An empirical assessment of the welfare effects of reciprocal dumping*

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Abstract

Can two-way trade in similar products lead to lower welfare than if such trade was banned? Theory answers yes. To empirically investigate this proposition we examine Swedish imports of bottled water. Assuming one-shot (Bertrand and Cournot) competition, we can use the estimates from a structural model of demand to uncover marginal costs. We simulate the effect on consumer and producer surplus of banning imports. We do not find convincing evidence that banning imports would increase overall welfare. Given our choice of market this suggests we should not be overly concerned with the welfare effects of two-way trade in consumer goods that are close to homogenous.

Keywords: Reciprocal dumping, intra-industry trade, nested logit models, beverage industry.

JEL: F12, F14, L13, L66

1 Introduction.

More than 60 percent of the non-sparkling mineral water sold in Swedish stores is imported. Sweden also exports mineral water; in an average month in 2001 Sweden exported 791 metric tons of bottled

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mineral water and imported 1305 metric tons.[1] Does this shipping of water in both directions represent a good use of resources?

The theory of trade under imperfect competition that has developed from the 1980s onward (see for instance Helpman and Krugman, 1985) demonstrates that trade may have adverse consequences on welfare under certain conditions. In particular, we know that when there is two way trade in a homogenous good ("reciprocal dumping") and important barriers to entry, the waste of transporting identical goods in opposite directions can dominate the positive, pro-competitive effect of trade. This was first shown in Brander (1981), and elaborated on in Brander and Krugman (1983). Is this result, that trade can hurt overall welfare, empirically relevant? Given the current debate about the merits of trade, and that a large share of world trade is generated by countries exporting and importing quite similar goods, this comes high on our “things we would like to know”-list. Particularly so since Feenstra, Markusen and Rose (2001) find that the global trade patterns for homogenous goods are consistent with a reciprocal dumping-type model with barriers to entry.

Theory is clear that trade is typically welfare enhancing – even the staunchest critic of international trade is likely to agree that some trade is good. The question is: do we know of any cases when trade is bad? We can’t know unless we look and we therefore wanted to choose an industry so as to stack the cards against the free trade case; bottled water suits that bill well – there is arguably little real product differentiation, low technological economies of scale, transport costs are high relative to the value of the product and Sweden is also an exporter of the same good.[2] A highly concentrated industry structure suggests that there are considerable barriers to entry. Furthermore, a close substitute, tap water, is available at a price close to zero. This should limit the pro-competitive potential for imports. If trade does not reduce welfare even in this setting the pro-trade case should be strengthened. If we find that trade is indeed detrimental to welfare in this market it then becomes important to study less extreme cases.

We use a structural model of competition on the Swedish market for bottled water to examine the welfare effects of bottled water imports. We make use of a detailed data set that includes monthly observations of prices and quantities of all brands of bottled water sold in Swedish stores during 1998-

[1] Bottled natural mineral water, sparkling and still, with no minerals or flavours added; KN22011011 and 22011019, source, statistics Sweden.

[2] In addition we saw our choice of the bottled water market as an opportunity to pay tribute to Augustin Cournot; his (1838) masterpiece used bottled water as the main example.

2001. To our knowledge no other paper has attempted a similar exercise – most of the empirical literature that examines trade under imperfect competition has focused on measuring intraindustry trade and examining how well such trade theory can explain actual trade patterns (see Hummels and Levinsohn, 1995) or simply on testing if there is a pro-competitive effect of lower trade barriers (see Levinsohn, 1993 or Tybout, 2003). A somewhat closer precursor is Berry, Levinsohn and Pakes (1999) who examine the welfare impact of voluntary export restrictions (VER) on Japanese car exports to the US.[3] Another paper who applies similar methods to international oligopoly is Irwin and Pavcnik (2004) who examine trade disputes between Airbus and Boeing.

Even though one could argue that mineral water is a homogenous product, different prices of different brands demonstrate that brands are imperfect substitutes. Taking this seriously, we follow seminal work by Berry (1994) and Berry, Levinsohn and Pakes (1995) and estimate a model of demand for differentiated products. We model demand as being a function of product characteristics, using a multinomial nested logit (MNL) specification. Similar MNL formulations are also applied by for instance Verboven (1996) on European car markets, by Slade (2003) on the UK beer market and Ivaldi and Verboven (2005) on European truck markets.

The next section summarizes theoretical results on the welfare effects of trade that are relevant for our investigation. In Section 3 we describe the Swedish bottled water market, with particular attention to how it matches the assumptions of the Brander-Krugman model. In section 4 we estimate demand. We proceed to calculate the implied markups in Section 5 and provide a counterfactual experiment of calculating consumer surplus, and global producer surplus, under the assumption that only domestically produced waters can be sold on the Swedish market. Section 7 concludes.

2 Trade theory as it applies to bottled water

[3] Related are also Goldberg (1995), who examines the role of VERs on the US auto market, and Fershtman and Gandal (1998) who find a large positive welfare effect of entry of some Japanese and Korean brands on the Israeli auto market following the lifting of a boycott by a number of Arab countries. A previous attempt to evaluate the reciprocal dumping model is Fung and Lao (1998) who examine price differences for the same goods in the US and Japan. Essentially they find that the deviations from the law of one price are consistent with the predictions from a model of international oligopoly with segmented markets.

To answer if it makes sense for Sweden to import water we want to assess the global welfare implications of international trade. Let us briefly relate to the three explanations for (international) trade that economic theory has supplied (see for instance Krugman and Obstfeld , 2003).

The classical answer to the question if it makes sense for Sweden to import water is that by importing, rather than producing domestically, we free resources that can be used in the production of goods in which we have a comparative advantage. In the standard type of models (such as Ricardo or Heckscher-Ohlin), which rely on perfect competition, we would not observe the simultaneous exporting and importing of the same good, however. We take as given that there exists some general equilibrium effect of trade in water – holding consumption and exports fixed, importing rather than producing domestically frees up resources (Sweden is a net importer of bottled water). The general equilibrium implications are outside the scope of the present study and are likely to be miniscule for this particular product category. For instance, the largest selling brand of still water in Sweden (and Norway) is the Norwegian water Imsdal. There are 17 people employed at the source where the water is bottled.

