Modeling Marketing Services and Assessing Their Welfare Effects in a General Equilibrium Framework

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Since nearly every good purchased by consumers must pass through the distribution (or marketing) sector, it plays an important role in any modern economy, exerting a strong influence on prices and overall welfare. Most Applied General Equilibrium (AGE) models, however, do not explicitly account for marketing. These models assume that consumers pay producer prices (corrected for taxes and subsidies) and that all distribution services can be lumped into a single sector. In reality, consumer prices are substantially higher than producer prices, and the gap between the two depends on the good being purchased and on the purchaser. Accounting for these facts requires explicit modeling of marketing. Failure to do so within an AGE model may lead to misleading results and will prevent one from analyzing the welfare effects of changes within this crucial sector.

In this paper, we explicitly model marketing within an AGE framework. For the first time, to our knowledge, we compare two alternative approaches to such modeling with each other and with the standard approach of not modeling marketing. We do so by running trade opening simulations using each approach. We find that modeling marketing may have a large influence on trade simulations in some cases, while, in other cases, it probably does not.

We also exploit our modeling to explore the possible welfare effects of increased efficiency in marketing. We find large potential gains. For the EU and the US, a mere 3% reduction in final goods marketing margins would create the same benefits for these regions as worldwide free trade. For Japan, it would only take a 10% reduction in its high margins. Thus, modest improvements in marketing efficiency may be more beneficial than any possible trade agreement. We also find that reducing margins has a smaller affect on production than does trade opening, so that streamlining distribution may be politically more feasible than trade opening.

1. Introduction

The distribution, or "marketing"[1], sector plays a crucial and large role in most economies. In the G-7 (United States, Japan, Germany, France, United Kingdom, Italy, and Canada) distribution's share of GDP ranges from 8% to 15%, and its share in employment ranges from 11% to 19%. (See Pilat (1997), Table 2.1.) Since almost all goods sold in an economy pass through this sector, marketing can heavily influence prices. For consumer goods, in particular, these price effects can be large. For instance, according to OECD data, the average ratio of the final consumer price to the producer price ranges between 1.2 in the UK to 1.4 in Australia and Canada for the year 1993. In addition to--indeed, because of--its economic importance, marketing enjoys substantial political clout and has thus has won many favorable regulations from the political process.[2] (See Kalirajan (2000), as well as Pilat (1997).) The welfare costs imposed by these regulations may be quite large.

Given its prominent place within any country's political economy, we believe that applied general equilibrium (AGE) models ought to model marketing explicitly, both because failure to do so may produce misleading results and because doing so enables one to simulate the welfare costs of inefficient marketing. In this paper, we introduce explicit modeling of marketing into an AGE model and compare trade simulations with and without such modeling. We find that, in certain cases, modeling marketing does not matter much, while, in other cases, it can greatly affect simulation results. We also simulate the welfare gains that would flow from more efficient marketing and find these to be substantial, rivaling or exceeding those of complete trade liberalization.

As Dixon et al. (1982) point out, failing to model marketing appropriately can generate strange demand behavior within AGE models. The great majority of AGE studies, including those using the basic GTAP framework, assume that marketing services are separate consumer goods in households' utility functions, as well as ordinary intermediate inputs in firms' production functions. Under this approach, marketing services are not tied to the commodities involved, with each user consuming a single package of marketing services. This can be problematic. For example, with marketing modeled as a separate good, an increase in the price of food may show consumers substituting into marketing, even though higher food prices would be expected to reduce the demand for food marketing. Similarly, lower food prices should stimulate demand for marketing associated with food, because one cannot purchase food without purchasing the marketing services associated with it. In other words, marketing should not be automatically modeled as a substitute for all other goods: it is more likely to be a complement. Also,

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[1] We use "distribution" and "marketing" interchangeably. In either case, we consider them to include the following services: retail trade, wholesale trade, transport, and storage.

[2] Regulations that probably increase rents for incumbent distributors at the expense of overall welfare include: zoning restrictions, restrictions on store hours, and limits on new entrants into the distribution sector.

the standard approach fails to recognize that the amount of marketing services depends on the purchaser. For example, retail trade margins associated with the sale of energy goods to householders are generally much higher than for the same goods sold to industrial users. Hence, a change in household demand for energy has a more marked effect on marketing activity than an equal change in industrial demand for petrol.

