits of globalization will require more detailed understanding of local adjustments. In particular, the rural poor majority must find a means to participate in urban based growth, including migration and marketing of agricultural products with higher income elasticities.

The next section of the paper summarizes our perspective on economywide price dispersion and its significance for the composition of economic outcomes. In section 3, we lay out the economywide CGE model and database for Vietnam. Section 4 reviews a set of trade liberalization scenarios that were evaluated with the economywide model, followed by more microeconomic results and analysis in section 5. A sixth and final section of the exposition is devoted to concluding remarks and indications about how this work will be extended.

**Price Dispersion and Development**

The assumption of national market clearing and homogeneous prices is shared by both traditional national CGE models and more recent micro-macro models. Despite the wide use of this standard, however, price dispersion is a pervasive and robust characteristic of developing economies. Previous efforts to exploit detailed household data in CGE models have relied on national market clearing and implicitly homogeneous prices in the underlying product, factor, and asset markets.

In contrast, we argue that, for developing countries generally and the rural sector in particular, price dispersion is a defining characteristic and structural determinant of inequality. It is often argued, for example that developing economies are replete with market failures. This may be true, but it does not mean that prices have failed to capture information about economic structure and conduct. Indeed, we believe that local price differences embody essential information about the impediments to efficiency and broader economic progress.

Before examining this issue empirically, it is worthwhile to consider the economic scope of this issue. The underlying causes of price dispersion are many, but generically they can be divided into four categories:

1. Geography – spatial and physical characteristics that affect distribution margins

2. Information – spatial asymmetries in market relevant information induce heterogeneity in production and consumption decisions, this can be especially important in relation to expectations and risk-oriented behavior, also relevant are product quality, choice of technique, and market timing
3. Institutions – bargaining theory Price differences for both producers and consumers are likely to be affected by their abilities to participate in formal and informal, public and private institutions that represent economic interests

Each of these generic categories contributes something to observed patterns of price dispersion, and in turn requires its own theoretical consideration. These are treated in greater detail in a companion paper (Roland-Holst:2004), but for present discussion we mention them only in passing. Likewise, we want to review four different perspectives on price dispersion, discussed at greater length elsewhere, before more focused empirical analysis. Generally, price dispersion can be examined in four ways:

*Absolute price differences*

This perspective refers to the idea that the same good or service may have a different price in different localities. While understandable in terms of distribution margins and the other four determinant categories referred to above, this phenomenon refers to a departure from domestic purchasing power parity that can lead to important differences in other locational economic characteristics. The best analogy here is that of exchange rate comparisons, where efficient markets are presumed to achieve PPP through exchange rate arbitrage.

To the extent that we observe departures from PPP across the economic, this will translate into a myriad of induced distortions in other prices, incomes, incentives, and behavior patterns. Examples are legion, but consider regressive patterns of primary resource allocation (e.g. water, forest products, etc.). In remote rural areas, these resources have very low prices and are therefore more likely to be over-exploited, especially if they are inputs to traded commodities.[1] From this perspective, a simple trade model would then predict observed patterns of water misallocation, de-forestation, etc. but rural poor populations. More generally, many characteristics of rural poverty are reinforced by patterns of nominal price

[1] This disparity is most obvious in an international setting. A wheat noodle is far cheaper in China than in Kansas, but it contains the same amount of wheat.

dispersion, particularly for the primary income sources of the rural poor, labor and agricultural products.

To get a more precise quantitative sense of the degree of price dispersion in the NUR, consider now the following indexes for consumer and producer prices of major agricultural commodities. These indexes are computed for each from the 2002 Vietnam Household Living Standards Survey (VHLSS) and normalized to unity at the national level.

**Table 2.1: Rural Price Indices by Province, Northern Uplands Region**
**(National average = 1)**

| | Consumer Prices by Commodity | | | | | Producer Prices by Commodity | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Rice* | *Other Crops* | *Pigs* | *Cattle* | *Poultry* | *Rice* | *Coffee/ Tea* | *Sugar Cane* | *Other Crops* | *Pigs* | *Cattle* | *Poultry* |
| **1** ***HaGiang*** | 1.09 | 1.24 | .52 | .75 | .40 | 1.07 | .53 | 1.77 | .73 | 1.00 | .81 | 1.02 |
| **2** ***CaoBang*** | 1.02 | 1.12 | .71 | .35 | .54 | 1.15 | .51 | 1.46 | .91 | .94 | .70 | .97 |
| **3** ***LaoCai*** | 1.02 | .90 | .75 | .74 | .61 | 1.04 | .55 | .95 | .63 | .96 | .52 | 1.03 |
| **4** ***BacCan*** | 1.05 | 1.13 | .71 | .73 | .63 | 1.04 | .51 | 1.88 | .77 | .90 | .56 | .91 |
| **5** ***LangSon*** | 1.03 | 1.08 | .74 | .41 | .71 | .98 | NA | 1.21 | .97 | .96 | .52 | 1.09 |
| **6** ***TuyenQuang*** | 1.04 | 1.01 | .77 | .60 | .65 | 1.03 | .51 | .81 | .49 | .91 | .69 | .95 |
| **7** ***YenBai*** | 1.04 | 1.01 | .76 | .78 | .78 | 1.02 | .55 | .56 | .64 | .93 | .45 | 1.03 |
| **8** ***ThaiNguyen*** | 1.03 | 1.08 | .81 | .73 | .63 | 1.04 | .51 | .72 | .76 | .94 | .80 | 1.00 |
| **9** ***PhuTho*** | 1.08 | .97 | .80 | .84 | .77 | 1.01 | .51 | 1.02 | .69 | .92 | .65 | .99 |
| **10** ***BacGiang*** | 1.09 | .80 | .78 | .96 | .88 | 1.11 | .51 | 1.99 | .90 | .95 | .70 | .98 |
| **11** ***QuangNinh*** | 1.03 | .99 | .90 | .94 | 1.09 | 1.06 | NA | 1.66 | .75 | .99 | .54 | 1.25 |
| **12** ***LaiChau*** | 1.08 | .99 | .72 | .90 | .36 | 1.04 | 1.23 | 1.32 | .57 | 1.02 | .43 | 1.07 |
| **13** ***SonLa*** | 1.00 | .81 | .86 | 1.23 | .52 | 1.21 | .96 | 1.26 | .41 | 1.00 | .45 | 1.03 |
| **14** ***HoaBinh*** | 1.00 | 1.11 | .79 | .63 | .60 | 1.04 | .51 | 1.11 | .33 | .95 | .82 | 1.02 |

Rice prices exhibit considerable uniformity across the region, as can be expected because of high levels of state intervention in the rice supply chain. Beyond this special case, however, prices show remarkable dispersion across the NUR, even in relatively homogeneous categories like pigs and cattle. Of particular interest is the fact that, excluding rice, producers in this region face supply prices below the national average in 75% of the cases considered. Interestingly, consumers face below average prices more often (82% of the cases), but their indices are generally lower. This implies even greater pressure on profit margins for local producers, further limiting the incentive to emerge from subsistence.

*Relative price differences*

In a way, this is obviously an extension of the previous case, but because goods and services emanate from different origins, nominal price differences can combine in many more complex ways to influence economic conditions and incentives. For the sake of economy in

the present discussion, consider one example, the agricultural terms of trade (Agtot), localized to the individual household or village level. Depending upon distance and other barriers between this rural economic unit and a regional trading center, the Agtot can vary substantially. In particular, greater remoteness can be expected to affect Agtot adversely (from a rural perspective) in two ways, reducing the numerator (things rural households sell) and increasing the denominator (things rural households buy from outside). Both these components undermine rural purchasing power and incentives for market participation, contributing directly to rural marginalization, poverty, and inequality. Over the longer term, upward bias in prices of urban or international agricultural inputs, including agrochemicals and technology, can also retard technology adoption and agricultural productivity growth. The following figure makes these comparisons more explicit.

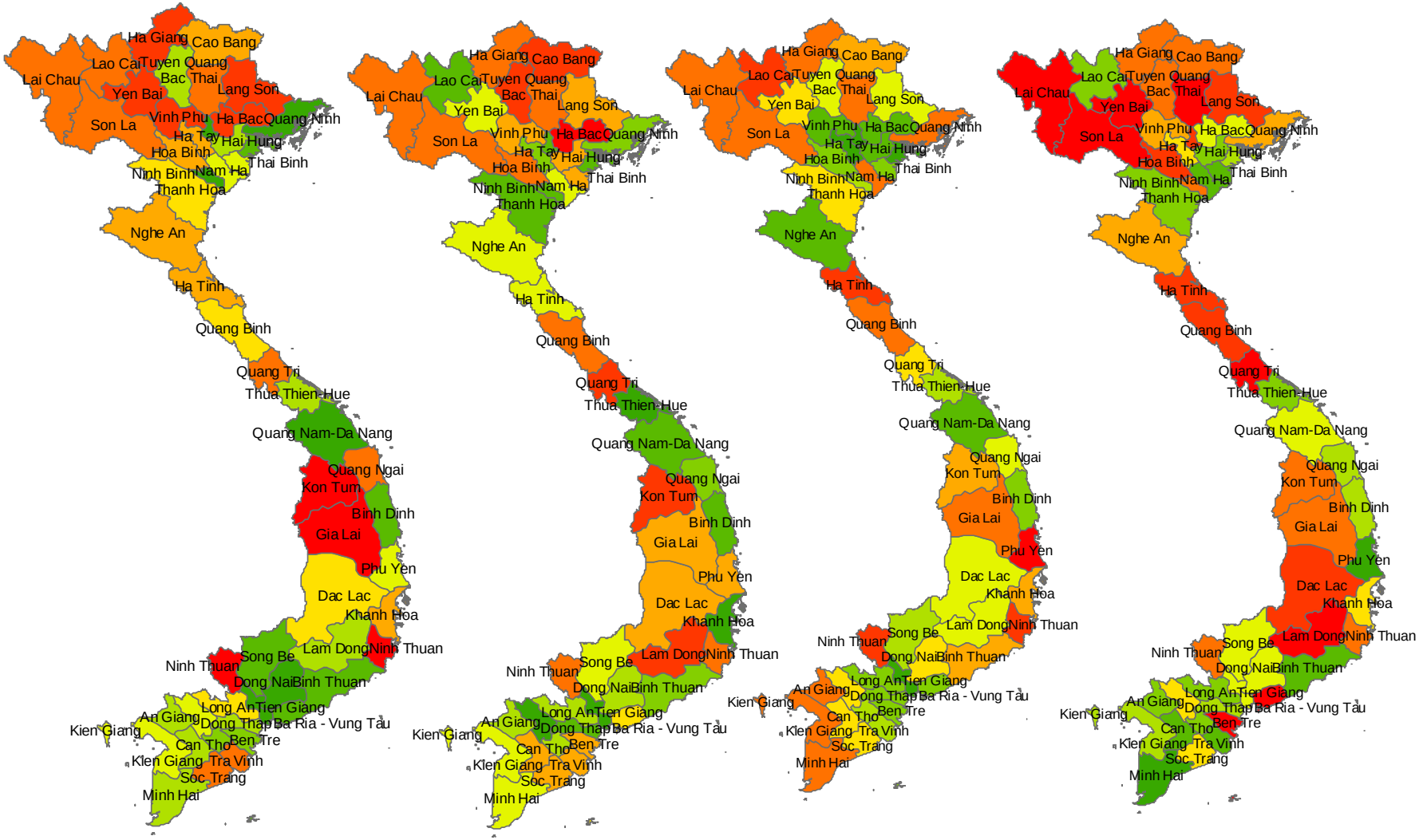
*Price transmission*

A third perspective on prices and development, and a focal point of the empirical analysis to follow, relates to the ways in which prices transmit information about changing economic circumstances. We have already seen above that steady state price dispersion may reflect structural characteristics such as geography, local endowments, institutions, and persistent differences in available information. In a more dynamic context, it is reasonable to ask how prices adapt to changes in the underlying information set. For example, if external prices change for an economy, because of exogenous forces or some domestic policy intervention. How will prices across the economy change to take account of this? The answer presumably depends on many of the same original price determinants referred to above, yet it can illuminating to trace the interactions that link price changes across the economy.