The two other effects of trade rely on imperfect competition and can be studied in a partial equilibrium framework. One class of models, where modeling has focused on monopolistic competition and increasing returns, yields gains from trade because of product differentiation and increasing returns to scale. International trade makes more varieties available and at a lower cost. For instance this can explain two-way trade in differentiated goods such as automobiles. Thus the import of water could be associated with an increased welfare compared to the case where only domestic varieties were available because of an expanded choice set. The last reason for trade, and the only one that can account for trade in literally homogenous goods is the one associated with Brander (1981) and Brander and Krugman (1983). In the simplest case, two firms are based in different countries and sell the same product. There are zero transport costs within countries but "iceberg" transport costs between countries. If markets are segmented, and transport costs are low enough, each firm has a unilateral incentive to sell onto the other firms market and we observe two way trade in the same good. Figure 1 below illustrates the welfare effects of trade, which are ambiguous. Let p_{trade} and Q_{trade} represent the market price and quantity under trade and $p_{no\ trade}$ and $Q_{no\ trade}$ represent the corresponding figures if imports are shut out. The gain from trade stems from the decreased deadweight loss associated with increased competition, while the loss is caused by high cost foreign firms, rather than domestic lower cost firms, supplying part of the market. From the diagram it is readily seen that the negative impact of trade is more likely to dominate when transport costs are high. If we assume free entry the ambiguous result disappears however, as shown in Brander and Krugman (1983) and elaborated on by Venables (1985). The reason is that, ignoring integer constraints, free entry implies zero profits in equilibrium. With zero profits it suffices to examine the consumer surplus to evaluate the welfare effects; consumer surplus is decreasing in price and trade lowers price. We do our simulations under the assumption that entry is restricted and thereby stay true to the main thrust of reciprocal dumping type models, which we see as the trade-off between stronger competition and transport costs. [4]

Figure 1 about here

If goods are imperfect substitutes there is an additional positive effect of trade in a Brander-Krugman type model since consumers value a greater choice set. In a companion paper, Friberg and Ganslandt (2005), we examine the welfare effects of trade with differentiated products, extending work by Clarke and Collie (2003) who study Bertrand competition in differentiated goods when there is only one firm from each country.[5] It may be helpful to summarize some of the main results from our paper to generate an intuition for how the welfare effects of trade depend on the number of firms and the form of competition (Bertrand or Cournot). We use the same form of utility function (sometimes denoted Bowley form) as Clarke and Collie (2003) but allow for four firms,

$$U(q) = \sum_{i=1}^{4} aq_i - \frac{b}{2}\left(\sum_{i=1}^{4} q_i^{\,2} + 2\theta \sum_{i \neq j} q_i q_j\right) + m. \qquad (1)$$

In this equation U denotes utility, q_i the quantity of product i, m the utility of money and $\theta \in [0,1]$ measures the degree of product differentiation, such that the closer θ is to one, the closer substitutes are products. Using this utility function (and the linear demand functions that it gives rise to) it is straightforward to calculate how welfare (sum of producer and consumer surplus) depends on trade costs under different assumptions on the form of competition and the number of firms. As in Brander and Krugman we assume there are two countries, no economies of scale and transport cost between

[4] For instance Helpman and Krugman's (1985, p. 110) book give a relatively thorough treatment of the trade-off, while referring to the free entry case as "Free entry and exit will, however, eliminate for this particular model the possibility of losses from trade. The argument is stated fully in Brander and Krugman (1983)." Also, the undergraduate textbook Krugman and Obstfeld (2003) discusses the trade-off without stating the free entry result.

[5] It may be worth to point out that if goods are homogenous and firms compete à la Bertrand there is no potential for cross-hauling, the lowest cost producer supplies the whole market. Ben-Zvi and Helpman (1992) show that this also holds if goods are homogenous but we instead model competition as a two stage game where firms first decide on quantity and then on price.

countries. The thin lines in Figure 2 graph the relation between welfare under Bertrand duopoly (W^B) and Cournot duopoly (W^C) as a function of trade costs for a particular parameterization. W^M gives the welfare under monopoly which then is the relevant autarky comparison. One common feature is that welfare is U-shaped in the transport cost as long as trade occurs in equilibrium. There is, however, a drastic difference between the Bertrand model and the Cournot model. Moving from monopoly to duopoly at the prohibitive trade cost in the Cournot model is a marginal step, i.e. prices and quantities are essentially unchanged. Moving from unconstrained monopoly to a duopoly with positive trade flows in the Bertrand model, on the other hand, is a discrete change.[6] In the Bertrand model, the trade equilibrium is significantly more competitive than unconstrained monopoly. The welfare level in a Bertrand duopoly is, consequently, always higher than welfare with a single domestic producer and trade dominates autarky in a welfare perspective. This was shown by Clarke and Collie (2003).

Figure 2 about here

Can then trade be associated with lower welfare also in the case of Bertrand competition? As proved in Friberg and Ganslandt (2005), and illustrated by the thicker lines in Figure 2, the answer is yes. Welfare under trade with Bertrand competition (W^{B4}) is lower than welfare under autarky (W^{B2}) for some values of trade costs.[7] Trade can reduce welfare compared to autarky in a Bertrand oligopoly as long as the autarky equilibrium is sufficiently competitive, i.e. there is competition between domestic producers and goods are sufficiently close substitutes. With more than one domestic producer in each market and relatively homogenous products, the prices are quite low under autarky. Import competition does then not reduce consumer prices much and product differentiation does not add much value. Real resources are nevertheless wasted in trade activities as consumer substitute from domestic goods to imported varieties.

3. The market for bottled water

[6] The dashed segment of W^B represents equilibria where pricing power of the domestic firm is constrained by the potential for foreign entry but there are no trade flows – price is set such that it is not profitable for the foreign firm to enter the home market.

[7] For comparison we also graph welfare under the same setup, instead assuming that firms compete in a Cournot fashion (W^{C4} and W^{C2}).

We study the Swedish market for bottled water sold in stores from November 1998 to the end of September 2001. The main source of the data is ACNielsen, who use scanner data from stores to assemble their estimates of monthly brand level prices and quantities for each of six different regions in Sweden. Prices are per liter and are generated by dividing revenues from a particular brand by total quantity sold of that brand. These data were complemented with product and producer characteristics as well as cost variables from a number of sources, data definitions are detailed in the Appendix. In 2000 Swedes consumed an average of 17.6 liters bottled water per person and year, similar to figures in for instance the Netherlands and Ireland, but considerably lower than in countries further south, for instance France (112 liters per year) or Italy (155 liters). There is a cyclical pattern to demand, with higher demand in the summer months. Over the period covered there are 62 brands of sparkling water and 22 brands of still water sold. There is considerable entry and exit of smaller brands, the number of brands sold in grocery stores is the same in the first and last period (37 brands of sparkling water and 12 brands of still water).