For trade policies in particular, several researchers have stressed the need to pay more attention to marketing margins. Rousslang and To (1993) estimate that margins in the US impose greater barriers to trade than those imposed by tariffs and international transport cost combined. Accordingly, they argue for a more careful analysis of distribution. In his commentary on the recent paper written by Hertel (2000), Reed (2000) also argues for a more detailed treatment of the food retailing sector, especially given the potential non-competitive behavior of this industry. In their paper on agricultural and non-agricultural liberalization in the Millenium Round, Hertel et al. (2000) say that "much more research will be needed in order to understand the implications of services liberalization. It is important, not only for services trade, but also for the food and agricultural sector. The latter are increasingly dependent on services as a production input, as well as a mechanism for transporting, and adding value to, food products". In the same vein, Kohli (1999) conjectures that if one accounts for the fact that virtually all goods, including imports, need to pass through the marketing sector, one might find that the welfare effects of trade liberalization are even larger than has been estimated. **How** one models marketing is also important. James and Anderson (1998) show that, in a partial equilibrium framework, the results of removing an import ban on fresh bananas in Australia are quite sensitive to the way in which marketing is modeled. If the margins are constant in cents per kg, they estimate that Australia's net economic welfare would increase by $104 million per year, while, if they are constant in proportional terms, the economic welfare would improve by more than $200 million per year.

In this paper, then, we undertake two tasks. First, we introduce modeling of marketing into an AGE model by explicitly tying margins to distinct commodity transactions. We examine two approaches: one in which marketing services enter as an input into production of final goods and one in which marketing results in price mark-ups. The first approach assumes perfect competition and uses structural modeling, while the second approach is compatible with imperfect competition but is reduced form. We compare these approaches with each other and with the standard approach, which does not model marketing, by running trade liberalization scenarios under all three frameworks. Second, we simulate reductions in marketing margins. Such reductions are plausible given that many governments interfere extensively with distribution, just as they do with trade, and given that significant technical improvements

may still be expected in the near future. In particular, we endogenously determine the reduction of marketing margin rates that generate the same welfare effects as complete trade liberalization.

This paper is organized as follows. Section 2 reviews other treatments of marketing margins in AGE models. Section 3 describes our AGE equilibrium modeling framework and details the three approaches adopted in this paper. Section 4 discusses the empirical framework, including the marketing margin data. Section 5 defines the simulation experiments and analyses simulation results. Section 6 concludes.

2. Literature Review

A few AGE models have explicitly incorporated marketing. The ORANI model, the well-known AGE model of the Australian economy, offers an interesting treatment of marketing margins (Dixon et al, 1982). Eight services among 115 commodities in total facilitate the flow of goods from two sources, domestic production and imports, to five destinations: intermediate demand, private fixed capital formation, household demand, foreign demand for Australian exports, and other demands (mainly government demand). The eight commodities are: wholesale trade, retail trade, road transport, rail transport, water transport, air transport, other insurance, and restaurants and hotels. On the demand side, ORANI assumes that these eight marketing services are combined in fixed proportions with the producer goods to define the consumer goods. The consumer price then equals the supply price of the good plus the weighted sum of the price of all marketing services. Therefore, this price differs according to the user. Moreover, in household demands, substitution between food products, say, and retail trade does not take place with price or income changes. Finally, like other commodities, the price of marketing services equates supply and demand.

Peterson et al. (1994) develop an AGE framework for the analysis of marketing margins and the food system in the USA. The treatment of marketing margins in this paper model differs from ORANI in that Peterson et al. assume that there are as many wholesale/retail activities as products in the model (9 agricultural goods, 14 processed food products, and 4 non-food goods). Each wholesale/retail sector purchases domestic and foreign goods and combines them with labor and capital to produce a final consumer good. The marketing margins on final demand are therefore determined by the value of labor and capital used in the corresponding wholesale/retail sector. Domestic marketing margins on intermediate consumption and on exports are not taken into account. Unlike ORANI, this model assumes allows for substitution between commodities and marketing services.