In a rural-urban development context, we can simply observe that more remote areas are less sensitive to border price variation and while border markets are less responsive to market shocks in remote areas. The former implies, for example, that remote farmers will be less responsive to any change in border price incentives. This not only retards aggregate agricultural price response arising from international or metropolitan demand, but does so in a way that is biased geographically and probably regressive in income terms.

By symmetric logic, border or urban markets will be less responsive to rural price changes and the implied needs of remote areas. This means that rural scarcity can only be alleviated by with greater local price increases, further undermining the purchasing power of rural households and increasing local financial risks arising from shortages.

**Figure 2.1: Poverty, Specialization, Distance, and Ag. Terms of Trade Compared**




**Source: Author's estimate from VHLSS 2002.**

*Price volatility – Risk and Insurance*

A fourth and final perspective on prices and development relates to intertemporal price uncertainty. Prices inevitably change, and the reasons are very diverse, yet agents need to anticipate the effects of this uncertainty to limit economic risks. In developing countries, risk management tools are limited, markets are volatile, and the margin for economic error can be very small. In the case of poverty, for example, entry and exit are quite asymmetric risks. Exit from poverty is most often associated with longer term conditions and strategies for market participation, investment, and human capital development. Entry into poverty, on the other hand, is more likely to be associated with precipitous events adverse health status (especially the decease of a household head and expenses appurtenant thereto). Given that economic uncertainty then poses a special threat to the poor, it is reasonable to ask how they cope with price volatility. This question will be addressed in an extension of the present work.

## Vietnam Data and model overview

The results reported in this study arise from application of two primary datasets and two estimation strategies. The data are a detailed new year 2000 Social Accounting Matrix for Vietnam (Tarp et al:2002), and three nationally representative household surveys. We use the former to calibrate the CGE model and the latter to estimate detailed microeconomic incidence from CGE scenario results.

*A 2000 SAM for Vietnam*

The latest complete SAM for Vietnam, just estimated for the year 2000, is the result of a three-year project to assemble and reconcile a variety of economywide data into a consistent set of tabular accounts. Generally speaking, the SAM provides a closed form, economywide accounting of linkages between activities (and/or commodities), factors, households, domestic institutions (e.g., investment, government), and foreign institutions in a tabular format that is transparent and amenable both to multiplier analysis

similar to that popularized by Leontief and more sophisticated CGE analyses. These include for example studies focusing on the economic impact of initiatives such as WTO accession. The relevance of such analyses in the present phase of Vietnamese integration into the global economy and the international institutions dealing with trade issues can hardly be exaggerated.

An interesting SAM for Vietnam was published by the United Nations in the mid-1990s. While much of the theoretical analysis and overview in that document remains valid, that SAM is very aggregated and relies on a now outdated 1989 10-sector I/O table. Other contributions to this area include a SAM for Central Vietnam, underpinning the study by Bautista (2000), a working paper by Nielsen (2001) that estimated a 1997 SAM (included in the GTAP database), and the thesis by Huong (2000). However, until now there is no SAM reflecting the economic structure of Vietnam in the aftermath of the Asian financial crisis, taking into account the substantial changes in exports and imports over the past few years.

The first SAM in the current project, for 1999, was produced in 2002, and this has been followed by two 2000 tables, one prototype produced last year and a final one in February, 2004. The latter includes the new GSO input-output table for 2000, and represents the most up-to-date economywide data available from official sources, reconciled for the first time. The 2000 table is also the first SAM for Vietnam (or any other country as far as we know) with household and factor accounts calibrated directly from LSMS micro data. The general structure of the current SAM is summarized in the next table.

For the present analysis, we have also estimated a regional SAM that tabulates income and expenditure flows within the fourteen provinces of the target area for the microeconomic study, Vietnam's Northern Uplands Region. Another version of this table was estimated for 2000 under JBIC sponsorship, and was updated to be conformal and otherwise consistent with the new national SAM.[2] From this basis, a new NUR SAM was estimated for the year 2002,. In particular, we used the VHLSS sample for the same year to disaggregate detailed income-expenditure accounts for 15 representative household

[2] See IFPRI (2003) for more complete documentation.

categories, one rural household type for each of the fourteen NUR provinces and a single urban household type for the entire region. This new regional SAM table is reproduced in an annex below, representing the 38-sector/commodity aggregation used in this research.

**Table 3.1: Vietnam SAM for 2000 – Structural Characteristics**

| |
|---|
| 1. Incorporates the new 2000 GSO Input-Output Table |
| 2. 112 domestic production activities |
| 3. 114 commodities (includes trade and transport margins) |
| 4. 14 factors of production |
| 5. 12 labor categories |
| 6. Capital |
| 7. Land |
| 8. 16 household types, sampled from the VLSS<br>(Farmer, SelfEmp, Worker, UnEmp)x(Rural, Urban)xGender |
| 9. 3 enterprises (Private, Public, and Foreign) |
| 10. State (detailed fiscal instruments) |
| 11. Consolidated capital account |
| 12. 94 international trading partners |

*Micro Survey Data*

Three LSMS type surveys for Vietnam provide detailed and direct observations on many economic and demographic characteristics of rural households, including information on household and community composition, asset/factor ownership, production and consumption patterns, local price information, immigration status, and many others. Our microeconomic estimates are calibrated to the 2002 survey data, with nominal values renormalized to be consistent with the 2000 Vietnam SAM.

*CGE Specification*

The national CGE model used for this work has been constructed according to generally accepted standards, implemented in the GAMS programming language, and calibrated to the new Vietnam SAM estimated for the year 2000.[3] The structural specification of this model is typical of models emerging from the tradition of Dervis, de Melo, and Robinson (1982), and is presented more explicitly in and annex below.

*Baseline Economic Structure*

To prepare the reader for the many structural insights that arise from applying this dataset, we reproduce some of this information in the present section. Table 3.4 presents a variety of disaggregated economic statistics extracted from the 2000 Vietnam SAM. In column 1, for example, shares of economy-wide gross output are given for all 38 sectors and aggregates representing primary, industry, and service activities. As one would expect for an economy at Vietnam's stage of development, most of output is concentrated in primary and secondary activities. Even these statistics understate the importance of the rural and food sector, which provides employment to over two-thirds of the population, because of the large subsistence or non-market component of agricultural output.

There are many indications that Vietnam's agricultural potential could be expanded significantly and sustainably, but ideally this would be done in ways that respond to more attractive output prices and greater value-added capture. In terms of the former, this would mean shifting the composition of crops toward higher value varieties. More domestic food processing capacity could also be developed, independently or in foreign partnership, and preferably located in rural regions where the income gains would be most significant.

[3] See e.g. Meeraus et al (1992) for GAMS Tarp et al (2002) for the Vietnam SAM.

**Table 2.2: Structure of Supply Demand, and Value Added for Vietnam, 2000**

**(all figures in percentages except as indicated)**

| | | 1 | 2 | 3 | 4* | 5 | 6 | 7 | 8 | 9 | 10* | 11 | 12 | 13 | 14 | 15* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | X | Sd | E | E/Sd | Int | C | I | Dd | M | M/Dd | VA | LVA | KVA | LandVA | LVA/VA |
| 1 | *Rice* | 7.00 | 9.46 | .59 | .02 | 12.05 | 1.93 | .77 | 9.46 | .06 | .00 | 9.35 | 9.60 | 1.31 | 53.50 | 72.98 |
| 2 | *RawRub* | .24 | .01 | .83 | 37.92 | .06 | .00 | .01 | .01 | .08 | 3.98 | .33 | .15 | .52 | 2.21 | 32.23 |
| 3 | *CoffBn* | .71 | .04 | 2.45 | 22.77 | .07 | .00 | .01 | .04 | .02 | .20 | .96 | .70 | .77 | 6.56 | 51.97 |
| 4 | *SugCane* | .39 | .54 | .00 | .00 | .64 | .20 | .01 | .54 | .00 | .00 | .67 | .74 | .05 | 3.38 | 77.73 |
| 5 | *OthCrp* | 3.76 | 3.25 | 5.08 | .60 | 2.22 | 5.62 | .12 | 3.26 | 2.35 | .31 | 6.15 | 6.66 | 1.02 | 28.30 | 76.96 |
| 6 | *Pig* | 2.00 | 2.47 | .76 | .12 | .20 | 4.65 | .40 | 2.47 | .01 | .00 | 1.74 | 2.16 | .52 | 1.69 | 88.51 |
| 7 | *Poultry* | .68 | .88 | .16 | .07 | .37 | 1.31 | .02 | .88 | .02 | .01 | 1.12 | 1.51 | .04 | .95 | 95.57 |
| 8 | *OtLvstk* | .57 | .68 | .29 | .16 | .11 | 1.19 | .15 | .68 | .02 | .01 | .55 | .65 | .29 | .42 | 83.95 |
| 9 | *IrrServ* | .17 | .24 | .00 | .00 | .35 | .00 | .00 | .24 | .00 | .00 | .16 | .17 | .13 | .00 | 78.62 |
| 10 | *OtAgSrv* | .29 | .40 | .00 | .00 | .58 | .00 | .00 | .40 | .00 | .00 | .26 | .29 | .22 | .00 | 78.89 |
| 11 | *Forest* | .95 | 1.28 | .09 | .03 | 1.64 | .54 | .02 | 1.28 | .27 | .09 | 1.52 | 1.87 | .35 | 2.57 | 87.36 |
| 12 | *Fish* | 2.79 | 3.01 | 2.23 | .28 | 2.25 | 3.12 | .01 | 3.01 | .12 | .02 | 3.67 | 4.60 | 1.57 | .42 | 88.92 |
| | *All Agriculture* | 19.55 | 22.27 | 12.48 | .22 | 20.53 | 18.55 | 1.52 | 22.28 | 2.94 | .06 | 26.48 | 29.10 | 6.79 | 100.00 | 78.09 |
| 13 | *Energy* | 4.79 | .00 | 17.32 | .00 | 1.32 | .38 | .55 | -.04 | 2.96 | -30.47 | 8.00 | 6.21 | 14.45 | .00 | 55.16 |
| 14 | *Mining* | 1.72 | 2.30 | .22 | .04 | 3.50 | .00 | .00 | 2.30 | .30 | .06 | 1.01 | 1.27 | .44 | .00 | 89.10 |
| | *All Energy and Mining* | 6.51 | 2.30 | 17.55 | .04 | 4.82 | .38 | .55 | 2.26 | 3.26 | .63 | 9.01 | 7.48 | 14.89 | .00 | 58.97 |
| 15 | *Meat* | .33 | .40 | .14 | .13 | .25 | .48 | .02 | .40 | .01 | .01 | .20 | .23 | .14 | .00 | 82.06 |
| 16 | *Dairy* | .27 | .34 | .08 | .10 | .29 | .89 | .10 | .34 | .74 | .94 | .16 | .15 | .19 | .00 | 69.53 |
| 17 | *FrtVeg* | .30 | .19 | .58 | 1.15 | .17 | .27 | -.14 | .19 | .04 | .10 | .18 | .20 | .14 | .00 | 80.20 |
| 18 | *Sugar* | .63 | .62 | .65 | .40 | .41 | .54 | .73 | .62 | .26 | .18 | .27 | .16 | .63 | .00 | 42.70 |
| 19 | *CoffBv* | .10 | .08 | .16 | .77 | .04 | .15 | -.01 | .08 | .05 | .27 | .10 | .13 | .06 | .00 | 86.98 |
| 20 | *OtBvTob* | 2.12 | 2.63 | .80 | .12 | .51 | 6.87 | .32 | 2.63 | 2.54 | .42 | 2.39 | 1.90 | 4.19 | .00 | 56.52 |
| 21 | *SeaFood* | 1.82 | .60 | 4.99 | 3.20 | .65 | .34 | .01 | .60 | .03 | .02 | 1.44 | 1.70 | .93 | .00 | 84.04 |
| 22 | *Feed* | .34 | .47 | .00 | .00 | 1.18 | .00 | .02 | .47 | .80 | .74 | .36 | .46 | .13 | .00 | 91.00 |
| 23 | *OthPrFd* | 8.29 | 7.94 | 9.18 | .45 | .88 | 17.10 | .15 | 7.94 | 2.15 | .12 | 2.51 | 2.54 | 2.83 | .00 | 72.01 |
| | *All Processed Food* | 14.21 | 13.28 | 16.59 | .48 | 4.39 | 26.64 | 1.21 | 13.29 | 6.63 | .22 | 7.61 | 7.48 | 9.23 | .00 | 69.88 |
| 24 | *BldgMat* | 5.82 | 6.36 | 4.44 | .27 | 10.45 | 1.77 | .75 | 6.36 | 4.47 | .30 | 3.59 | 2.86 | 6.28 | .00 | 56.62 |
| 25 | *IndChem* | 1.82 | 1.63 | 2.30 | .54 | 8.01 | 3.02 | 1.17 | 1.63 | 13.12 | 3.49 | .90 | .90 | 1.05 | .00 | 71.04 |
| 26 | *AgChem* | .50 | .63 | .16 | .10 | 3.57 | .00 | .05 | .63 | 4.29 | 2.95 | .31 | .33 | .28 | .00 | 77.34 |
| 27 | *TechMfg* | .11 | .09 | .14 | .59 | .44 | 3.23 | 1.25 | .09 | 4.81 | 22.36 | .08 | .08 | .08 | .00 | 73.64 |
| 28 | *Vehicls* | 1.02 | 1.01 | 1.02 | .39 | 2.23 | 3.05 | .98 | 1.01 | 5.20 | 2.22 | .39 | .47 | .24 | .00 | 84.68 |
| 29 | *Machnry* | 1.14 | 1.39 | .50 | .14 | 4.72 | 4.14 | 16.48 | 1.39 | 18.80 | 5.88 | .63 | .66 | .66 | .00 | 73.93 |
| 30 | *Metals* | .92 | 1.25 | .05 | .02 | 6.26 | .15 | .52 | 1.25 | 7.61 | 2.63 | .72 | .72 | .83 | .00 | 71.29 |
| 31 | *TxtAppr* | 4.81 | .37 | 16.33 | 16.84 | 5.08 | 4.66 | 1.23 | .37 | 13.18 | 15.28 | 2.73 | 2.99 | 2.46 | .00 | 77.68 |
| 32 | *OthInd* | 1.94 | 2.02 | 1.75 | .33 | 2.64 | 2.90 | .53 | 2.02 | 3.11 | .67 | 1.30 | 1.25 | 1.66 | .00 | 68.35 |
| | *All Industry* | 18.07 | 14.75 | 26.69 | .70 | 43.40 | 22.92 | 22.95 | 14.75 | 74.57 | 2.19 | 10.66 | 10.26 | 13.55 | .00 | 68.44 |
| 33 | *Utils* | 2.24 | 3.11 | .00 | .00 | 3.80 | 1.06 | .00 | 3.11 | .09 | .01 | 2.81 | 1.55 | 6.90 | .00 | 39.17 |
| 34 | *Constr* | 10.18 | 14.09 | .00 | .00 | .82 | .00 | 52.28 | 14.10 | .00 | .00 | 5.68 | 6.18 | 5.20 | .00 | 77.28 |
| 35 | *Trade* | 8.47 | 8.51 | 8.37 | .38 | 8.14 | 4.13 | 3.39 | 8.51 | .00 | .00 | 12.81 | 13.41 | 13.21 | .00 | 74.40 |
| 36 | *Transp* | 2.34 | 2.42 | 2.13 | .34 | 3.08 | 1.89 | .35 | 2.42 | 1.64 | .29 | 2.81 | 2.06 | 5.42 | .00 | 52.12 |
| 37 | *PrServ* | 11.67 | 10.45 | 14.83 | .55 | 9.47 | 14.89 | 3.99 | 10.46 | 9.94 | .41 | 14.13 | 11.97 | 22.64 | .00 | 60.22 |
| 38 | *PbServ* | 6.75 | 8.82 | 1.37 | .06 | 1.55 | 9.54 | 13.76 | 8.82 | .93 | .05 | 8.00 | 10.50 | 2.16 | .00 | 93.31 |
| | *All Service* | 41.66 | 47.40 | 26.70 | .22 | 26.86 | 31.51 | 73.77 | 47.42 | 12.60 | .12 | 46.24 | 45.67 | 55.53 | .00 | 70.20 |
| | *All Economy* | 100.00 | 100.00 | 100.00 | .32 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | .43 | 100.00 | 100.00 | 100.00 | 100.00 | 71.07 |