In the following we argue that the Swedish market for bottled water matches the assumptions of the Brander-Krugman model quite well. Firstly, the market is oligopolistic. The Swedish market for beverages is dominated by two firms; Pripps-Ringnes (owned by Danish brewer Carlsberg since 2000) and family-owned Spendrups. Let us first describe the still water segment, exemplifying with data from May 2000 and May 2001 as shown in Table 1. Prices are expressed in Swedish kronor per liter.[8] The market share (based on quantity) in this segment of the largest distributor, Carlsberg, is well above 50 percent. The Norwegian water Imsdal is its main brand, with a market share of 44 percent in 2001. Second is KF, a major grocery retail chain whose store brand Blåvitt has a market share of 19 percent. The international food chain Danone has 15 percent through its brand Evian and Nestlé has 11 percent through its brand Vittel. Both of these are imported from France. All of the leading brands, except Blåvitt, are imported and the average market share of imports for the whole period is 66.9 percent. All imports come from Europe, with Iceland representing the source furthest away from Sweden. There is considerable dispersion in prices, also between brands that can be expected to be quite close substitutes, such as Evian and Vittel.[9] To some extent price differences may reflect differences in

[8] The mean exchange rate during the period is USD 1= SEK 9.06.

[9] Table 1 reports mean prices over all the six regions in Sweden. The price dispersion that we report is not primarily a reflection of regional price differences. For example consider prices in the southernmost region in this period. The mean

package size (some imported brands are frequently sold in packs of six bottles which under quantity rebates will be associated with a lower price) or differences in the proportion of sales that take place in for instance discount stores. We have no reason to believe that such matters are the main influence on prices however and note that the price dispersion is consistent with our treatment of bottled water as a differentiated good.

Table 1 about here

Not all firms handle their own distribution, in particular Evian is distributed by Carlsberg and Vittel by Spendrups. The resulting Herfindahl-Hirschman Index (HHI) of concentration is 0.27 on the brand level and 0.41 using the distributor quantities. Thus, of the four main brands one is produced in Sweden by a Swedish firm, one is produced in Norway by a wholly owned subsidiary of a Danish firm, the same Danish firm also manages distribution for Europe's largest selling brand of mineral water and finally a Swedish firm manages distribution of another well known French brand. The facts of this market are thus more complex than in the model of Brander-Krugman (1983). We have no access to information about the contracts signed between Evian/Vittel and their local distributors. A reasonable assumption is that producers such as Nestlé and Danone have significant bargaining strength and that the price is mainly determined by the producer rather than by the distributor. In our main specifications we therefore assume that price is set by the manufacturing group.[10]

Figure 3 below illustrates the development over the period of the market shares of the main brands. The stand out feature of the diagram is the developments of market shares during the late summer of 2000, when Spendrups started importing and distributing Vittel in July 2000. This coincided with a drastic reduction of sales of Evian and an increase in the market share of Imsdal. These brands are both distributed by Carlsberg. It would not be surprising if consumers view Vittel and Evian as close substitutes, and it appears that instead of meeting the harder competition head on, Carlsberg promoted its wholly owned brand Imsdal instead. Alternatively, Evian partly pulled back from the Swedish market when a particularly close competitor appeared on the stage.

Figure 3 about here

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over the 7 products in the still segment is 8.37 kronor with a standard deviation of 3.45. The cheapest is Beber, imported from Italy at a price of 3.89 kronor, the most expensive is Evian at 12.83 kronor.

[10] We have also estimated markups under the assumptions that profit maximization is at the distributor level as well as at the brand level. The qualitative nature of our results, with respect to the welfare effects of banning imports, were not sensitive to these different assumptions.

The market for sparkling water is much larger in Sweden than that for still water, in fact it constitutes 96.9 percent of the market for bottled water sold in stores.[11] The lower part of Table 1 details some variables for the leading brands. The sparkling segment is dominated by three brands that are produced in Sweden – Ramlösa, Loka and Vichy Noveau. The share of imports is low on the sparkling market, on average imports only make up 2.9 percent of the market. Despite this, there are a fairly large number of imported brands, in May 2001 the largest of these is Beber from Italy. Other imported brands in this period were Perrier from France, Verdiana and Vittoria from Italy, Rogaska from Slovenia, Irish Classic from Ireland, Premier from Germany, Harboe from Denmark and Fyresdal and Rimi from Norway. All in all there are 17 imported brands that have sales in at least one period during the sample. Also the market for sparkling water is very concentrated with the largest player Carlsberg controlling more than half of the market. Ramlösa and Vichy Nouveau are both owned by Carlsberg. LOKA is owned by Spendrups. There is considerable price dispersion also in this segment.[12] Perhaps somewhat surprisingly the prices of the leading sparkling brands are lower than the prices of the leading still brands. Since, other things equal sparkling is more costly to produce than still water this is one indication of positive markups within the bottled water market – consistent with the notion that the strength of competition may affect markups and therefore prices.

At first the high concentration of the industry is surprising given the continued operation of a number of very small local producers, which indicates that the fixed costs of production are low. Indeed, in John Sutton's (1991, p 104) investigation of different food retail markets, bottled water and soft drinks are estimated to have the lowest minimum efficient scale of the 21 industries examined. The market structure is consistent with (endogenous) sunk costs in marketing however. The advertising to revenue ratio over the period is 6.8 percent, which is quite high.[13] These marketing expenditures are highly concentrated, on the still segment Imsdal accounts for 78 percent of the marketing expenditures and Olden accounted for the rest. On the sparkling segment the top three brands accounted for 86

[11] This is not true globally where 73 percent of bottled water sold is non-sparkling. Markets with lower quality tap water typically have a higher share of still water sales; for instance still water represents 94 percent of sales in Spain but only 8 percent in Germany (source: www.mineralwater.org).

[12] Again, we can examine prices in the southernmost region as in footnote 7. The cheapest was Rimi, imported from Norway at a price of 3.29 kronor per liter and the most expensive Irish Classic at 23.7 kronor.

[13] Indeed, the Swedish bottled water market would rank among the top places in terms of advertising intensity in Sutton's examination (Sutton 1991, p. 107). Comparing with advertising to sales ratios for 19 US food industries for instance, only ready to eat cereals (at 10.8 percent) has a higher advertising to sales ratio.

percent of the total marketing expenditures with Coca-Cola Company spending a further 12 percent on its brand Bon Aqua. It is likely that marketing expenditure needed for large scale entry constitutes an important entry barrier.

Marketing is also likely to be an important element in why bottled water should not be seen as perfectly homogenous. Nevertheless, it is clearly easy to argue that water is an almost homogenous product, indeed in blind tests consumers frequently prefer tap water and are seldom able to identify brands. An important assumption in the reciprocal dumping type models is that national markets are segmented, this appears to hold well for bottled water as well. In a comparison of prices of supermarket products across 14 EU countries bottled water had the highest price dispersion *across* national markets of all products investigated while price dispersion within countries for bottled water was comparatively low (irrespective of whether Evian or local brands were used for the comparison, Commission, 2002).