Several AGE models have been developed for African countries in the context of the MERRISA project (for Mozambique, Arndt et al. (1999); for South Africa, McDonald and Kirsten(1999); for Tanzania, Wobst (2000); for Zimbabwe, Bautista and Thomas (2000)). These models usually contain explicit marketing margins for domestic supply, exports, and imports in order to capture the extreme differences between producer and consumer prices that prevail in these countries. The marketing margins do not differ according to domestic users. These models isolate one marketing sector that offers one composite marketing service, is assumed to be perfectly competitive, and has standard technology (CES between labor and capital, fixed coefficients for intermediate inputs). On the demand side, the marketing service is combined in fixed proportions with the factory/farm gate good.

The MEGAAF model is a static AGE model focused on the French food complex (Gohin (1998)). Two marketing sectors are isolated. The first one provides a composite of marketing services only for final food consumption. The second one provides a composite of marketing services for all other uses: final consumption of other goods, intermediate consumption, inventory changes, investment, and exports to foreign countries. The technology of these two sectors is given by a CES functional form between labor and capital and fixed coefficients for intermediate inputs. On the demand side, marketing services are not distinguished between domestically produced and imported goods. Moreover, it is assumed that exogenous unit marketing margins represent a fixed share of consumer prices. This margin rate works like a tax rate on the producer price, with the "tax revenues" going to the marketing sector. In this set-up, producer price changes are perfectly transmitted to consumer price changes. Bradford (2001) also follows this approach in which margins are treated like taxes.

The WAGEM model is a static, single country AGE model of the Netherlands with emphasis on agriculture and agribusiness (Komen and Peerlings (1996)). Trade and transportation services involved in marketing margins are assumed to be produced by different industries. The use of these services is incorporated in the buyers' prices of each commodity at three levels in the model: export (export margins), total domestic use (wholesale margins), and household demand (retail margins). At each level, a constant marketing margin rate for each commodity is assumed, being the initial share of marketing margins in the value of the transaction at sellers' prices.

3. Our Modeling Framework

We use the GTAP model as the core of our modeling framework (Hertel and Tsigas (1997)). Since marketing affects nearly all goods transactions within an economy, we believe that marketing should be modeled within an AGE framework, which capture all interactions among agents in a given economy. The GTAP model is a relatively standard multi-region, multi-sector AGE model, which, in the

simplest version, is static, perfectly competitive, and constant returns to scale. We adopt this simple base model in order to focus the analysis on the modeling of marketing margins. Bilateral trade is modeled with a nested Armington structure. Each region has a single representative consumer who allocates her or his income across commodities so as to maximize welfare. All distortions, including trade instruments, are represented as *ad valorem* price wedges. We now turn to the discussion of how the marketing sector can be incorporated into such a model. We describe what we call the implicit modeling of marketing margins and then detail our two explicit approaches.

3.1 Implicit Modeling of Marketing

In the standard GTAP model, marketing margins paid by a given consumer (intermediate, private, or public consumer) when buying commodities from given suppliers (either domestic or foreign producers) are not distinguished by commodity and thus are not linked to distinct commodity transactions. On the contrary, this consumer buys marketing services from the trade and transport sector in the same way as he or she buys other commodities.

Let PM_i denote the market price of commodity i; Y_i, the market supply of that commodity; $PC_{i,j}$, the price of that commodity for consumer j; $QC_{i,j}$, the demand of commodity i by consumer j; and $t_{i,j}$, the *ad valorem* tax rate on transaction $QC_{i,j}$. Then the implicit modeling is characterized by the following equations:

$$PC_{i,j} = PM_i.(1+t_{i,j}), \quad \forall i,j \tag{1}$$

$$QC_{i,j} = f(PC_{i,j},.), \quad \forall i,j \tag{2}$$

$$Y_i = \sum_j QC_{i,j}, \quad \forall i,j. \tag{3}$$

Equation (1) states that the price for consumer j of commodity i is given by the market price of this commodity, corrected by the *ad valorem* tax/subsidy. This consumer price does not include any marketing margin. Equation (2) expresses the consumer demand of this commodity as a function of the consumer price and other variables. This demand function also prevails for the trade and transport commodity. The amount of marketing service combined with each consumer purchase is not explicitly determined. Equation (3) is the market equilibrium condition that determines the equilibrium market price. This equation prevails for all commodities, including trade and transport.