More detailed inspection reveals that about half of gross output is in primary and light industry sectors, with the highly capital intensive-type industry accounting for less than 8% of total output. Primarily because of capital insufficiency, Vietnamese industry is only beginning the path to modernization and manufacturing diversification commensurate with its population size and resource base. For this reason, processed food, construction materials, and labor-intensive light industries dominate its secondary sector.

Excluding the construction sector, only about one third of Vietnam's gross output takes the form of marketable services. Service output, employment, and value added are the hallmarks of developed countries, the average in the OECD exceeding 65%, and Vietnam is only beginning to develop this component of economic activity. As incomes and rural-urban migration rise over time, however, the share of services in overall output will grow substantially.

The second column of Table 3.4 gives sectoral shares of domestic supply, i.e. domestic output delivered to the domestic market. Generally, the differences between these and the gross output shares are better understood by reference to Column 3, which gives the corresponding export shares, a measure of supply-side trade dependence for each sector. Despite its heavy reliance on primary sector activities, Vietnamese exports are already more concentrated in sectors classified as industrial (43% against 30%). The main reason for this is the Textile and Apparel sector, which accounts for 16.33% of total exports in 2000.

More detailed examination of these shares reveals many opportunities for Vietnamese development, however. For example, food and non-food crops, such as rice and coffee, have significant export shares already but are generally thought to be producing well below their long-term output and revenue potential. Likewise, the Oil and Gas sector has a significant share of 2000 exports, but is only beginning to develop its long term potential by overcoming capital constraints.

In manufacturing, even a cursory review of column 3 indicates that Vietnam has not yet captured the export potential of dynamic growth sectors elsewhere in ASEAN, including technology, consumer durables, and even vehicles. These sectors not only leverage external demand for domestic employment and capacity development, but also

accelerate modernization and confer many growth externalities on the domestic economy. In other economies of the region, the primary catalysts for development of these sectors were foreign capital and sustained state commitments to human capital development via education and labor market liberalization.

A more focused comparison between production for domestic and external markets can be made with the ratios given in the fourth column of Table 3.4. Here the export orientation of certain sectors, such as cash crops and energy, comes into very high relief. Several agricultural sectors, including rice and fishery, are still directing the vast majority of their output to domestic markets, while their export potential at the margin is only beginning to be realized. Given that rice is an inferior good,[4] its export potential at the margin of a growing economy is considerable. Conversely, fishery supply may increasingly be diverted to the domestic market as Vietnamese per capita incomes rise. In the latter case, export shares will depend heavily on capacity expansion in aquaculture, since marine fisheries in the region are being exploited near or even beyond sustainable capacity. Significantly, export ratios for food processing are also very low, indicating that the export potential of the Vietnamese agricultural sector, apart from classical cash crops like coffee and rubber, is far from being realized. Unless progress can be made in this area, rural incomes are unlikely to keep pace with growth of the overall economy.

The challenge facing Vietnam in an era of globalization can be clearly seen in the average export ratio for industry, which indicates an economy with very low levels of external supply orientation in the growth inducing sectors that have accelerated development and living standards elsewhere in Asia. Without more external market linkage in a variety of essential industrial activities, Vietnam is likely to be a chronic underachiever in the Asian modernization process that began with Japan and has continued to spread around the region. Again the main reasons are capital insufficiency and lack of access to technology, but institutional conditions can do much to overcome this, facilitating commercial and multilateral trade partnerships to leverage Vietnam's rich human and natural resource base.

[4] In other words, per capita consumption of this good will decline as income rises, and we see this effect strongly in the forecasts. This creates a widening margin of excess supply that can be diverted to export markets.

Service sector export ratios are also very low. While it would be nice to see higher levels in externally oriented sectors like transportation and hotels/restaurants, low service exports are typical of all but the most advanced economies.

**Economywide results**

For economywide analysis, the Vietnam CGE was calibrated to the new 2000 Vietnam SAM for a "business as usual" Baseline. This reference scenario was then used to evaluate comparative static experiments provided by GTAP global liberalization results. To implement the latter, we obtained data from GTAP on induced price and external demand changes for the purpose of re-calibrating Vietnamese exports against downward sloping external demand functions. This was done according to the double calibration method described by Zhai in this volume, shifting intercept parameters and using exogenous demand elasticities. The exogenous data used in this calibration are summarized in Annex Tables A2-4. Finally, we assume the so-called Hertel-Keeney Medium-run Closure. That is, all factors are fully employed before and after experiments, labor and capital are mobile across sectors, but we maintain a specific factor (land) in agriculture. There is no imperfect competition, nor economies of scale or dynamic gains from trade (Hertel 1997).

In this paper, we compare three counterfactual scenarios to the Baseline (see Table 4.1). Aggregate comparative static results for these counterfactuals are presented next in Table 4.2. In terms of aggregate growth, these scenarios are generally consistent with intuition. In particular, universal tariff removal is the biggest stimulus to Vietnam, followed by unilateral liberalization and Doha SDT.[5] Real GDP rises moderately in the first two cases, following the usual sequence of liberalization, real exchange rate depreciation and trade stimulus. Full liberalization is significantly better for domestic incomes because it not only provides greater trade stimulus but even improves Vietnam's

[5] It should be noted that, in more extensive experimentation, Vietnam did nearly as well by just exempting itself in the Full Liberalization scenario. In this sense, Vietnam might appear to be a "free rider" on GTL as other authors (e.g. Martin and Winters:1996 and World Bank:2000) have warned.

terms of trade. The resulting growth effect is more than enough to offset downward price pressure from imports, and real consumption growth is nearly 50% higher than in either of the other scenarios. The Doha scenario is actually detrimental to Vietnam for several related reasons. Here we assume that Vietnam stands by its prior tariff system, and misses new export opportunities since, not being a member of the WTO, other countries do not remove their protection against Vietnamese products. In the global model, trade diversion leads to a significant adverse terms of trade effect on Vietnam, and this is mirrored in the national results via exogenous export price changes.

Even at this aggregate level, however, the results deserve closer inspection. Of particular interest is the relationship between supply and demand based GDP growth, as measured by GDP at factor cost and market prices, respectively.[6] Trade liberalization generally stimulates the former, by increases in gross output and productivity gains from sectoral reallocation of factors.[7] This can be seen in both the Unilateral and Full Liberalization scenarios, but supply growth is negative for Vietnam in the Doha scenario. When GDP is considered from the demand side, liberalization may drive the trade component in either direction. In the Unilateral scenario, trade flow and terms of trade adjustments lead to a reduction of GDP at market prices. Even though domestic factors receive higher prices from underlying output growth, import penetration and adverse terms of trade reduce the net value of aggregate demand. In the case of Full Liberalization, real imports again exceed real export growth, but improving terms of trade and higher domestic demand push up GDPMP at twice the rate of real GDP growth. Meanwhile, factor prices rise much faster with expanding export demand, and the result is higher domestic incomes and household consumption levels.[8] Of particular significance for rural households is the superiority of land income gains in this scenario, where sectoral results (below) indicate that many agricultural activities benefit from full liberalization.

[6] GDP at factor cost is the sum across sectors of the demand for land and natural resources, labor, and capital. GDP at market prices is simply the current nominal value of C+I+G+E-M.

[7] This is standard growth accounting, where changes in GDPFC are the sum of three component effects: 1)Direct Productivity of Each Factor, 2)Aggregate Productivity Gains from Factor Re-allocation, 3) Aggregate Factor Growth.