Another attractive feature of the bottled water industry is that the production technology is very simple. Water classified as natural mineral water (such as all imported brands) has to be bottled at the source and we can thus calculate the distance "traveled" for each liter of water sold. We assume that the distance is zero for a liter that is both bottled and consumed in the same region (6 regions in all in Sweden). In all other cases we use the distance between the approximate population centers in the region of consumption and region of production. Foreign brands in addition have to cover the distance to the region closest to them from their location (for the foreign brands their exact location is used).

The imported share of the bottled water market over the whole period is 4.5 percent. The low overall share of imports is consistent with high transport costs which makes it more likely that trade lowers welfare. Taken together all these features imply that the market is almost tailored to allow for the possibility of trade being welfare decreasing.

4 Demand for differentiated products.

We now turn to the estimation of demand, following Berry (1994) closely. Let there be N_r potential consumers in each region r at time t who each buy at most one of J_r products. Both time and regional indexes are suppressed in the following. Assume that the utility of consumer i from buying a product depends both on the characteristics of the product and of the consumer. Let each product belong to one of G mutually exclusive groups. We express the utility of consumer i if she purchases product j as

$$u_{ij} = \delta_j + \zeta_{ig} + (1-\sigma)\varepsilon_{ij} \quad (2)$$

where δ_j is the mean valuation for product *j*, ζ_{ig} is individual *i*'s deviation from the mean valuation common to all goods in the group and ε_{ij} is individual *i*'s good specific deviation. We assume that ε_{ij} and ζ_{ig} + (1-σ)ε_{ij} are identically and independently distributed across consumers following an extreme value distribution. We also specify an outside good, tap water, and normalize so that δ_o is set to 0. The closer that σ gets to 1, the more perfect substitutes are the products within groups. The mean valuation is given by

$$\delta_j = x_j\beta - \alpha p_j + \xi_j \quad (3)$$

where x_j is a matrix of product characteristics of product *j*, p_j is the price and ξ_j is a random component in the mean valuation. The consumer buys at most one product in each period and chooses the one that gives the highest utility. Following Berry (1994) it can be shown that the above setup implies that the market share of product *j* can be written as

$$s_j = \underbrace{\frac{\exp(\delta_j/(1-\sigma))}{D_g}}_{s_{j|g}} \underbrace{\frac{D_g^{1-\sigma}}{1+\sum_{g=1}^{G} D_g^{1-\sigma}}}_{s_g} \text{, where} \quad (4)$$

$$D_g = \sum_{k\in G_g} \exp(\delta_k/(1-\sigma)).$$

We thus express the market share of product *j* as the sum of its share within the nest, $s_{j|g}$ and the share of the nest in the total market, s_g. Use s_o to denote the market share of the outside good. We take logs of market shares and rewrite, as Berry (1994) shows in his equation (28), to arrive at our estimating equation

$$\ln(s_j) - \ln(s_o) = x_j\beta - \alpha p_j + \sigma \ln(s_{j/g}) + \xi_j. \quad (5)$$

Thus, observing market shares, prices and product characteristics allow us to estimate α and σ.

4.1 Estimation.

We estimate the demand equation with the GMM, using instruments for the prices and market share within nests. We use an unbalanced panel of sales covering brands sold in grocery stores in six different regions over 35 months. Table 2 below reports the results from estimation of equation (5). By specifying the number of liters per month that a person drinks we define the market share of the individual goods as well as of the outside good. In columns (1)-(8) the dependent variable DEP is created assuming a total market of 9.025 liters per person and month, the same level as the consumption of bottled water in France. We thus take the French per capita consumption of bottled water (more than 6 times greater than the current Swedish consumption) as an upper limit of the size of the potential market for bottled water in Sweden. In columns (9) and (10) we examine the sensitivity of estimates to the assumptions on the total market.

Table 2 about here

All specifications include PRICE as an explanatory variable, this is the price per liter in Swedish kronor. All regressions also include a dummy for the high demand season; SUMMER. Also included are marketing expenses per month for the respective brand - MARMON. Column (1) reports results from a simple pooled OLS regression with PRICE, MARMON, SUMMER and a constant term. The coefficient on PRICE is negative as expected. Column (2) presents an OLS regression of DEP on PRICE, MARMON and SUMMER along with regional effects. We also use observable product characteristics as explanatory variables - a dummy variable for PREMIUM products, a dummy variable for natural mineral waters (NATUR) and dummies for the country of origin. PRICE is endogenous and we want to use instruments that are correlated with PRICE, but not with the error term. Following much of previous research (Hausman, 1994, Nevo, 2001, Slade, 2003) we use PRICE in other regions as an instrument in column (3).[14] The underlying assumption is that PRICE in all regions reflect cost shocks while demand shocks are local. Importantly, the nationwide demand shocks that are correlated with nationwide marketing should be picked up by our inclusion of MARMON, national monthly marketing expenses. We also use the distance from producer to the consumers region multiplied by the

[14] We use PRICINST, which is the price in the southernmost region, as instrument. This is arguably the market that differs the most from the others and we expect a relatively low correlation between local demand shocks. The coverage in product space is also very good in this region. For the southern region itself we use prices in the western region as PRICINST. The correlation between PRICINST and PRICE is 0.89.

change in the diesel price (DISTDIES). The correlation between DISTDIES and PRICE is low, only 0.08. Nevertheless DISTDIES is a significant predictor of PRICE and thus satisfies a criterion for a valid instrument. In column (3) we report the GMM estimates when PRICE has been instrumented for by DISTDIES and PRICINST. Comparing with column (2) shows that consumers appear more sensitive to price when price is instrumented.

Column (5) reports the results from our main specification. We use a nested logit specification and assume that there are three parallel nests; sparkling water, still water and the outside good. The market share within the nest is denoted by MSNEST1. The two central coefficients are those on price (α) and on the log of the market share within the nest (σ). Consistent with theory, the price effect is negative and the estimated coefficient on LOG(MSNEST1), σ, lies between 0 and 1. A point estimate of σ of 0.698 as in column (5) indicates that products within nests are seen as much closer substitutes than products in different nests. In this specification we use instruments for both PRICE and the market share within nests.[15] When there is oligopolistic competition the demand that each product faces will be a function of the characteristics of all competitors. This suggests that we can use rival characteristics as demand shifters if we view product characteristics as exogenous. Indeed, following the work by Berry, Levinsohn and Pakes (1995) such instruments are frequently used in the literature and we use a set of instruments that are a function of rival characteristics (denoted BLP instruments in Table 2); the number of competing natural mineral waters, the number of competitors and the number of competing premium products in each region and period. Comparing with column (4), which is the equivalent OLS regression, shows that instrumenting again leads to a more negative coefficient on price.