3.2. Explicit Modeling of Marketing

The first explicit modeling we propose as an alternative to the standard one follows the work done in ORANI, in the MERRISA AGE models, and by Peterson et al. In this first case, equations (1) to (3) are replaced by the five following equations:

$$PC_{i,j} = (1 + t_{i,j}) CES(PM_i, PM_{"t"}), \quad \forall i, j \tag{4}$$

$$QC_{i,j} = f(PC_{i,j}, .), \quad \forall i, j \tag{5}$$

$$QM_{i,j} = QC_{i,j} . CES_{PM"t"}(PM_i, PM_{"t"}), \quad \forall i, j \tag{6}$$

$$Y_i = \sum_j QC_{i,j} . CES_{PM_i}(PM_i, PM_{"t"}), \quad \forall i \neq t \tag{7}$$

$$Y_{"t"} = \sum_j QC_{"t",j} + \sum_i \sum_j QM_{i,j} \tag{8}$$

where the index t stands for the trade and transport commodity/sector; the $CES(.)$ notation, for the Constant Elasticity of Substitution (CES) functional form; $CES_{PM}(.)$, the first order derivative of the CES function with respect to the market price of the considered commodity; and $QM_{i,j}$, the amount of marketing service that corresponds to the buying of $QC_{i,j}$. According to equation (4), the price for consumer j of commodity i is now given by a CES function of the market price of that commodity and the market price of the trade and transport (or marketing) service, corrected by the applicable *ad valorem* tax/subsidy. The choice of a CES function allows us to encompass the case where no substitution is permitted between commodities and marketing services (like ORANI) and the case where such substitution is permitted (like Peterson et al.). The consumer demand for marketing services is now explicitly determined by equation (6). Demand for marketing services, which are now linked to particular commodity flows, is an increasing function of the quantity of the commodity purchased by the consumer and a decreasing function of the price of the marketing services. This framework also allows for substitution between marketing and commodities, which would happen if $QM_{i,j}$ were an increasing function of PM_i. Finally, market equilibrium conditions are modified to take account of these new demand specifications. For all commodities except trade and transport, total demand is now a derived demand of consumer demand of commodities. For the trade and transport commodity (equation 8), total

demand is now given by the "direct" consumption of trade and transport by each agent and by their indirect demand for marketing services.[3]

In the above framework, the marketing sector is characterized by perfect competition and constant returns to scale. In the second approach, we make quite different assumptions, following James and Anderson, WAGEM, and MEGAAF. Marketing margins are now specified as rates. Equations (9) to (13) replace equations (1) to (3).

$$PC_{i,j} = (1 + t_{i,j}).PM_i.(1 + \tau_{i,j}) \quad (9)$$

$$QC_{i,j} = f(PC_{i,j},.) \quad (10)$$

$$PM_m.QM_{i,j} = PM_i.\tau_{i,j}.QC_{i,j} \quad (11)$$

$$Y_i = \sum_j QC_{i,j} \quad (12)$$

$$Y_m = \sum_j QC_{m,j} + \sum_i \sum_j QM_{i,j} \ , \quad (13)$$

where $\tau_{i,j}$ is the unit marketing margin connected with flow $QC_{i,j}$. Consumer prices are given by the market price, augmented by a unit marketing margin and by an *ad valorem* tax/subsidy. If we assume that the unit marketing margin is fixed, then the consumer price evolves as the market price of that commodity. In this case, the share of marketing in the consumer value of that commodity is constant. It can be mathematically shown that this corresponds to the case of a Cobb-Douglas relationship between commodities and marketing services, with the prices of marketing services evolving as the market price of the related commodity. Since such pricing behavior is compatible with cost-plus pricing or mark-up pricing rules, we call this the "imperfectly competitive" approach to the explicit modeling of marketing.

4. Empirical Framework

The core database is GTAP version 4. Our sectoral aggregation, with the mapping to the original GTAP sectors, is given in Table 1. We adopt the 22 sectors used in recent papers evaluating trade liberalization scenarios with the GTAP framework (Hertel (2000); Hertel et al. (2000)). Such a detailed sectoral breakdown minimizes aggregation bias when simulating trade opening.