[8] For labor in particular, these factor price gains are probably overstated since they assume initial and final full employment.

**Table 4.1: Simulation Experiments**

1. Presimulation – The Baseline scenario,
   -including the admission of China in the WTO
   -removal of quotas on textile to the US and the EU
   and the expansion of the EU to 25 members.

2. Unilateral Liberalization:
   -removal of all import tariffs
   -removal of all export subsidies

3. Full liberalization with Vietnam participating:
   -same as 2, except that the tariffs to all countries but Vietnam are removed.

4. Doha_SDT:
   -removal of all exports subsidies
   -domestic support and tariffs are reduced based on a scenario developed in cooperation with Kym Anderson and Will Martin.
   -this simulation preserves the Special and Differential Treatment of developing countries (smaller cuts) and no cuts in the least developing countries.

**Table 4.2: Aggregate Results**

| | Unilateral | Full Lib | DohaSDT |
|---|---|---|---|
| **Real GDP** | 1.87 | 2.20 | -0.11 |
| **GDP at Factor Cost** | 2.79 | 11.40 | -1.17 |
| **GDP at Market Prices** | -3.67 | 4.40 | -1.19 |
| **Labor Income** | 3.00 | 11.28 | -1.20 |
| **Capital Income** | 3.05 | 10.84 | -1.12 |
| **Real Consumption** | 6.05 | 9.26 | -0.40 |
| **Imports** | 15.42 | 25.91 | -1.20 |
| **Exports** | 11.28 | 16.49 | -0.61 |
| **Consumer Price Index** | -4.84 | -0.18 | -0.68 |
| **Terms of Trade** | -2.43 | 2.88 | -0.78 |

To better understand the structural implications of the trade scenarios, consider the sectoral output results in Table 4.3. While the agricultural sector remains prominent, the compositional shifts shown here are consistent with Vietnam's expected transition to a more industry and service intensive economy. In particular, textiles, technology, and machinery sectors expand significantly, accompanied by construction, trade, and transport services. More fundamentally, these results begin to reveal the mechanisms by which external liberalization can affect poverty and inequality in Vietnam.

We begin this discussion with a basic insight. Trade policy can alleviate poverty if it improves returns to asset classes associated with the poor. Like many developing countries, Vietnam's poor majority are farmers living at or near the subsistence level. Their assets are generally limited to labor, small land holdings of uncertain quality, and livestock. In the Asian context, external liberalization has generally provided the most direct growth impetus to urban populations through expansion of light, intermediate, and heavy industrial activities. The rural poor majority have two channels by which they can participate in urban based growth, migration and marketing of food products. The comparative static model used here does not model the former, so we confine our attention to the role of rising consumption in changing farmer's income opportunities. In this context, commodities with higher income elasticities, such as meat and specialty crops, are of special significance.[9]

The sectoral results of Table 4.3 pre-sage our subsequent poverty and distributional analysis. The most important difference between the scenarios in this context has to do with food prices and domestic output responses. Under the unilateral scenario, food prices are suppressed by import liberalization and farmers suffer directly and indirectly. In the case of Full liberalization, all primary food prices rise and farm output and income respond accordingly. In Doha, by contrast, output changes are sharply attenuated and there are many sectoral reversals. Because Vietnam's bilateral protection with respect to all trading partners remains in place while liberalization is occurring elsewhere, Vietnam misses both the efficiency gains of own tariff reform and the export

[9] Ravallion (1996) and others have shown conclusively that in China, a country renowned for the tonic income effects of migration, the biggest initial steps in poverty alleviation came directly through the food supply chain when agricultural marketing was reformed in the early 1990s.

stimulus of greater foreign market access. Clearly, a low income agrarian country like Vietnam needs to see significant agricultural returns from any multi-lateral trade agreement if its poor rural majority is to benefit in the short or medium term.

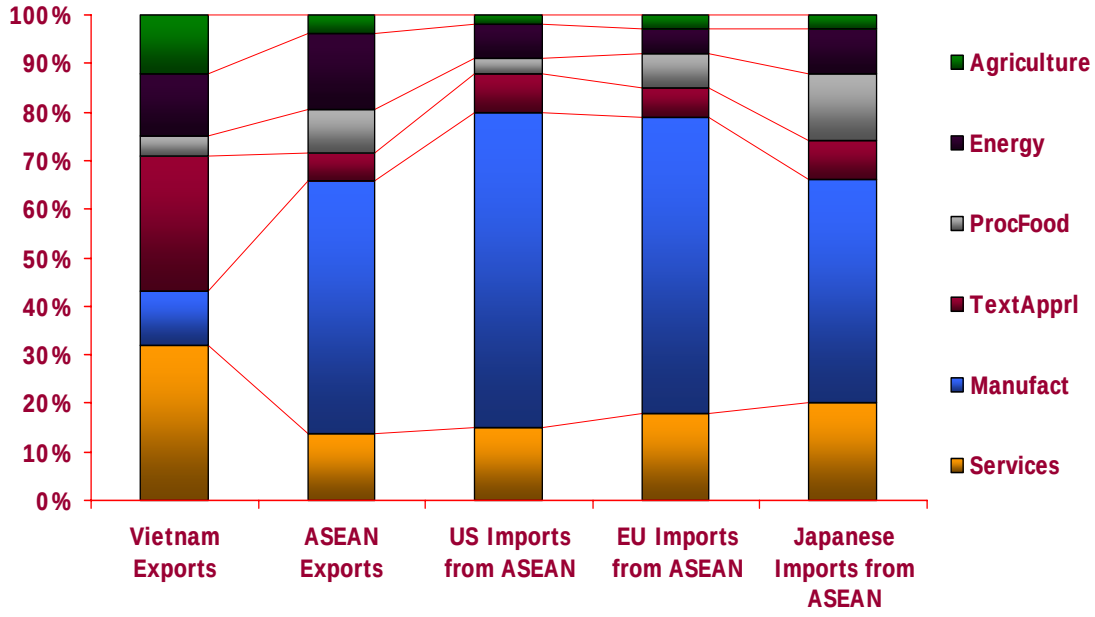
In the Vietnam case, the national model results are broadly in accord with those of the global model (compare with Hertel and Ivanic in Chapter 3). In particular, Vietnam's terms of trade decline in the Unilateral and Doha scenarios, but rise smartly under Full Liberalization. Finally, sectoral adjustments include sharp increases in Textile and Apparel output in the tariff removal scenarios (Unilateral and Full), as well as significant increases in aggregate imports.

## Table 4.3: Sectoral Adjustments
## (change from Baseline)

| | Domestic Output | | | Domestic Prices | | |
|---|---|---|---|---|---|---|
| | 2000 USD Millions | | | Percent | | |
| Sector | Unilateral | Full Lib | DohaSDT | Unilateral | Full Lib | DohaSDT |
| 1 *Rice* | -393.4 | 2397.7 | 196.8 | .5 | 10.5 | -.9 |
| 2 *RawRub* | -21.0 | 251.3 | 8.4 | -2.8 | 3.0 | -.3 |
| 3 *CoffBn* | -24.4 | -615.2 | -29.8 | -.5 | 1.7 | -1.2 |
| 4 *SugCane* | -23.7 | 144.4 | -17.0 | .2 | 16.0 | -1.8 |
| 5 *OthCrp* | -350.9 | -962.5 | -13.2 | -.3 | 5.0 | -1.0 |
| 6 *Pig* | 195.7 | 348.6 | -19.1 | .0 | 6.9 | -1.1 |
| 7 *Cattle* | 16.3 | 30.2 | .0 | .2 | 7.2 | -1.0 |
| 8 *Poultry* | 15.9 | 27.1 | -1.7 | .8 | 8.2 | -1.1 |
| 9 *Other Livestock* | 5.7 | 166.4 | 17.7 | .7 | 8.3 | -1.1 |
| 10 *Irrigation Services* | -3.4 | 10.7 | .2 | .5 | 7.1 | -1.0 |
| 11 *Other Ag Services* | -14.9 | 81.6 | 5.1 | -.2 | 6.0 | -.9 |
| 12 Forestry | -53.5 | -259.5 | 32.5 | .6 | 5.8 | -.8 |
| 13 *Fish* | 891.1 | -443.9 | -388.4 | -1.5 | 3.6 | -1.0 |
| 14 *Energy* | -2739.9 | -5607.4 | 596.4 | -8.2 | -8.0 | .0 |
| 15 *Mining* | -106.7 | -329.1 | 28.6 | -1.8 | .9 | -.4 |
| 16 *Meat* | -63.5 | -182.6 | 17.0 | -1.4 | 5.2 | -1.1 |
| 17 *Dairy Products* | -210.2 | 946.6 | 197.6 | -9.0 | -7.9 | -.7 |
| 18 *Fruits and Vegetables* | -84.2 | -74.4 | -1.8 | -3.0 | 1.6 | -.9 |
| 19 *Refined Sugar* | -62.7 | 415.5 | -47.7 | -.5 | 8.9 | -1.2 |
| 20 *Coffee and Tea Bev* | -15.1 | -35.5 | -11.5 | -.8 | 4.1 | -1.0 |
| 21 *Other Bev and Tobacco* | -2854.9 | -2982.7 | -63.6 | -9.6 | -5.8 | -.8 |
| 22 *SeaFood* | 650.8 | -2446.5 | -568.9 | -6.5 | -2.7 | -.7 |
| 23 *Animal Feed* | -494.0 | -631.4 | 13.6 | -5.3 | -1.1 | -.7 |
| 24 *Other Processed Foods* | -1224.2 | -1628.4 | -85.7 | -5.9 | -2.0 | -.7 |
| 25 *Building Materials* | 63.5 | -485.7 | 47.8 | -2.3 | 2.0 | -.7 |
| 26 *Industrial Chemicals* | -795.8 | 1293.3 | 191.0 | -3.9 | -3.1 | -.2 |
| 27 *Agro Chemicals* | -457.5 | -835.2 | 77.8 | -3.9 | -2.7 | -.2 |
| 28 *Tech Manufacturing* | 1661.5 | 722.8 | 292.0 | -8.1 | -8.2 | .0 |
| 29 *Vehicles* | -10620.1 | -10702.1 | 189.2 | -23.5 | -22.7 | -.3 |
| 30 *Machinery* | 794.5 | 785.0 | 255.9 | -7.7 | -7.4 | -.1 |
| 31 *Metals* | 40.0 | -630.3 | 176.6 | -4.8 | -3.9 | -.2 |
| 32 *Textile and Apparel* | 21040.2 | 37294.1 | -2418.7 | -19.9 | -19.4 | .0 |
| 33 *Other Industry* | -884.0 | -1755.9 | 205.3 | -11.5 | -10.4 | -.2 |
| 34 *Utilitites* | 99.0 | 77.6 | 2.0 | .4 | 6.3 | -.9 |
| 35 *Construction* | 1837.5 | 5566.5 | -551.6 | -2.7 | 1.2 | -.6 |
| 36 *Trade and Transport* | 3786.1 | 5706.4 | -312.8 | -2.3 | 3.1 | -.8 |
| 37 *Private Service* | 52.2 | -1965.9 | -8.7 | .4 | 5.0 | -.7 |
| 38 *Public Service* | 76.8 | -1125.7 | 159.3 | .1 | 5.6 | -.8 |

How might gains from external liberalization be even greater? One important limitation on gains from trade-driven expansion is excessive specialization in traditional (low wage) activities and capital insufficiency that limits the creation of domestic production capacity and higher skill/wage employment. There is always the risk that passive WTO-style opening of the economy merely intensifies Vietnam's traditional employment in resource intensive, low wage production. Figure 4.1 contrasts this situation with average ASEAN trade composition, as well as with the main destination markets. Clearly, Vietnam's trade patterns are not conformal to either, and movement in this direction would probably result in higher average wage content and value added capture for exports. This kind of growth dividend might justify more determined negotiating efforts.[10]

**Figure 4.1: Trade by Origin and Destination: 2000**




[10] These results can be compared with Fukase and Martin (1999) who discuss Vietnamese liberalization in a regional context.