The rest of the columns report various regressions to examine robustness. In column (6) we use a different nesting assumption, further dividing the sparkling and still nests into premium and non-premium nests, yielding a total of five nests. The point estimate of the coefficient on within nest market shares defined in this way (LOG(MSNEST2)) is essentially 1, indicating that that products are seen as very close substitutes within these more narrow nests. We had problems in finding suitable instruments

[15] One might also question the assumption that marketing expenditures are exogenous to product quality. Part of the positive effect of marketing on mean valuation would be picked up by the unobserved product quality if marketing and unobserved product quality are positively correlated. We did experiment with just adding marketing to our list of instrumented variables, with the same instruments as in our main specification. Marketing was then not significant and there was some effect on the estimates of other coefficients. Since our interest is not focused on issues that directly hinge on marketing, we were more comfortable with the above specifications. Notable is also that none of the imported brands pursue marketing in Swedish media during the period of study.

and indeed for the specification in column (6) we can reject that the instruments are exogenous (using a Hansen J-test). Column (7) includes time effects and this changes the results considerably compared to column (5), our main specification. Again exogeneity is rejected however.

Column (8) reports results from a specification inspired by Ackerberg and Rysman (2005), who note that the logit model tends to overestimate the welfare gains of a greater choice set. The reason is that every good is associated with its own set of product specific individual valuations that are distributed i.i.d. This means that there is no tendency for the product space to "fill up". Ackerberg and Rysman show that one way to correct for this is to include a function of the number of products as an explanatory variable, in column (8) we therefore use the log of the number of products sold in the respective region in the respective time period in addition to the variables in the logit formulation (column 3). The coefficient on the log of the number of products (γ) can be interpreted as a measure of how much additional products crowd the product space. The closer that γ is to -1 the more crowding do we have in product space. When $\gamma = 0$ we are in the standard logit case and each additional product adds a new dimension to the unobserved characteristics space. Our point estimate of -0.34 suggest that there is indeed some tendency towards crowding in the unobserved characteristics space. However, we are not able to reject that the coefficient is 0.[16] Finally the last two columns check robustness with respect to the size of the total market. Our assumption of a total market of some 9 liters per person and month implies a quite large market share for the outside good since current Swedish consumption of bottled water is only about 1.5 liters per person and month. The larger the share of the outside market, the more important substitute is the outside good and the more elastic is the market demand for bottled water. Since a more elastic market demand will be associated with lower markups in the absence of foreign competition we are increasing the chance of finding that importing reduces overall welfare by having a relatively large outside market. Column (9) uses a total market of 4 liters per month and column (10) a very large share for the outside good, 30 liters.[17] The estimates are not very sensitive to these changes.

[16] We also estimated corresponding regressions for the nested logit case, but exogeneity of the instruments (also a function of the number of products in that case) was then rejected and the point estimates of parameters were outside the range consistent with theory.

[17] With good estimates of the market demand elasticity one can in principle back out the relevant market share of the outside good. For example, if we use a logit specification the market elasticity of demand should equal α*the average price*the market share of the outside good. The estimated α is -0.45 in the logit specification and the average quantity weighted price

The exogeneity of instruments is sensitive to the exact specification of the estimation equation and estimates are also more sensitive to changes in the specification in the nested logit case than one could have wished for. Nevertheless, the overall impression from the estimation of demand is that regressions are typically well behaved in the sense that the coefficients of interest are within the range consistent with theory, significant and explanatory power is respectable.

5. Supply – Bertrand competition in differentiated goods

We now use the estimated coefficients to solve for the implied marginal costs. We follow the standard practice in this empirical literature of assuming one-shot Bertrand competition in differentiated goods. The J products are being supplied by F firms, where each firm markets a subset of products F_f. Each firm sets prices to maximize

$$\Pi_f = \sum_{j \in F_f} (ep_j - c_j) M s_j(p) \tag{6}$$

where e is the exchange rate (producer currency price of Swedish kronor), p_j the price in Swedish kronor, c_j is the marginal cost of producing product j and bringing it to consumers, M is the size of the market and s_j is the market share of product j. For simplicity we exclude fixed costs. We simplify our problem by not explicitly considering VAT or the vertical relations between producers/distributors and retailers. Assuming the existence of a unique Nash equilibrium in pure strategies the price of each product has to satisfy the first order condition

$$s_j(p) + \sum_{r \in F_f} (p_r - c_r / e) \frac{\partial s_r(p)}{\partial p_j} = 0\,. \tag{7}$$

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for the month that we use for calibrations (May 2001) is 7.02. Our estimates for aggregate demand are quite uncertain given our three years of data. Using different specifications we estimated industry demand elasticities in the range of -0.28 to -1, suggesting inelastic demand. Thus, for instance using unit elastic demand the implied market share of the outside good is 0.32. Given the shaky estimates of the aggregate industry demand elasticity and that we, if anything, would like to err on the side of finding that trade is welfare decreasing, we assume the market share of the outside good to be large; some 0.62 and 0.83 respectively for the two specifications reported above.

Bertrand competition implies a conjecture of a zero response of other firms' market shares to price changes. The cross-price effects on brands operated by the same firm will depend on whether goods are in the same nest or not. We define the JxJ matrix Ω where each element takes on a value according to the following:

$$\Omega_{k,j} = \frac{\partial s_k}{\partial p_j} = \begin{cases} \alpha s_j \left(\frac{1}{1-\sigma} - \frac{\sigma}{1-\sigma} s_{j|g} - s_j \right) & \text{if } j = k \\ -\alpha s_k \left(\frac{\sigma}{1-\sigma} s_{j|g} + s_j \right) & \text{if } j \neq k \text{ and } j,k \in \text{same nest, same firm} \\ -\alpha s_k s_j & \text{if } j \neq k \text{ and } j,k \in \text{different nests, same firm} \\ 0 & \text{otherwise} \end{cases} \quad (8)$$

We can thereby express the first order conditions in vector notation and solve for marginal costs, which are given by the solution to the following system of equations

$$\frac{\hat{c}}{e} = p - \Omega(p)^{-1} s(p), \quad (9)$$

where *c/e*, *p* and *s* all are Jx1 vectors,

5.1 Markups

Given observed prices, market shares and the estimates of α and σ from Section 4.1 it is straightforward to calculate the estimated marginal costs by solving the system represented by equation (9) for each market and each time period separately. In Table 3 we present some summary statistics on prices together with the estimated own-price elasticities, markups and marginal costs. We do this for May 2001 which is the month where the market share of foreign brands took on its median value.

Table 3 about here

In the top of Table 3 we report results for our main specification, using estimates from column (5) in Table 3. In general the estimates are of the expected signs and of magnitudes that make economic sense. In particular, theory requires that optimizing firms face own price elasticities that are greater than 1 in absolute value and have markups between 0 and 1. But for a handful of outliers our estimates are consistent with these requirements. The median own price elasticity is estimated to be –4.94, and median markups are around 20 percent. Prices and marginal costs are higher and markups lower for imports than for domestic brands. We defer a further discussion of this until our calibration exercise.