The availability of marketing margins data governs our choice of regional aggregation. We have marketing margins data for final household consumption and for private capital formation for six OECD

[3] With this specification, we implicitly assume that trade and transport directly consumed by economic agents and trade and transport consumed as marketing services are perfect substitutes. The robustness of such an assumption obviously depends on the length of time we consider.

countries: Australia, Canada, Japan, the Netherlands, the United Kingdom, and the United States. We only have margins on intermediate inputs for the US, so such intermediate marketing services are not incorporated into the simulations of this paper. We also do not break out separate margins for imported goods. They are assumed to have the same margins as their domestic counterparts.[4] While it would have been possible with GTAP4 to break out Germany and the UK separately, we keep the EU as a single region for this paper. Accordingly, we have six regions: Australia, Canada, the European Union, Japan, USA, and the Rest of the World (ROW).

The margins data are reported in Table 2. These numbers show significant gaps between consumer and producer prices and a fair amount of variation across sectors. Also, these numbers are not small and imply that the marketing sector has a large impact within these economies. The overall averages imply that Japan and the UK have relatively low margins, while margins for the Australia, Canada, the Netherlands, and the US are bunched toward the high end. It should be noted, however, that these percentage margins can be misleading when comparing across countries. Countries that have high producer prices because of trade barriers or other regulations will have percentage margins that are biased downward due to the denominator--the producer price--being biased upward.[5]

As for elasticities required to calibrate the model, we assume, as usual, that there is no substitution between intermediate inputs and value added and that there is unitary substitution between all primary factors in the value added nest for all sectors. On the import side, we also follow previous analyses of trade liberalization by choosing large values of substitution elasticities. The elasticity of substitution between aggregate imports and domestic goods equals 4 for all commodities and the elasticity of substitution between all imports equals 8, again for all commodities. Instead of the Constant Difference of Elasticity (CDE) demand system, well designed to capture differential price and income responsiveness across countries, we follow Harrison et al (1997) and assume a Cobb Douglas utility function. This choice will influence the trade liberalization results but will, as we will see later, ease the understanding of the effects of marketing margins modeling.[6] Also, when one is focused on OECD countries, as we are, the Cobb-Douglas assumption is less restrictive. Finally, with the competitive and explicit modeling of marketing margins, substitution elasticities between marketing service and commodity are required. Some AGE models adopt a zero value while Peterson et al. (1994) use values

[4] We have marketing margins data for exports, but incorporating these into the GTAP model would require altering the international trade benchmark, which is problematic.

[5] Bradford (2001) uses data on trade protection to correct for such biases and shows that Japan's margins are, in absolute terms, the highest by far. Also, once this correction is made, the other five countries' overall average margins are quite close to each other.

[6] In their evaluation of the Multi-Fibre Arrangement, Harrison et al. (1997) find that doubling this elasticity of substitution between commodities at the final demand level from 1 to 2 increases the world welfare effects of this reform from 16 to 18 billion US dollars.

contained between 0.11 and 0.96, based on Wohlgenant's work (1989). To our knowledge, there is little empirical evidence for, or against, positive substitution between marketing service and commodity. As a result, we will adopt three values--zero, one and two--for all sectors, which are likely to encompass true values.

5. Simulations

We perform two kinds of experiments. The first group involves a common trade liberalization scenario which assumes that all import barriers and all export instruments are removed. Thus, we do not focus on estimating the effects of likely trade agreements but on the welfare costs to the world economy of the total protection package. This trade liberalization scenario is evaluated under the three approaches described in section 3: the standard or implicit one, explicit and competitive modeling with three values for the substitution elasticity, and explicit and imperfectly competitive modeling. In the last case, we assume first that the unit marketing margin is constant for all commodity flows, and then we assume that this unit margin adjusts so that consumer prices are fixed.

The second group of experiments deals with reductions of marketing margins. We determine the uniform ad valorem reduction of marketing margins in each region required to obtain the same welfare effects that result from the removal of all trade barriers. These experiments allow us to put the potential gains from trade liberalization in perspective. In these simulations, we retain the explicit and competitive modeling of marketing margins, assuming no substitution between marketing services and commodities. There are at least three possible sources of such reductions in margins: scaling back regulations, technological progress, and distributors with price-setting power choosing to reduce their mark-ups. We referred to extensive regulations above, and certainly there is plenty of scope for removing deadweight loss through deregulation. (Bradford (2001) assesses the possible welfare gains of distribution deregulation in OECD countries.) One possibly important source of productivity gains in the marketing sector is the internet. "E-tailing" will probably experience strong growth for years to come and will probably reduce margins. Finally, many empirical studies on the food distribution sector reveal that distributors may have price-setting power (for instance, Kinsey (1998); Capps et al. (1995); McCorriston et al. (2000)). Depending on the competitive behavior of food distributors, exploitation of scale or scope economies may lead to marketing margins reductions.