**Household Incomes and the Role of Prices**

While trade has the potential to stimulate economic aggregates, the experience of poverty is a microeconomic phenomenon and deeper analysis is required to clearly understand its incidence. The results of the last section are also based on a national CGE model with homogenous prices, yet we know price dispersion can affect local outcomes. We now examine trade liberalization from a more detailed perspective, using LSMS sample imputation and calibration experiments with price variation. This kind of analysis gives more insight into welfare differences between different sectoral policies, since household-level results are the ultimate metric for policies targeted at reducing poverty and inequality. Our general results indicate that price dispersion can have important distributional effects, and these will vary significantly with local circumstances. In particular, the benefits of external policy for rural households will be limited unless market access barriers can be overcome.

First, consider the nationwide results for households by type, summarized in Table 5.1. Under the Full Liberalization, representative Vietnamese households see substantial increases in real disposable income. Note first of all that most gains to households in the unilateral and Doha scenarios come from price effects, while real growth is the prime impetus under Full Liberalization. It is also significant that the biggest estimated gains for rural households are nearly equal to those of urban households. The latter are more direct beneficiaries of trade reform, but a combination of rising agricultural prices and commercial opportunities in the rural economy bring rural household incomes up by comparable magnitudes. Rural Self-Employed households even do a little better than their urban counterparts. Whether or not, and especially which, rural households actually enjoy these growth benefits will ultimately depend upon links to the original source of the stimulus – international and urban markets, and this in turn will depend upon domestic market access. In this section we take a closer look at how locational differences might influence the growth participation of rural populations. Since most dynamic Asian export experiences emphasize urban industrial development, this linkage to rural livelihoods is important for the poor majority in many countries.

**Figure 5.1: Household Income and Consumer Price Changes**
**(percentage change form Baseline)**

| Household Type | Disposable Income | | | CPI | | |
|---|---|---|---|---|---|---|
| | Unilateral | Full Lib | DohaSDT | Unilateral | Full Lib | DohaSDT |
| 1 *Rural Farmers* | 1.0 | 9.7 | -1.1 | -4.5 | .9 | -.7 |
| 2 *Rural Self-Employed* | .0 | 7.9 | -1.2 | -5.1 | -.3 | -.7 |
| 3 *Rural Wage Workers* | 1.5 | 9.7 | -1.2 | -4.9 | .0 | -.7 |
| 4 *Urban Farmers* | 2.2 | 10.2 | -1.1 | -4.5 | .5 | -.7 |
| 5 *Urban Self-Employed* | .0 | 7.4 | -1.1 | -5.7 | -1.8 | -.6 |
| 6 *Urban Wage Workers* | 2.8 | 10.4 | -1.0 | -5.7 | -1.8 | -.6 |

*Microeconomic Results*

In the present study, we have chosen micro-imputation over micro-simulation. This approach provides ample evidence for the role of prices, and we believe the complexities of micro-simulation add little to the present discussion. Specifically, we have taken the CGE results from each scenario (at the level of institutional detail summarized in Annex Table A1) and disaggregated these across the 2002 VHLSS according to occupational and household characteristics, giving a snapshot of incidence under an assumption of stable demographic conditions.[11]

The following tables summarize micro-imputation results for the Full Liberalization Scenario. Unlike the six representative households used in the economywide model, here we impute income effects across a nationally representative sample of 75,000 households. Specifically, we recomputed household incomes from observable sources, including comparative static price solutions for all commodities marketed from household production and wage income imputed from observed labor supply by occupational group.

[11] Handling dynamics in a micro-simulation framework is still an uncertain exercise. Our results greatly simplify the underlying demographic process.

Table 5.1 compares, with respect to the Baseline situation in 2020, six different poverty statistics. These include two of generalized entropy measures of inequality[12],

1. $GE(0) = \frac{1}{W}\sum w_i \log\frac{y_i}{\bar{y}}$, the mean log deviation, where $y_i$ is income of household i, $w_i$ is their sample weight, and W is the total population, and
2. $GE(1) = \frac{1}{W}\sum w_i \frac{y_i}{\bar{y}} \log\frac{y_i}{\bar{y}}$, the Theil index of inequality

The traditional index of inequality,

3. $Gini = \frac{W+1}{W-1} - \frac{2}{W(W-1)\bar{y}}\sum w_i y_i \left[\rho_i + 0.5(w_i - 1)\right]$ where $\rho_{i+1} = \rho_i + w_i$

Finally, three versions of the poverty index popularized by Foster, Greer, and Thorbecke (1984), i.e. $P\alpha = \frac{1}{N}\sum_{i=1}^{N} \max\left[0, \left(\frac{z - y_i}{z}\right)^{\alpha}\right]$ with defined poverty line $z_i$.

4. P0 = Headcount incidence of poverty
5. P1 = Depth of poverty
6. P2 = Severity of poverty, where

The results in Table 5.2 indicate the complexity of the adjustment process confronting Vietnamese policy makers, as well as the potential for pro-poor intervention. Salient features of this scenario deserve closer inspection. Firstly, it is apparent that this form of trade liberalization affects welfare in two countervailing ways, reducing poverty but increasing inequality. At the national level, inequality effects are limited because the urban and rural effects work in opposite directions. Rural inequality is reduced while urban inequality increases.[13]

At the same time, poverty indices of all three types show substantial improvement in both rural and urban areas. Rural poverty headcounts fall by 7%, and measures of poverty depth (p1) and severity (p2) are mitigated significantly. Across the economy, over 7% of the population leaves poverty. Again, from a national perspective with

[12] Compare, e.g. Bourguignon (1979) and Ravallion (1996).
[13] These two characteristics are actually fairly typical of early stage, dynamic Asian development (e.g. China).

uniform prices across the economy and essentially no barriers to market access, the results for poverty alleviation are very favorable.

**Table 5.2: Micro-imputation Results for Full Liberalization**

| | *All Households* | | | *Urban* | | | *Rural* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Before* | *After* | *% Change* | *Before* | *After* | *% Change* | *Before* | *After* | *% Change* |
| *GE0* | 47.28 | 47.01 | -0.57 | 69.70 | 72.59 | 4.14 | 40.20 | 38.93 | -3.15 |
| *GE1* | 63.23 | 62.39 | -1.33 | 85.80 | 87.61 | 2.11 | 56.10 | 54.42 | -2.99 |
| *Gini* | 29.96 | 29.73 | -0.77 | 35.42 | 37.19 | 5.01 | 28.23 | 27.37 | -3.06 |
| *p0* | 28.64 | 26.55 | -7.29 | 6.60 | 5.80 | -12.16 | 35.60 | 33.11 | -7.00 |
| *p1* | 28.55 | 24.62 | -13.78 | 22.70 | 19.97 | -12.04 | 30.40 | 26.09 | -14.18 |
| *p2* | 15.76 | 13.83 | -12.24 | 13.40 | 11.58 | -13.61 | 16.50 | 14.54 | -11.89 |

*Number of Poor (Thousands)*

| | *Before* | *After* | *Change* | *%Change* |
|---|---|---|---|---|
| *Urban* | 1,267 | 1,113 | -154 | -12.16 |
| *Rural* | 21,645 | 20,129 | -1,516 | -7.00 |
| *Total* | 22,912 | 21,242 | -1,670 | -7.29 |

*Price Dispersion, Economic Structure, and Incidence*

Results of the national CGE, as well as standard micro-simulation techniques, assume that a single price system applies in all markets across the economy. We have already emphasized, however, that price dispersion is pervasive in developing countries. If price levels vary, especially as a result of differential price transmission, it is reasonable to suppose that incidence results will diverge from those based on homogeneous price calculations. For example, reform measures targeted at border or urban prices may have unpredictable effects on more remote communities if distribution margins are significant barriers to national market participation.

In this subsection, we present some calculations to show how incidence can be affected by locational price variability. It should be emphasized that capturing price dispersion is a very difficult and data intensive empirical problem, yet our preliminary results indicate that reliance on homogeneous price levels and adjustments could be quite misleading. Our initial approach to this problem is intended to stimulate more work on this issue.

To better understand the importance of these factors, we consider how differing economic structure, in terms of regional consumption and production patterns, can influence price incidence. The next table presents consumer and producer price indices calculated from the VHLSS for provinces in Vietnam's Northern Uplands Region, including most of the country's poorest communities. This table uses homogeneous CGE prices and household level data to show how differences in local consumption and production composition would affect CPI and PPI values.

**Table 5.3**

**Consumer and Producer Price Indexes by Province**
**(Full Liberalization, percentage change from Baseline)**

| | Consumption | Output | Mkt Output |
|---|---|---|---|
| ***Ha Giang*** | 8.73 | 8.98 | 8.00 |
| ***Cao Bang*** | 10.83 | 7.14 | 5.43 |
| ***Lao Cai*** | 11.47 | 9.74 | 8.26 |
| ***Bac Can*** | 11.45 | 10.39 | 8.89 |
| ***Lang Son*** | 11.37 | 10.51 | 9.04 |
| ***Tuyen Quang*** | 9.20 | 6.28 | 4.92 |
| ***Yen Bai*** | 10.93 | 7.25 | 5.51 |
| ***Thai Nguyen*** | 12.49 | 3.27 | 2.49 |
| ***Phu Tho*** | 11.81 | 6.13 | 4.76 |
| ***Bac Giang*** | 12.37 | 7.62 | 6.37 |
| ***Quang Ninh*** | 12.47 | 7.40 | 6.49 |
| ***Lai Chau*** | 11.58 | 9.02 | 7.16 |
| ***Son La*** | 4.35 | 8.39 | 6.37 |
| ***Hoa Binh*** | 12.69 | 9.05 | 7.32 |

Two aspects of these results are particularly interesting. Firstly, changes in he value of consumption and production, even assuming homogeneous national prices, are significant, yet they are smaller than reported price dispersion in the LSMS data (Table 2.1 above). Thus differences in economic structure, of the kind captured in most micro-simulation, can only account for part of differences in incidence. Secondly, even with homogeneous prices it is clear that, as combined consumption-production units,

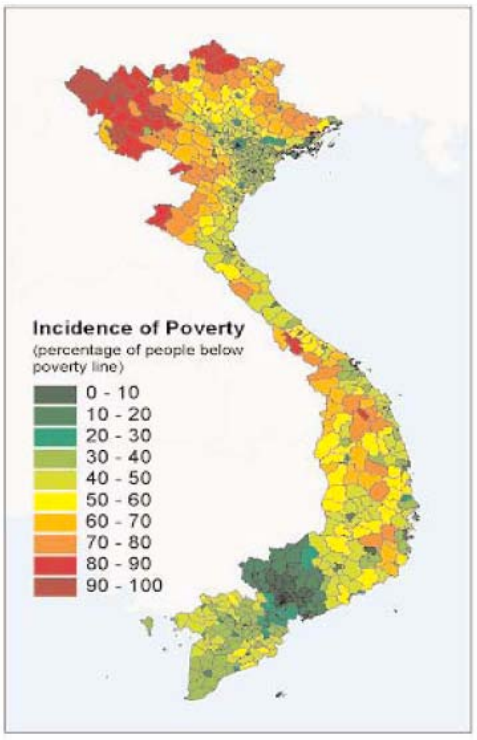
households experience greater increases in cost of living than in marginal revenue under trade liberalization. Composite producer prices rise by less than their CPI when valuing output as a whole, and even less when considering only marketed output. This regressive effect can be offset by volume adjustments, but it remains apparent that a single price system only captures part of the story.