The estimated markups are somewhat low compared to industry sources and previous findings on relatively cheap, marketing intensive, branded consumer products such as beer or ready to eat cereal. For instance Slade (2003) finds a median markup of around 30 percent for the UK beer industry. In another related study (Nevo, 2001) a preferred estimate for the median markup in the US ready to eat cereal industry is slightly above 40 percent. We can also compare our estimates with estimates based on accounting data - the bottled water divisions of Nestlé and Danone report operating margins (for global sales) of around 12 percent before taxes and excluding capital costs. According to discussions with a retail manager, a good estimate of the average retail margin on bottled water is 25 percent. Combined with a value added tax of 12 percent this implies a total margin (retail+manufacturer) of 0.48. Thus, it is not unlikely that our estimated markups are on the low side. In the lower part of Table 3 we report markups for some of the other specifications in Table (3). The logit specification, with a median markup of 33 percent thus confirms slightly better to our expectations – we return with a closer discussion of the logit specification when we discuss our calibrations. The version where we did not instrument yields implausibly high markups, and the alternative specification in column (7) results in implausibly low markups. We also calculate an equilibrium assuming that firms compete à la Cournot without taking account of cross-ownership. The small difference in markups between Cournot and Bertrand might be surprising – the likely explanation is that with many brands prices are mainly determined by the own price effect and the details of competition are less decisive.[18]

6. The gains from international trade

We now use our estimated parameters to simulate welfare under counterfactual assumptions on trade frictions. Firstly, we simulate a new set of prices that are associated with changes in marginal costs for imported brands. We then proceed to simulate equilibrium without imports and with no new entrants.[19]

[18] One difference between the estimates is that in the Cournot competition we do not take account of cross-ownership.

[19] We also examined the welfare effects of the one major introduction of a new brand during the sample period - that of Vittel. The picture that emerged is consistent with the view that the introduction of a new foreign brand was associated with welfare gains. The sum of producer surplus and consumer surplus on the still market in the month of introduction under our baseline specification for July 2000 is .75 million kronor compared to .53 million in the proceeding month or .61 million in

Marginal costs of the domestically produced brands are assumed to be the same as those solved for above. Under these assumptions we can calculate a vector of counterfactual prices by, for each period and each region, solving an analogous system of equations as in (9) for the optimal counterfactual prices, p^*,

$$p^* - \frac{\hat{c}}{e} = \Omega(p^*)^{-1} s(p^*). \tag{10}$$

The market shares are now calculated according to

$$s_j(p^*) = \underbrace{\frac{\exp(\delta(p_j^*)/(1-\sigma))}{D_g(p^*)}}_{s_{j|g}^*} \underbrace{\frac{D(p^*)_g^{1-\sigma}}{1+\sum_{g=1}^{G} D(p^*)_g^{1-\sigma}}}_{s_g^*} . \tag{11}$$

where the set of products included are only the domestic brands. The predicted prices and market shares are then compared with the predicted prices and market shares given the observed marginal costs and all current products being sold. Under the current assumptions the consumer surplus to one consumer generated by a set of products can be calculated as

$$CS = \frac{1}{\alpha} \ln\left(1 + \sum_{g=1}^{G} D_g^{1-\sigma}\right). \tag{12}$$

Using the estimate of marginal costs from Section 5.1 the calculation of profits is straightforward. In Table 4 we compare the resulting consumer surplus and producer surplus reporting descriptive statistics for May 2001. Consumer surplus and profits are aggregated to the national level.

Table 4 about here

As noted in section 2, a prediction from both Bertrand and Cournot competition is that welfare is a U-shaped function of transport costs. Raising transport costs can be associated with an increase in welfare. In column 1 we simulate a counterfactual with all products still in the market but let the marginal costs of foreign producers go up by 10 percent whereas we let the marginal costs of domestic

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July 1999. However many other things apart from the introduction of Vittel affect these figures and the methodology below is a clearer path for examining the welfare effects of trade.

brands be unchanged.[20] This increase in foreign costs is indeed associated with a slight increase in welfare under our simulations. While the confidence intervals on our parameters are wide enough that we can not reject that welfare in the two cases are the same we might nevertheless take this as an indication that the raising border barriers would be associated with a welfare gain on this market. Of course, the flip side of the coin is that if we are close to the bottom of the U-shaped welfare function we could equally well increase welfare by lowering border barriers. Indeed, the policy experiment in column 2 lowers the marginal costs for all imported brands by 10 percent, which results in a higher point estimate of the welfare gain than the raising of transport costs. Indeed, successive experiments with lowering the marginal cost of imports resulted in successively higher welfare. Taken together these observations are consistent with the idea that welfare is a U-shaped function of transport costs and that we are close to the minimum of the welfare function under trade. The perhaps most striking implication of the reciprocal dumping model is that no trade can dominate the trade case, even when the pricing of domestic firms is unconstrained by imports. We proceed to an examination of this.

Column 3 represents our main specification of the counterfactual when foreign firms are banned from selling on the Swedish market. We thus simulate an autarkic equilibrium where prices are set without regard to potential competition from foreign firms. As implied by theory, the banning of imports is associated with a lower consumer surplus - less choice and higher prices of the domestic brands imply that the consumer surplus drops from 3.66 million kronor to 3.57 million kronor in the no imports scenario. Also, as expected, domestic profits are higher when there is no foreign competition; aggregate domestic profits increase from 13.7 million kronor to 14.2 million. Foreign profits from Swedish sales drop from 0.44 million to zero. The net of these effects implies that aggregate welfare is some 0.01 million kronor lower when imports are banned. Setting this figure in relation to the sum of consumer and producer surplus under trade we conclude that welfare is 0.03 percent higher when imports are allowed. Given that the point estimate is positive it is clear that we can reject that the welfare effect of trade is negative for this market and under the assumptions we have made. Thus, trade in bottled water does not seem to be associated with a loss of welfare, even in this market that was chosen to maximize the possibility of finding this result. On the other hand it is hard to make much of

[20] As an alternative we could let the increase more explicitly depend on distance. As discussed below however there is a positive relation between the estimated marginal cost and distance from the place of production, but many costs of transport seem to be related to crossing of the border. A simple way to operationalize the above experiment was thus to let the foreign marginal costs increase.

the fact that the point estimate is positive, the positive effect is very small and our estimate is associated with considerable confidence bands. To calculate confidence bands we generated 1000 draws for α and σ (assuming that they follow a bivariate normal distribution with a covariance matrix equal to the one estimated for the corresponding specification in Table 2, column 5) and calculated the difference in welfare between the current situation and the counterfactual for each case. Based on these draws we find a 95-percent confidence interval for the welfare effect of banning trade that ranges from -1.50 percent to 1.13 percent of current welfare.