5.1. Trade Liberalization Scenario

The welfare effects of the trade simulations are reported in Table 3. In the implicit modeling of marketing margins (second column), complete trade liberalization improves world welfare by 171 billion US dollars, with Japan reaping the largest share (nearly 35%). All regions, except Canada, gain under

this scenario. Canada experiences a slight decrease due to negative terms of trade effects. Our estimate of the global welfare effect is roughly half of Hertel's estimate, which is based on a projection to 2005. Developing countries, which make up the bulk of the ROW region, would gain significantly from trade liberalization.

We observe from columns three through five that the explicit and competitive modeling of marketing margins does not significantly affect these welfare effects. In general, the higher the substitution elasticity, the more responsive prices are, and the greater are the welfare effects of a trade liberalization scenario. Compared to the implicit modeling, the global welfare impact of complete trade liberalization is lower when no substitution is permitted between marketing service and commodity (167 billion US dollars), nearly equal with unitary substitution elasticity (169 billion US dollars) and slightly greater when the substitution elasticity equals 2 (172 billion US dollars). Distribution of this global welfare effect across regions is similar to the one obtained in the standard case. For individual regions, welfare effects are greater with higher substitution possibilities, except for the US and the European Union.

These outcomes are in fact not really surprising. The move from the standard modeling to the explicit and competitive modeling mainly involves a partial reallocation of trade and transport services in each final consumer utility tree, while keeping constant the budget share of each commodity in total consumer expenditure. This induces a change in the pattern of substitution in final demand that depends on the initial substitution elasticities and the assumed elasticities of substitution between marketing service and commodities. As Perroni and Rutherford (1995) point out in their work on nested CES functions, the initial pattern of substitution between commodities at the final demand level can be reproduced by adopting appropriate substitution elasticities between marketing service and commodities. The choice of a Cobb Douglas utility function facilitates this task.

On the other hand, the welfare effects obtained with explicit but imperfectly competitive behavior differ quite a bit from those obtained with the standard approach. Removing all trade barriers is still welfare improving at the world level. The global gain is 254 billion US dollars when marketing margins are determined with a fixed rate and only 90 billion US dollars when marketing margins are determined with an adjusted rate. These figures come again as no surprise. Market prices of commodities decrease following the removing of trade barriers. In the fixed rate modeling, distributors also reduce the price of marketing services in order to maintain the share of marketing margin in the consumer value of each commodity. In that case, the distortion caused by the non-competitive behavior of distributors is also reduced in this experiment. On the other hand, when the unit margin can adjust, we naturally obtain the opposite results. Distributors increase the price of marketing services in response to a decrease of commodity prices and thus increase "their" distortions. This general explanation of global results does

not apply to each region. We observe in particular that the welfare gain from the removal of trade barriers are higher for Australia when an adjusted rate mechanism is adopted, compared to the implicit modeling. Also, the European Union loses with the former modeling whereas it gains with the latter.

5.2. Marketing Margins Scenarios

Results of the five experiments (one for each region) are reported in Table [4]. The uniform reduction of the amount of marketing services required to obtain the same effects as trade liberalization welfare effect is quite modest, especially for the USA (-3.19%) and the European Union (–3.11%). This means that if technical change or deregulation in the US distribution sector leads to a reduction of marketing services by 3.19% for all commodities, other things being equal, the US economy will gain as much as from a multilateral and complete removal of trade barriers. Thus, the potential gains from streamlining distribution are quite large. The percentage reductions required in Japan and Australia are larger because they gain quite a bit more from trade opening, as a percentage of GDP, than do the US and the EU. Still, Japan's equivalent margins reductions are just 10%, which, given the many regulations in Japan's distribution sector, is probably easily obtainable. The effects of the marketing margin scenario on other countries (not reported in Table 4) are nearly insignificant.