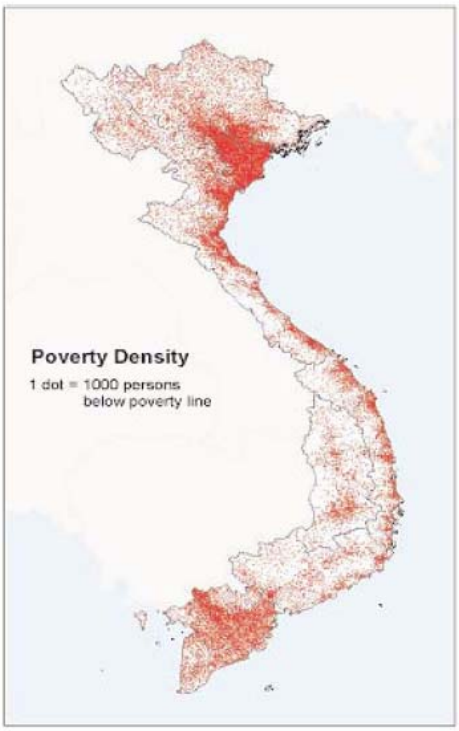
Ultimately, the importance of price dispersion to national agendas for poverty reduction will depend upon initial conditions of inequality, market segmentation, and geographic dispersion of the poor themselves. If most of the poor are in remote areas, border and urban price changes may have unpredictable effects on their market participation and welfare. By contrast, if they are in close proximity to major urban areas, border price signals are likely to be more reliable indicators for behavioral responses and structural change affecting them. This reasoning mandates more intensive incidence analysis for many developing countries, where remote populations constitute the majority of the rural poor and resources for infrastructure development are limited.[14]

In Vietnam, however, the population density of poverty is such that distribution margins may not substantially offset the benefits of border price reform. In Figure 5.1 the poverty density results (right-hand map) indicate why this might be the case. Although the provinces with the highest poverty headcount proportions are remote, the majority of Vietnam's poor people live relatively close to major cities or border/coastal areas. This implies the latter group is within effective reach of external market stimulus and the urban growth effects of trade liberalization. For these reasons, external reform may be more effective in reducing poverty in Vietnam than in other developing countries.

[14] There is a fast growing literature on small area estimation that is already making important contributions here. See e.g. Lanjouw et al (2003, 2005)

**Figure 5.1: Poverty Headcount and Poverty Density (1998)**




*Note:* Constructed by applying a household expenditure relationship estimated based on data from the 1998 VLSS to one third of the records from the 1999 Population Census

*Source:* Inter-Ministerial Poverty Mapping Task Force (2003), based on data from GSO.

Source: World Bank: 2004.

**Conclusions and extensions**

This paper represents preliminary research into the role of price dispersion on income distribution. Using Vietnamese trade reform as a case study, we have examined how aggregate growth, structural adjustment, and the microeconomics of income determination interact. Our results indicate that expansionary effects of trade liberalization may be significant in the aggregate, while their detailed incidence depends on domestic market access. In particular, distribution margins may limit the benefits that remote households enjoy from export stimulus and reduced border prices for imports. Such market access barriers can thereby attenuate the scope of poverty alleviation.

We began with conceptual discussion and evidence regarding the empirical significance of domestic price variation. It is clear from LSMS samples that prices for comparable goods vary across Vietnam in ways that are important and likely to affect the incentives for domestic agents responding to national level policy measures. Using a set of standardized trade liberalization scenarios, we then showed that Vietnam could benefit significantly from trade liberalization and the aggregate gains from this would be larger the broader the geographic scope of such an agreement. Having said this, the microeconomic incidence of these effects is a very complex empirical question. Price differences arising from geographically differing patterns of consumption and production or from distribution margins could affect the impact of external reform on local poverty and inequality. This may have adverse implications for reform agendas in some developing countries, but it appears to be less of a concern for Vietnam. In this country, poverty density is concentrated in proximity to economic centers, meaning that limited commitments to infrastructure can more effectively propagate the benefits of trade reform.

While a CGE model simulated the national level impacts, we used LSMS data to impute poverty and inequality results. Each approach contributes some insight, but a more coherent synthesis is needed. National CGE modeling relies on homogeneous national prices, which fail to capture important structural realities. Imputation lacks the endogeniety needed for a complete behavioral story. Another approach, micro-

simulation, relies on less than definitive closure rules and ad hoc calibration methods.[15] A unified approach is under development that can strike a better balance between parsimony and heterogeneity, within a consistent conceptual framework.

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[15] See e.g. Alatas and Bouguignon:2000, Robilliard et al:2003, and Bussolo and Lay:2004.

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## Annex Table A1: Detailed Accounts from the Vietnam CGE

A. Production Sectors and Commodity Groups

| | | |
|---|---|---|
| 1. | A01Rice | Rice |
| 2. | A02RawRub | Unrefined Rubber |
| 3. | A03CoffBn | Unprocessed Coffee Beans |
| 4. | A04SugCane | Raw Sugar Cane |
| 5. | A05OthCrp | Other Agricultural Crops |
| 6. | A06Pig | Pigs |
| 7. | A07Poultry | Poultry |
| 8. | A08OtLvstk | Other Livestock |
| 9. | A09IrrServ | Irrigation Services |
| 10. | A10OtAgSrv | Other Agricultural Services |
| 11. | A11Forest | Forest Products |
| 12. | A12Fish | Fishery Products, unprocessed |
| 13. | A13Energy | Coal, Oil, and Gas |
| 14. | A14Mining | Mining |
| 15. | A15Meat | Processed Meat Products |
| 16. | A16Dairy | Dairy Products |
| 17. | A17FrtVeg | Fruits and Vegetables |
| 18. | A18Sugar | Refined Sugar |
| 19. | A19CoffBv | Refined Coffee and Coffee Beverages |
| 20. | A20OtBvTob | Other Beverages and Tobacco |
| 21. | A21SeaFood | Processed Fishery Products |
| 22. | A22Feed | Animal Feed |
| 23. | A23OthPrFd | Other Processed Food |
| 24. | A24BldgMat | Building Materials |
| 25. | A25IndChem | Industrial Chemicals |
| 26. | A26AgChem | Agricultural Chemicals |
| 27. | A27TechMfg | Technological Manufacturing |
| 28. | A28Vehicls | Vehicles (water, land, and air) |
| 29. | A29Machnry | Machinery |
| 30. | A30Metals | Basic Metal Products |
| 31. | A31TxtAppr | Textiles and Apparel |
| 32. | A32OthInd | Other Industry |
| 33. | A33Utils | Electric, Water, and Other Utilities |
| 34. | A34Constr | Construction |
| 35. | A35Trade | Commercial Trade Services |
| 36. | A36Transp | Commercial Transport Services |
| 37. | A37PrServ | Other Private Services |
| 38. | A38PbServ | Public Services |

B. Labor Categories

| | | |
|---|---|---|
| 1. | L01RU | Rural Unskilled |
| 2. | L02RM | Rural Medium Skill |
| 3. | L03RH | Rural High Skill |
| 4. | L04UU | Urban Unskilled |
| 5. | L05UM | Urban Medium Skill |
| 6. | L06UH | Urban High Skill |

C. Capital

D. Land

E. Household Groups

| | | |
|---|---|---|
| 1. | HH01RF | Rural Farmers |
| 2. | HH02RS | Rural Self-employed, Non-farm |
| 3. | HH03RW | Rural Wage Workers |
| 4. | HH04RN | Rural Unemployed |
| 5. | HH05UF | Urban Farmers |
| 6. | HH06US | Urban Self-employed, Non-farm |
| 7. | HH07UW | Urban Wage Workers |
| 8. | HH08UN | Urban Unemployed |

F. Enterprise Groups

| | | |
|---|---|---|
| 1. | E01State | Public Enterprises |
| 2. | E02PrivDom | Domestic Private Enterprises |
| 3. | E03PrivFor | Foreign Owned Private Enterprises |

G. Individual and Aggregate Trading Partners

| | | |
|---|---|---|
| 1. | ASEANxV | ASEAN excluding Vietnam |
| 2. | China | |
| 3. | Japan | |
| 4. | Korea | |
| 5. | Taiwan | |
| 6. | EU | |
| 7. | USA | |
| 8. | ROW | aggregate of Vietnam's remaining trading partners |

## Table A2:
## GTAP Vietnam Export Price Changes from 2005 (percent)

| | Scenario One | Two | Three | Four | Five | Six | Seven |
|---|---|---|---|---|---|---|---|
| 1 ***Rice*** | -1.03 | 7.00 | 7.71 | -1.04 | -.89 | -1.14 | -.95 |
| 2 ***RawRub*** | -.36 | 3.66 | 4.89 | -.87 | -.82 | -.97 | -.88 |
| 3 ***CoffBn*** | -1.21 | .49 | 1.24 | -1.21 | -1.05 | -1.28 | -1.09 |
| 4 ***SugCane*** | -1.05 | 8.73 | 13.61 | -1.53 | -1.36 | -1.63 | -1.43 |
| 5 ***OthCrp*** | -1.15 | 1.89 | 2.51 | -1.04 | -.88 | -1.11 | -.93 |
| 6 ***Pig*** | -1.27 | 6.99 | 9.15 | -1.55 | -1.36 | -1.69 | -1.44 |
| 7 ***Cattle*** | -1.27 | 6.99 | 9.15 | -1.55 | -1.36 | -1.69 | -1.44 |
| 8 ***Poultry*** | -1.27 | 6.99 | 9.15 | -1.55 | -1.36 | -1.69 | -1.44 |
| 9 ***Other Livestock*** | -1.14 | 6.16 | 8.49 | -1.47 | -1.23 | -1.60 | -1.31 |
| 10 ***Irrigation Services*** | -1.16 | 15.95 | 12.07 | -2.52 | -2.39 | -2.74 | -2.51 |
| 11 ***Other Ag Services*** | -1.16 | 15.95 | 12.07 | -2.52 | -2.39 | -2.74 | -2.51 |
| 12 **Forestry** | -.87 | 12.30 | 9.84 | -1.86 | -1.78 | -2.05 | -1.91 |
| 13 ***Fish*** | -.93 | 4.93 | 6.76 | -2.49 | -2.36 | -2.65 | -2.45 |
| 14 ***Energy*** | -.47 | 6.45 | 6.12 | -.80 | -.75 | -.87 | -.78 |
| 15 ***Mining*** | -.66 | 3.43 | 7.39 | -1.21 | -1.20 | -1.34 | -1.28 |
| 16 ***Meat*** | -.88 | 7.50 | 8.19 | -1.32 | -1.14 | -1.46 | -1.22 |
| 17 ***Dairy Products*** | -.45 | -.62 | 7.74 | 1.31 | 1.34 | 1.24 | 1.29 |
| 18 ***Fruits and Vegetables*** | -1.18 | 5.30 | 7.59 | -1.15 | -.84 | -1.26 | -.91 |
| 19 ***Refined Sugar*** | -.89 | 7.21 | 10.82 | -1.38 | -1.26 | -1.50 | -1.33 |
| 20 ***Coffee and Tea Bev*** | -.83 | 7.71 | 7.69 | -1.46 | -1.34 | -1.59 | -1.42 |
| 21 ***Other Bev and Tobacco*** | -.70 | 5.49 | 7.64 | -1.33 | -1.23 | -1.46 | -1.31 |
| 22 ***SeaFood*** | -.83 | 7.71 | 7.69 | -1.46 | -1.34 | -1.59 | -1.42 |
| 23 ***Animal Feed*** | -.83 | 7.71 | 7.69 | -1.46 | -1.34 | -1.59 | -1.42 |
| 24 ***Other Processed Foods*** | -.82 | 7.66 | 7.69 | -1.44 | -1.33 | -1.58 | -1.41 |
| 25 ***Building Materials*** | -.60 | 4.67 | 6.89 | -1.23 | -1.19 | -1.35 | -1.27 |
| 26 ***Industrial Chemicals*** | -.36 | 3.66 | 4.89 | -.87 | -.82 | -.97 | -.88 |
| 27 ***Agro Chemicals*** | -.36 | 3.66 | 4.89 | -.87 | -.82 | -.97 | -.88 |
| 28 ***Tech Manufacturing*** | -.34 | 2.55 | 4.67 | -.82 | -.77 | -.90 | -.82 |
| 29 ***Vehicles*** | .05 | -8.51 | 3.57 | -.56 | -.44 | -.66 | -.48 |
| 30 ***Machinery*** | -.37 | 3.00 | 5.09 | -.91 | -.86 | -1.00 | -.92 |
| 31 ***Metals*** | -.48 | 6.49 | 6.15 | -1.17 | -1.10 | -1.28 | -1.16 |
| 32 ***Textile and Apparel*** | -.27 | -3.64 | 4.54 | -.75 | -.71 | -.85 | -.79 |
| 33 ***Other Industry*** | -.59 | 5.96 | 7.02 | -1.31 | -1.24 | -1.43 | -1.31 |
| 34 ***Utilitites*** | -.62 | 7.53 | 7.78 | -1.42 | -1.32 | -1.55 | -1.40 |
| 35 ***Construction*** | -.69 | 7.99 | 8.31 | -1.58 | -1.49 | -1.72 | -1.58 |
| 36 ***Trade and Transport*** | -.72 | 7.90 | 8.14 | -1.65 | -1.54 | -1.81 | -1.62 |
| 37 ***Private Service*** | -1.45 | 21.36 | 14.86 | -3.16 | -2.99 | -3.42 | -3.14 |
| 38 ***Public Service*** | -.83 | 12.47 | 9.00 | -1.87 | -1.77 | -2.03 | -1.87 |