As with any calibrated model, the exact magnitude of results depend on modeling choices. The benefits of trade for consumers are two: the value of having a greater set of products to choose from and a disciplining effect on domestic markups. How to model the welfare increase from an expanded set of products has been an important theme in the empirical literature on differentiated goods, see for instance Hausman (1994) or Petrin (2002). As discussed earlier, Ackerberg and Rysman (2005) stress that the nested logit model tends to overestimate the welfare gains of a greater choice set since each additional product expands the unobserved quality space equally much, irrespective of how many products there are on the market. To understand if this is driving the net positive effect of trade we also compare the current consumer and producer surplus with the following scenario; we calculate consumer and producer surplus using the full set of products, letting imports have the same prices as currently, and letting domestic products have the prices that we simulated under the assumption that there were no imports. In this fashion we keep the positive welfare effect of all the foreign brands, letting all of them enter the calculations with the same prices in both the current situation and the counterfactual. At the same time we let consumer surplus be affected by the higher domestic prices that would result if imports were banned. This set of prices clearly does not represent an equilibrium outcome, but it allows us to isolate the pro-competitive effect of trade. These results are reported in column 4 of Table 4. Indeed, if we in this way take away all loss associated with a smaller choice set, the net welfare effect is slightly negative at 0.11 million kronor, -0.6 percent.

In columns 5 to 7 we further examine the sensitivity of our estimated welfare effects to assumptions on the nature of demand and the form of competition. Column 5 reports results from the logit specification where the point estimate points to more substantial welfare effects, trade is here found to be associated with 3.4 percent higher welfare than the no trade scenario. An important reason for this difference is that if we treat all products symmetrically the imported brands play only a very small role for disciplining the prices of domestic producers. The median prices for still water products are virtually the same under our counterfactual of no trade as they are in the current situation. As discussed in Section 2 the original models of reciprocal dumping assumed Cournot competition and it may therefore be of interest to also examine this case. We report results from a Cournot specification in column 6 yielding very similar results to the Bertrand case in column 1. Thus, while there are pronounced differences between Cournot and Bertrand competition in the simplest case with only two firms our assumption of Bertrand competition is clearly not responsible for our results that trade is not welfare reducing in this setup.[21]

One may ask whether a model with price competition in differentiated goods can generate the result that trade is associated with lower welfare than the no trade case. The confidence bands that we reported earlier answer this in the affirmative. Indeed, as discussed in Section 2, in our companion paper Friberg and Ganslandt (2005) we show that if domestic competition is strong enough and goods are sufficiently close substitutes welfare can be lower when we allow for imports. A further illustration is given by our results in column 7. Even though the specification on which this builds (column 7 in Table 2) used instruments that were not valid and resulted in implausibly high estimates of marginal costs the parameter values can serve as a basis for welfare calculations. Indeed under these values welfare is some 3.34 percent lower with trade than without trade. This case is associated with very strong competition and low markups. Under this specification for instance Evian has a mean markup of just 0.029 compared to the mean markup for the main domestic water Blåvitt at 0.068 – also low but more than twice as high as Evian's. The transport cost savings under these parameter values are thus substantial.

We therefore conclude that it is possible to find parameter values such that welfare is lower with imports than without. Nevertheless, the overall impression from our calibrations is that global welfare is not negatively affected by allowing imports. Note though that we, following Brander and Krugman (1983) include foregone foreign profits in the welfare calculations. If we only consider Swedish welfare the increase in domestic profits of banning trade more than makes up for the loss of consumer surplus in all cases (except in the logit case represented in column 5).[22]

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[21] Interestingly, Irwin and Pavcnik (2004) similarly find little difference between the estimated markups under the two forms of competition.

[22] It goes without saying that in reality such a policy would in all likelihood result in a loss of Swedish export earnings as other countries retaliate. One potential area for retaliation would indeed be mineral water, as noted in the introduction Sweden's exports of mineral water are of similar magnitude as its imports.

Let us now turn a discussion of the importance of transport costs for these results, again using our main specification (column 3). The main gain from banning imports comes from replacing foreign high cost production with domestic, lower cost, production. The median marginal cost for foreign producers is 6.29 kronor per liter compared to 5.01 for the domestic brands. This difference can stem from less efficient production, or from higher costs associated with higher quality as well as from transport costs. Less efficient production by foreign firms seems unlikely, given that most imports are large international brand names that sell in many countries. Higher foreign costs because of higher quality are also not likely to be an important explanation. At a first glance, transport costs also seem unlikely as an explanation however. Using transport cost estimates from a government agency (cost per kilometer) and assuming that all water is shipped in 1.5 liter bottles on truck imply that it on average costs 0.2 kronor to ship one liter 1000 kilometers.[23] This is transport costs "on the road" and thus does not include the costs associated with loading and unloading and local distribution. However in the absence of additional reloading for international transport this should be the relevant comparison. To exemplify with a long distance traveler like a bottle of Perrier sold in the northernmost region, which has traveled about 2600 kilometers, transport cost would be 0.50 kronor higher than for a local product. This seems very low compared to the price of 17.5 kronor or the estimated marginal cost of 16.25 kronor. The higher marginal cost may be related to that imports to a larger extent are sold in smaller and/or glass bottles, which would be associated with higher transport costs. Even so, the transport cost share seems low. One way to estimate the transport costs is to run an ordinary least squares regression on the estimated marginal costs explained by distance to the border, distance within Sweden and PREMIUM. The coefficients of interest are reported in equation (8) below with t-statistics in parenthesis.

$$\hat{c}/e = \underset{}{7.29} \quad \underset{(3.09)}{+.0037*\text{distbord}} \quad \underset{(.07)}{-.000067*\text{dist}} \quad \underset{(2.63)}{+1.918*\text{PREMIUM}} \quad + \text{error}$$

$$R2adj=.1749 \qquad (13)$$

The point estimate on distance to the border implies that the estimated cost of shipping one liter 1000 kilometers is 3.7 kronor whereas distance within Sweden is not significant. Using price quotes from

[23] SIKA (2002)

Schenker, a major European transport firm imply a cost of 1.02 kronor to ship one liter 1000 kilometers, considerably lower than our estimate of 3.7, but much higher than the estimated cost of shipping domestically. The Schenker figure is five times as high as the cost of shipping domestically and it seems clear that higher costs of international transportation are an important explanation for the higher foreign marginal costs. In addition to shipping costs there may be additional costs that are related to distance, for instance a need to keep a larger stock. Indeed, higher costs for international trade are consistent with much of the literature on border effects (see for instance Anderson and Van Wincoop, 2004). High trade costs are also consistent with the low overall market share of imports.