Moreover, Table 4 reveals that production effects are much more muted in the marketing margin scenario compared to those obtain by the trade liberalization scenario. (Here we report only those sectors most affected by the liberalization experiment.) This prevails in each country. If larger production changes lead to larger political opposition, these results imply that there will less opposition to the marketing margin scenario than to the trade liberalization scenario.

Finally, we also performed an experiment in which we removed all trade barriers and reduced marketing margins by the amounts in Table 4. We do not find evidence that simultaneous liberalization on both fronts leads to gains that synergistically exceed the sum of the individual gains.

6. Conclusion

Since the marketing sector plays a crucial and large role in any modern economy, we believe that AGE models should explicitly account for marketing. The standard approach, in which marketing is treated as a separate commodity instead of a facilitator of exchange, should be viewed with skepticism because this implicit approach may produce odd results and because it does not allow one to analyze the potentially large welfare effects of deregulation or productivity improvements in the distribution sector. In this paper, we have, for the first time, to our knowledge, incorporated alternative models of marketing into an AGE model and explicitly compared the effects of these approaches with the standard implicit treatment. We find that such marketing modeling may greatly influence trade opening simulations.

With marketing accounted for, we are also able to simulate the effects of streamlining distribution. We find that making distribution more efficient can produce large welfare gains. In the EU and the US, a mere 3% reduction in marketing margins would create the same benefits as complete worldwide trade opening. Japan would only need reduce its high margins by 10% to achieve the same large gains that would flow to it from complete trade opening. Also, we find that the domestic production effects of margins reductions are generally smaller than those of trade opening, which means that deregulation of distribution is likely to be politically smoother than trade deregulation.

We hope that this paper spurs additional research. The analysis above makes clear that non-reduced-form modeling of possible market power in marketing may yield large rewards, since such imperfect behavior can greatly affect the results. Even though the perfectly competitive model of marketing had little influence on the trade simulations in this paper, it may be worth exploring whether this modeling framework affects the results of other kinds of simulations. We also believe that it will be straightforward to incorporate dynamics and imperfect competition in other industries into this model. Bradford (2001) follows Harrison et al in doing so for his model.

On the data front, we have final goods margins data for three more countries—Belgium, Germany, and Italy—and should be able to add France. Thus, the list of countries for which there is marketing data is growing, and we think it can continue to grow. It will probably be worthwhile to explore adding margins on intermediate sales for countries other than the US and margins on government purchases for all countries. As mentioned above, we have export margins, but incorporating them into the GTAP framework may be tricky, since it will probably require recalibrating the international trade data. This also may warrant further research. The GTAP4 database allows us to break out Germany and the UK separately, and, since we have marketing margins data for them, this, too, may be worth investigating.

In sum, we believe that this paper has shown that the marketing sector can and should be incorporated into standard AGE models, and we hope that these initial efforts will stimulate fruitful future efforts along these lines.

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Table 1: Mapping from GTAP's (Version 4) 50 Detailed Sectors into the 22 Aggregate Sectors Used in this study

Aggregate Sector	Detailed Sector
Foodgrains	Paddy rice
	Wheat
	Processed rice
Feedgrains	Cereal grains nec
Oilseeds	Oilseeds
Ruminants and Non-Ruminants	Bovine Cattle, Sheep and Goats
	Other animal products
	Wool, Silk-Worm, Cocoons
	Bovine meat, sheep and goat meat
	Other meat products
Dairy products	Raw milk
	Dairy products
Other farm products	Vegetables, fruits and nuts
	Sugar Cane and Sugar beet
	Plant-based Fibers
	Other crops
Other processed food	Vegetable oils and fats
	Sugar
	Other food products
Beverages and Tobacco	Beverages and Tobacco
Mining, Fish and Forestry	Forestry
	Fishing
	Coal
	Oil
	Gas
	Mineral nec
Textiles	Textiles
Wearing apparel	Wearing apparel
Wood and paper	Wood products
	Paper products, Publishing
Chemical	Petroleum, Coal products
	Chemical, Rubber, Plastic products
	Mineral products
Metals	Ferrous metals
	Metals
	Metal products
Autos	Motor Vehicles and Parts
Electronics	Electronic equipment
Other manufactures	Leather products
	Transport equipment
	Machinery and Equipment
	Other manufactures
Housing and Utilities	Electricity
	Gas manufacture and Distribution
	Water
	Dwellings
Trade and transport	Trade and Transport
Construction services	Construction services
Business and Financial Service	Financial, Business and Recreation
Government Services	Public Administration and Defense, Education