**Table A3:**
**GTAP Vietnam Export Demand Changes from 2005 (percent)**

| | Scenario One | Two | Three | Four | Five | Six | Seven |
|---|---|---|---|---|---|---|---|
| 1 ***Rice*** | -2.95 | 72.01 | 33.76 | 5.95 | 6.19 | 6.13 | 6.29 |
| 2 ***RawRub*** | -1.37 | 190.97 | 168.64 | 2.16 | 3.90 | .89 | 3.46 |
| 3 ***CoffBn*** | -.56 | -10.48 | -13.28 | -.10 | -.11 | .01 | -.05 |
| 4 ***SugCane*** | 6.03 | 18.26 | -9.99 | 6.30 | 8.84 | 6.22 | 8.85 |
| 5 ***OthCrp*** | -.41 | -7.53 | -10.40 | .16 | .14 | .27 | .20 |
| 6 ***Pig*** | -.16 | -33.65 | -39.27 | -1.63 | -2.21 | -1.20 | -1.95 |
| 7 ***Cattle*** | -.16 | -33.65 | -39.27 | -1.63 | -2.21 | -1.20 | -1.95 |
| 8 ***Poultry*** | -.16 | -33.65 | -39.27 | -1.63 | -2.21 | -1.20 | -1.95 |
| 9 ***Other Livestock*** | 2.60 | -.79 | -7.47 | 3.13 | 2.68 | 3.49 | 2.87 |
| 10 ***Irrigation Services*** | 4.00 | -48.55 | -38.37 | 9.93 | 9.24 | 10.96 | 9.79 |
| 11 ***Other Ag Services*** | 4.00 | -48.55 | -38.37 | 9.93 | 9.24 | 10.96 | 9.79 |
| 12 **Forestry** | 4.76 | -29.44 | -19.22 | 8.53 | 8.88 | 9.28 | 9.58 |
| 13 ***Fish*** | 1.61 | -4.48 | -8.14 | 4.98 | 4.76 | 5.25 | 4.92 |
| 14 ***Energy*** | .48 | -8.36 | -6.41 | 1.00 | .96 | 1.11 | 1.02 |
| 15 ***Mining*** | -1.03 | -4.42 | -10.98 | 1.97 | 2.32 | 1.93 | 2.39 |
| 16 ***Meat*** | 5.30 | -31.74 | -35.84 | 11.55 | 23.28 | 12.60 | 24.11 |
| 17 ***Dairy Products*** | -3.25 | 282.57 | 124.97 | 12.28 | 12.23 | 12.88 | 12.57 |
| 18 ***Fruits and Vegetables*** | -1.96 | 11.69 | 4.57 | 1.30 | 2.49 | 1.42 | 2.61 |
| 19 ***Refined Sugar*** | 2.18 | 232.54 | 175.47 | -16.24 | -16.52 | -15.97 | -16.37 |
| 20 ***Coffee and Tea Bev*** | .79 | -26.82 | -27.12 | -1.23 | -1.41 | -.93 | -1.28 |
| 21 ***Other Bev and Tobacco*** | -9.27 | 22.07 | 16.04 | .09 | .03 | .43 | .23 |
| 22 ***SeaFood*** | .79 | -26.82 | -27.12 | -1.23 | -1.41 | -.93 | -1.28 |
| 23 ***Animal Feed*** | .79 | -26.82 | -27.12 | -1.23 | -1.41 | -.93 | -1.28 |
| 24 ***Other Processed Foods*** | .63 | -25.75 | -26.21 | -1.20 | -1.33 | -.90 | -1.20 |
| 25 ***Building Materials*** | 3.04 | -22.14 | -27.02 | 6.32 | 6.04 | 6.56 | 6.01 |
| 26 ***Industrial Chemicals*** | -1.37 | 190.97 | 168.64 | 2.16 | 3.90 | .89 | 3.46 |
| 27 ***Agro Chemicals*** | -1.37 | 190.97 | 168.64 | 2.16 | 3.90 | .89 | 3.46 |
| 28 ***Tech Manufacturing*** | .10 | -12.10 | -28.58 | 7.18 | 6.78 | 7.63 | 7.02 |
| 29 ***Vehicles*** | -1.34 | 248.89 | 34.63 | 1.88 | .78 | 2.57 | .93 |
| 30 ***Machinery*** | 2.36 | 2.33 | -13.53 | 6.34 | 6.06 | 6.23 | 5.80 |
| 31 ***Metals*** | 2.64 | -13.75 | -22.28 | 4.89 | 4.41 | 4.56 | 3.79 |
| 32 ***Textile and Apparel*** | .63 | 85.91 | 4.65 | -5.41 | -4.63 | -5.88 | -4.74 |
| 33 ***Other Industry*** | 3.12 | -14.64 | -21.02 | 5.67 | 5.27 | 5.99 | 5.29 |
| 34 ***Utilitites*** | 4.30 | -45.87 | -39.32 | 10.52 | 9.81 | 11.70 | 10.48 |
| 35 ***Construction*** | 2.40 | -26.58 | -27.99 | 5.90 | 5.52 | 6.60 | 5.91 |
| 36 ***Trade and Transport*** | 1.92 | -14.58 | -22.08 | 5.62 | 5.11 | 6.28 | 5.44 |
| 37 ***Private Service*** | 3.60 | -45.36 | -35.26 | 9.02 | 8.40 | 9.95 | 8.90 |
| 38 ***Public Service*** | 2.56 | -40.24 | -29.89 | 7.31 | 6.85 | 8.04 | 7.26 |

**Table A4:**
## Model Parameters Obtained from GTAP and CEPII

| | | Baseline Tariffs | Tariff Cuts | CES Elasticity |
|---|---|---|---|---|
| 1 | ***Rice*** | 14.29 | -13.09 | 6.37 |
| 2 | ***RawRub*** | 5.30 | -5.08 | 6.60 |
| 3 | ***CoffBn*** | 16.77 | -16.02 | 6.50 |
| 4 | ***SugCane*** | 2.40 | -2.61 | 5.40 |
| 5 | ***OthCrp*** | 5.84 | -5.59 | 5.80 |
| 6 | ***Pig*** | 1.76 | -1.73 | 4.00 |
| 7 | ***Cattle*** | 1.76 | -1.73 | 4.00 |
| 8 | ***Poultry*** | 1.76 | -1.73 | 4.00 |
| 9 | ***Other Livestock*** | 2.93 | -2.78 | 4.17 |
| 10 | ***Irrigation Services*** | .00 | .00 | 3.80 |
| 11 | ***Other Ag Services*** | .00 | .00 | 3.80 |
| 12 | **Forestry** | 1.05 | -1.08 | 5.00 |
| 13 | ***Fish*** | 11.25 | -11.17 | 2.50 |
| 14 | ***Energy*** | 9.40 | -8.73 | 10.12 |
| 15 | ***Mining*** | 3.83 | -3.78 | 1.80 |
| 16 | ***Meat*** | 15.07 | -15.40 | 8.35 |
| 17 | ***Dairy Products*** | 18.36 | -15.68 | 7.30 |
| 18 | ***Fruits and Vegetables*** | 31.91 | -24.44 | 3.70 |
| 19 | ***Refined Sugar*** | 24.07 | -19.73 | 5.40 |
| 20 | ***Coffee and Tea Bev*** | 27.05 | -21.69 | 4.00 |
| 21 | ***Other Bev and Tobacco*** | 83.84 | -45.83 | 2.30 |
| 22 | ***SeaFood*** | 27.05 | -21.69 | 4.00 |
| 23 | ***Animal Feed*** | 27.05 | -21.69 | 4.00 |
| 24 | ***Other Processed Foods*** | 26.29 | -21.17 | 4.30 |
| 25 | ***Building Materials*** | 9.35 | -9.09 | 5.59 |
| 26 | ***Industrial Chemicals*** | 5.30 | -5.08 | 6.60 |
| 27 | ***Agro Chemicals*** | 5.30 | -5.08 | 6.60 |
| 28 | ***Tech Manufacturing*** | 8.80 | -8.78 | 8.80 |
| 29 | ***Vehicles*** | 46.92 | -34.06 | 6.43 |
| 30 | ***Machinery*** | 8.86 | -8.59 | 8.32 |
| 31 | ***Metals*** | 5.06 | -4.73 | 7.26 |
| 32 | ***Textile and Apparel*** | 29.02 | -22.90 | 7.58 |
| 33 | ***Other Industry*** | 16.58 | -14.53 | 5.86 |
| 34 | ***Utilitites*** | .00 | .00 | 5.60 |
| 35 | ***Construction*** | .00 | .00 | 3.80 |
| 36 | ***Trade and Transport*** | .00 | .00 | 3.80 |
| 37 | ***Private Service*** | .00 | .00 | 3.80 |
| 38 | ***Public Service*** | .00 | .00 | 3.80 |

## Annex B: Specification for the Comparative Static CGE Model

The Vietnam model is a one-country calibrated general equilibrium (CGE) model, typical in most respects. Vietnam has only one composite trading partner (ROW), whose behavior is exogenous with respect to all external commodity and factor flows. The current industry/commodity breakdown incorporates 38 sectors, aggregated from 112 sectors in the basic 2000 Vietnam SAM.[16]

A third dimension of the model is factor and household disaggregation, since most of this inessential to our focus on industrial organization, we have kept this element as parsimonious as possible. The current version details two factors of production, labor and capital, and one domestic household. Further disaggregation in both respects would be recommended for empirical work, since this is necessary to evaluate the real incidence or composition of welfare effects ensuing from structural adjustments.

### *B-1. Production*

As with many applied general equilibrium models, the Vietnamese model decomposes the production structure into a series of nested decisions allowing for a wide range of substitution possibilities between the various inputs. While we experiment extensively with alternative functional forms and specifications of industry conduct, the basic constituents of production remain the same. Figure B-1 provides a graphical depiction of the nested production structure.

The top level of the production structure decomposes the production decision between aggregate inputs and an aggregate bundle composed of capital and labor value added. While there is the possibility for allowing some substitution between intermediate inputs and value added, for the examples considered in this paper, it is assumed that the substitution elasticity is zero, or in other words the value added is always mixed in fixed proportions with intermediate inputs. It is also assumed that all the intermediate inputs are consumed in fixed proportion amongst themselves, though it is possible to substitute between domestic and imported intermediate goods. The next level of the production structure decomposes the value added bundle into labor and capital demand constituents.