TABLE 2
AD VALOREM MARGINS
(Ratio of the Consumer Price to the Producer Price)

	Australia	Canada	Japan	Netherlands	UK	US
Foodgrains	1.608	1.596	1.612	2.009	1.222	1.951
Feedgrains	1.608	1.596	1.612	2.009	1.222	1.951
Oilseeds	1.608	1.596	1.612	2.009	1.222	1.951
Ruminants and Non-ruminants	1.613	1.492	1.522	1.569	1.335	1.466
Dairy Products	1.613	1.492	1.522	1.569	1.335	1.466
Other Farm Products	1.608	1.596	1.612	2.009	1.222	1.951
Other Processed Food	1.613	1.492	1.522	1.569	1.335	1.466
Beverages and Tobacco	2.698	2.974	1.405	1.494	1.619	1.736
Textiles	1.876	1.762	1.813	2.284	1.583	1.797
Wearing Apparel	1.960	1.920	2.121	2.517	1.610	1.864
Wood and Paper	2.575	2.032	1.678	2.059	1.616	2.582
Chemical	2.258	2.028	1.608	2.315	1.569	1.718
Metals	1.383	1.613	1.200	1.485	1.243	1.422
Electronics	1.657	1.742	1.352	1.361	1.440	1.534
Autos	1.772	1.351	1.443	1.304	1.308	1.228
Other Manufactures	2.330	2.074	1.792	2.073	1.463	1.980
SIMPLE AVERAGES	1.861	1.772	1.589	1.852	1.397	1.754

Table 3: Annual welfare effects of complete trade liberalization: comparison of alternative marketing modeling

	Implicit		**Explicit Competitive** No substitution		**Explicit Competitive** Substitution = 1		**Explicit Competitive** Substitution = 2		**Explicit Non-competitive** Fixed Mark-up		**Explicit Non- competitive** Flexible Mark-up	
	Millions US$	% of GDP	Millions US$	% of GDP	Millions US$	% of GDP	Millions US$	% of GDP	Millions US$	% of GDP	Millions US$	% of GDP
USA	26388	0.37	25671	0.36	25556	0.36	25458	0.36	52296	0.73	30130	0.42
Japan	58701	1.15	57264	1.12	58701	1.15	60066	1.18	91774	1.80	13028	0.26
Canada	-2414	-0.42	-2507	-0.44	-2532	-0.44	-2551	-0.44	-484	-0.08	-3557	-0.61
European Union	32765	0.40	33058	0.40	32629	0.40	32228	0.39	51688	0.63	-9114	-0.11
Australia	10930	3.15	10129	2.92	10577	3.05	10895	3.14	14630	4.22	17553	5.06
ROW	44427	0.64	43011	0.62	44382	0.64	45676	0.66	44414	0.64	41822	0.60
Total	170797	0.60	166626	0.59	169313	0.60	171772	0.61	254318	0.90	89862	0.31

Table 4: Welfare equivalent reduction of the amount of marketing service and selected production effects

(in parentheses, production effects of the trade liberalization scenario)

(in percentages)

	USA	Japan	Canada	EU	Australia
Reduction of the amount of marketing service	-3.19	-9.89	+3.62	-3.11	-18.39
Production effects					
Meat	+0.56 (+14.50)	+2.43 (-12.73)	-0.48 (+12.21)	+0.69 (-16.32)	+3.07 (-15.52)
Dairy	+0.51 (+5.03)	+2.65 (-68.89)	-0.75 (-4.51)	+0.69 (-9.83)	+4.44 (+107.38)
Textiles	+0.95 (-14.92)	+3.27 (+18.48)	-0.87 (-22.51)	+0.97 (-6.13)	+5.97 (-45.82)
Wearing apparel	+1.45 (-22.95)	+4.89 (-4.96)	-1.42 (-42.12)	+1.35 (-17.36)	+8.89 (-9.77)
Trade and Transport	-0.64 (+3.54)	-1.66 (+0.93)	+0.61 (+0.98)	-0.81 (+1.57)	-2.91 (-3.53)