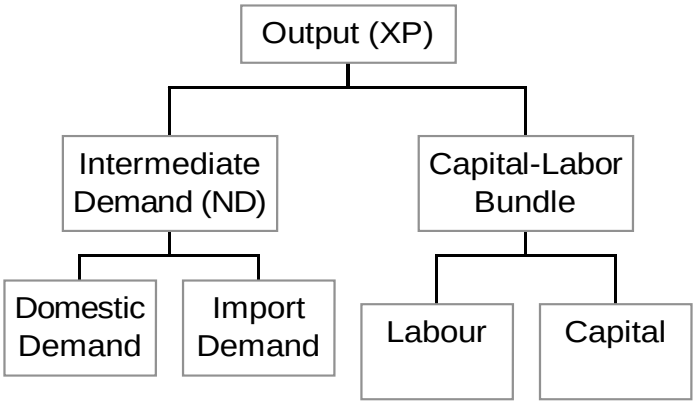
[16] See Tarp et al:2002 for complete documentation of the 2000 Vietnam SAM.

*B-2. Consumption*

The composite domestic household group is in turn captured by a single representative consumer who allocates disposable income across the various commodities. The model uses an extension of the familiar Stone-Geary consumer demand system, known as the extended linear expenditure system (ELES). The ELES has several distinct advantages over other demand systems. It allows for commodity-specific income elasticities which can either be econometrically estimated or derived from literature searches, it is easy to calibrate and implement, and it integrates the household saving decision in the consumer optimization process. In the ELES system, consumption is represented as the sum of two components, a subsistence minimum, and a share of supernumerary income, which is the residual disposable income after subtracting expenditures on the subsistence minimum. Household direct taxation is a fixed proportion of income.

**Figure B-1**

**Production Structure**




*B-3. Other Final Demand*

There are three other domestic final demand accounts: government expenditures, investment expenditures, and changes in inventory. Aggregate real government expenditure is assumed to be fixed, while aggregate real investment expenditure will

depend upon the closure rule. The decomposition into demand for commodities is assumed to use fixed shares in both cases.

### *B-4. Trade*

The model uses an extension of the familiar Armington hypothesis to implement trade equations. The principle behind the Armington assumption is that goods are differentiated according to region of origin. In practice this means that each agent specifies demand for a specific *aggregate* good (derived from maximizing utility for example). This good is a constant elasticity of substitution (CES) aggregate of imports and domestic products in each sector. At this stage of the demand system, agents decompose demand for the aggregate good into its domestic and (aggregate) import components based on relative prices and (calibrated) penetration shares.

Export supply is treated symmetrically to import demand, i.e. domestic producers are assumed to differentiate between domestic and export markets. A rise in export prices (relative to domestic prices), induces producers to shift production resources towards export markets. The model implements a constant elasticity of transformation (CET) curve to capture this assumption.

### *B-5. Equilibrium*

Production is modeled with a constant-returns-to-scale technology, which guarantees that supply equals domestic plus external (export) demand for domestic output. Factor prices, wages and capital returns, are generally determined by equilibrium conditions. In both markets there are a wide range of possibilities. We assume that aggregate capital is fixed in supply and mobile between sectors. We assume that labor of a specific skill is perfectly mobile across sectors, which implies a single economy-wide average wage rate for each skill, assuming labor markets are competitive. A number of authors have demonstrated, however, that significant and persistent wage differentials exist across sectors for the same occupational groups.[17] To account for this, we calibrate a distribution of inter-sectoral wage differentials which are held constant during the

[17] See e.g. Katz and Summers (1989).

simulations. Explaining the determination of these differentials is one of the main tasks of this chapter.

*B-6. Closure*

There are three key macro closure rules. The first concerns the government revenue-expenditure balance. For the purposes of the simulations, we assume real government saving is fixed in each region. The instrument used to achieve the balance is the household tax schedule which will shift either right or left to guarantee the budget balance holds.[18]

The second closure rule concerns the saving-investment balance. Domestic investment is determined by the stock of domestic private and public saving, plus net foreign saving (which is exogenous).

The third and final closure rule governs the external account, where we assume that the trade balance is equal to the level of foreign saving. If foreign saving were fixed, all adjustment would necessarily be mediated by the real exchange rate, since increased import demands which follow from trade liberalization must be financed by increased exports. At rigid terms-of-trade, exports can only expand by attracting resources whose relative prices have declined due to structural adjustment in other sectors. These include tradables which are being displaced by new imports and nontradeables, whose price declines both contribute to falling domestic resource costs or real exchange rate depreciation. When foreign saving is endogenous, as in the present model, net flows of foreign investment will also exert an influence on external adjustment, possibly even driving up the real exchange rate and offsetting the export competitiveness which would otherwise result from trade liberalization.

[18] This is equivalent to lump sum taxation or rebates.

**Structural Equations of the Model**

*Consumer Behavior*

$$C_i = LES_C(P_{Di}, Y) = \gamma_i + \frac{\eta_i}{P_{Di}}\left(Y - \sum_{j=1}^{n} P_{Dj}\gamma_j\right) \quad \text{(B-1)}$$

*Production Technology*

$$S_i = \min\left\{CES_S(L_{Di}, K_{Di}; \phi_i), V_{1i}/a_{1i}, \ldots, V_{ni}/a_{ni}\right\} \quad \text{(B-2)}$$

$$V_{ij} = a_{ij} S_j \quad \text{(B-3)}$$

*Factor Demands*

$$LD_i/KD_i = \psi(w/r_{Di}; \phi_i) \quad \text{(B-4)}$$

$$KD_i = KD_i^d + \sum_f KD_i^f \quad \text{(B-5)}$$

*Factor Supplies*

$$LS = LES_L(w, Y) \quad \text{(B-6)}$$

$$KS_i = KS_i^d + \sum_f KS_i^f \quad \text{(B-7)}$$

*Commodity Demands, Supplies, and Allocation of Traded Goods*

$$D_i = \overline{A}_{D_i}\left[\sum_k \beta_i^k \left(D_i^k\right)^{(\sigma_i - 1)/\sigma_i}\right]^{\sigma_i/(\sigma_i - 1)} \quad \text{(B-8)}$$

$$D_i^f / D_i^d = g_D\left(P_{Di}^f / P_{Di}^d; \sigma_i\right) \quad \text{(B-9)}$$

$$S_i = \overline{A}_{S_i}\left[\sum_k \delta_i^k \left(S_i^k\right)^{(\tau_i + 1)/\tau_i}\right]^{\tau_i/(\tau_i + 1)} \quad \text{(B-10)}$$

$$S_i^f / S_i^d = g_S\left(P_{Si}^f / P_{Si}^d; \tau_i\right) \quad \text{(B-11)}$$

*Composite Domestic Prices*

$$P_{Di}\, D_i = \sum_k P_{Di}^k\, D_i^k \quad \text{(B-12)}$$

$$P_{Si}\, S_i = \sum_k P_{Si}^k\, S_i^k \quad \text{(B-13)}$$

*Domestic Market Equilibrium*

$$D_i = C_i + \sum_{j=1}^{n} V_{ij} \quad \text{(B-14)}$$

$$D_i^d = S_i^d \quad \text{(B-15)}$$

$$L_l^S = \sum_{i=1}^{n} L_{lii}^D \quad \text{(B-16)}$$

$$KS = \sum_{i=1}^{n} KD_i^d \quad \text{(B-17)}$$

*Income and Government Revenue*

$$Y = (1 - t_L) \sum_{i=1}^{n} w\, LD_i + (1 - t_K) \sum_{i=1}^{n} r_{Di}\, KD_i + Y_G \quad \text{(B-18)}$$

$$Y_G = t_L \sum_i w\, LD_i + t_K \sum_i r_{Di}\, KD_i + \sum_k \sum_i \left( t_{Di}^k\, P_{Di}^k\, D_i^k + t_{Si}^k\, P_{Si}^k\, S_i^k \right) \quad \text{(B-19)}$$

*Balance of Payments*

$$B^f = \sum_i \left[ PW_{Si}^f\, S_i^f - PW_{Di}^f\, D_i^f \right] \quad \text{(B-20)}$$

*Foreign Commodity Prices*

$$P_{Di}^f = (1 + t_{Di}^f)\, e\, PW_{Di}^f \quad \text{(B-21)}$$

$$P_{Si}^f = \left[ 1 / (1 + t_{Si}^f) \right] e\, PW_{Si}^f \quad \text{(B-22)}$$

*Foreign Demand and Supply Functions*

$$D_i^{h,ROW} = \overline{A}_{M_i} \left( PW_{Si}^{h,ROW} \right)^{\zeta_i} \quad \text{(B-23)}$$

$$S_i^{h,ROW} = \overline{A}_{E_i} \left( PW_{Di}^{h,ROW} \right)^{\xi_i} \quad \text{(B-24)}$$

*Numéraire*

$$\sum_i \omega_i P_{Di}^d = 1 \quad \text{(B-25)}$$

## II. Variable and Parameter Definitions

*Price Variables*

| | |
|---|---|
| $e$ | Exchange rates (domestic/foreign currency) |
| $P_{Di}^d$ | Domestic purchaser prices of domestic goods |
| $P_{Di}^f$ | Domestic purchaser price of imports from region *f* |
| $P_{Si}^d$ | Domestic producer price in the domestic market |
| $P_{Si}^f$ | Domestic producer price for exports to region *f* |
| $P_{Di}$ | Purchaser price of composite domestic demand |
| $P_{Si}$ | Producer price of domestic output |
| $PW_{Di}^f$ | World price of imports from region *f* |
| $PW_{Si}^f$ | World price of exports to region *f* |
| $r_{Di}$ | Rental rate on capital |
| $w$ | Average wage rate |

*Quantity Variables*

| | |
|---|---|
| $C_i$ | Personal consumption |
| $D_i^d$ | Domestic demand for domestic goods |
| $D_i^f$ | Domestic demand for imports from region *f* |
| $D_i$ | Composite goods for domestic consumption |
| $KD_i^d$ | Domestic demand for domestic capital |
| $KS_i^d$ | Domestic supply of domestic capital |
| $LD_i$ | Demand for labor |
| $LS$ | Aggregate labor supply |
| $S_i^d$ | Domestic production for domestic use |
| $S_i^f$ | Domestic production for export to region *f* |
| $S_i$ | Gross domestic output |
| $V_{ij}$ | Demand for intermediate good *i* in sector *j* |

*Nominal Variables*

| | |
|---|---|
| $B^f$ | Net foreign borrowing from region *f* (may be exogenous) |
| $Y$ | Nominal domestic income |
| $Y_G$ | Government income |

*Structural and Policy Parameters*

| | |
|---|---|
| $a_{ij}$ | Intermediate use coefficients (Leontief technology) |
| $\gamma_i$ | Subsistence consumption of good *i* |
| $\eta_i$ | Marginal budget share for consumption of good *i* |
| $\phi_i$ | Elasticity of substitution between labor and capital in domestic production |
| $\sigma_i$ | Elasticity of substitution between domestic and imported products |
| $\tau_i$ | Elasticity of transformation between domestic and exported products |
| $\zeta_i$ | ROW import supply elasticity |
| $\xi_i$ | ROW export demand elasticity |
| $\overline{A}_{D_i}$ | Calibrated intercept parameter for composite product demand |
| $\overline{A}_{S_i}$ | Calibrated intercept parameter for composite product supply |
| $\overline{A}_{M_i}$ | Calibrated intercept parameter for ROW import supply |
| $\overline{A}_{E_i}$ | Calibrated intercept parameter for ROW export demand |
| $\beta_i^k$ | Base share parameter of demand by origin in the composite demand |
| $\delta_i^k$ | Base share parameter of supply by destination in the composite demand |
| $\rho_i^f$ | Ad valorem equivalent of nontariff barriers on imports from region *f* |
| $t_{Di}^d$ | Indirect tax rate on domestic sector production |
| $t_{Di}^f$ | Ad valorem tariff rate on imports from region *f* |
| $t_K$ | Tax rate on capital income |
| $t_L$ | Tax rate on labor income |
| $t_{Si}^d$ | Producer tax or subsidy on domestic deliveries |
| $t_{Si}^f$ | Tax or subsidy on exports to region *f* |

$\omega_i$ Domestic expenditure shares

*Indices*

*i, j :* *sectors*
*d* = *Vietnam*
*f* = *set of foreign trading partners*
*k* = $d \cup f$