Our calculation of the welfare effects of international trade is based on the assumption that the private cost of transportation is equal to its social cost. However, to the extent that negative externalities of transportation, such as pollution and congestion, are not corrected for by for instance diesel taxes, the private cost of transportation under-estimates the social cost. Let us therefore note that much of the concern with two-way trade in very similar products regards the environmental impact of such trade, and the distance traveled by a bottle of water is interesting for that reason. While the average distance would fall if imports are banned the effect is small (from 389 kilometers to 362 kilometers). The effect on distance is limited partly because the overall import share is low but also because the difference in distance between supplier and consumer for domestic and foreign producers is surprisingly small. The quantity weighted average distance is 361 kilometers for domestic waters and 1092 kilometers for imports. If we examine the still water segment only, the average quantity weighted distance is 734 kilometers for domestic brands and 1046 kilometers for imports. Thus cost savings from banning imports on this market are not so much associated with less transports per se, but rather appear related to higher costs of international transport. To exemplify, the major domestic still water, Blåvitt, is bottled in the far north of Sweden. From the south of Sweden this is about equidistant as producers in the French alps. Also, the major imported still water is produced in neighboring Norway.

7. Conclusions

This paper has investigated whether transport cost losses from trade can outweigh the partial equilibrium gains from trade (stronger competition and more brands to choose from). Welfare on the Swedish market for bottled water is perhaps of limited interest in itself. It is a small market (on average Swedes spends less than the equivalent of 20 US dollars per year on this market) and the share of imports in the overall market is low. Rather, we would argue that the case is of interest because we attempted to select an industry where we would be as likely as anywhere to find a negative effect of trade. We thus attempted to evaluate the empirical relevance of the proposition that trade can lower welfare through wasteful transportation. The results show that even in this case we do not find convincing evidence against trade. Our results from this market therefore suggest that we should not be overly concerned with two-way trade in consumer goods that are close to homogenous.

Clearly, as with any model based on simulations the work should perhaps more be seen as a reality based calculation rather than a prediction of what would actually happen if Sweden decided to ban imports. For instance it is likely that we would see some domestic entry into the still water market if the experiment had been undertaken in reality. In response to a banning of imports one could hypothesize that one of the large domestic brands of sparkling would launch a still version of their brand. Rather than hypothesize about such potential entry we note that free entry would make the pro-trade case even stronger. Thus our main conclusion would not be overturned by free entry. At a deeper level one may wonder about the welfare effects of marketing in this industry - are consumers' tastes for different brands just an artifact of marketing? This is clearly a large and interesting issue in its own right and one that we have abstracted from (see Bagwell, 2003 for an overview of the welfare effects of advertising).

One conclusion that is not sensitive to our modeling is the fact that in terms of distance traveled per liter the difference between domestic production and imports is fairly small. One should thus exercise caution before equating international trade with more wasteful transportation than domestic trade. Lastly, one could argue that the drinking of bottled water uses up a lot of resources for little apparent benefit in a country where the tap water is of high quality. From an environmental perspective it is sure to be less important whether bottled water is imported than if bottled water rather than tap water is consumed.

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Appendix. Data definitions and sources for some key variables.

Variable	*Description and source*
PRICE	Price per liter in Swedish kronor. Excludes cost of packaging for water sold in recyclable bottles, where a deposit system is in place. Source: AC Nielsen, Sweden
DEP	Market share in quantity terms of brand *j* in region *r* in period *t.* Total consumption set at 4, 9 and 30 liters per person and month. Population per region from Statistics Sweden, quantity from AC Nielsen, Sweden.
MSNESTX	Market share within nest in quantity terms of brand *j* in region *r* in period *t.* Nesting structure 1; three parallel nests: still, sparkling, outside good. Nesting structure 2; five parallel nests: still premium, still non-premium, sparkling premium, sparkling non-premium, outside good.
MARMON	National marketing expenditure for brand *j* in period *t*. Estimated cost for observed advertising in Swedish newspapers, magazines, Television and radio. Source: Marketwatch AB, Stockholm.
PREMIUM	Dummy variable equal 1 if brand is classified as a premium brand (if marketing expenditures are positive or a well-known international brand name such as Vittel, Evian, San Pellegrino).
DISTANCE	Distance in kilometers to approximate center of population in region *r* (Malmö, Göteborg, Eksjö, Stockholm, Ludvika, Umeå) from the corresponding center in the region of production. For imported brands distance from source to the closest Swedish region + further distance withing Sweden analogously to domestic brands. Distance is as the crow flies: locations from http://www.planetware.com and great circle distances from http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm
BRAND CHARACTERISTICS	Location and whether natural mineral water through labels, correspondence with manufacturers and the Swedish brewers association. Distribution, manufacturer and group details from AC Nielsen.

Table 1. Prices and market shares for leading brands and distributors. Still and sparkling segments.

		May 2000		*May 2001*	
Still water segment ***Brands***	*Share of marketing expenses over total period*	*price/liter*	*market share*	*price/liter*	*market share*
Imsdal (Norway)	0.78	9.63	0.38	12.02	0.44
Evian (France)	0	10.92	0.34	13.15	0.15
Vittel (France)	0			10.78	0.11
Blåvitt (Sweden)	0	6.09	0.19	6.26	0.19
All brands; mean		8.69	0.08	9.04	0.07
(std dev)		(2.84)	(0.14)	(3.81)	(0.12)
HHI			0.30		0.27
Distributors					
Carlsberg			0.72		0.59
Spendrups			0		0.11
KF			0.19		0.19
HHI			0.56		0.41
Sparkling water segment					
Brands					
Vichy Noveau (Sweden)	0.20	7.27	0.28	7.46	0.25
Ramlösa (Sweden)	0.29	7.25	0.28	7.15	0.25
LOKA (Sweden)	0.37	6.96	0.20	6.58	0.23
Blåvitt (Sweden)	0	6.18	0.04	6.37	0.04
All brands; mean		8.17	0.02	8.23	0.02
(std dev)		(4.31)	(0.06)	(5.06)	(0.06)
HHI			0.21		0.19
Distributors					
Carlsberg			0.64		0.56
Spendrups			0.23		0.23
KF			0.04		0.05
HHI			0.47		0.39

Table 2. Estimation of demand. (Standard errors in parenthesis.)[a]

VARIABLE	OLS POOLED	OLS	GMM	OLS	GMM (Main Specification)	GMM	GMM	GMM	GMM	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PRICE	-.209**	-.311**	-.453**	-.085**	-.239**	-.235	-.095**	-.452**	-.262**	-.228 **
	(.006)	(.007)	(.011)	(.005)	(.081)	(.19)	(.07)	(.011)	(.082)	(.081)
LOG(MSNEST1)				. 704**	.698**		.968**		.661**	.714**
				(.007)	(.101)		(.07)		(.102)	(.099)
LOG(MSNEST2)						.998**				
						(.156)				
LOG(NRPROD)								-.344		
								(.177)		
MARMON (*100)	.12**	.032**	.028**	.02**	.019**	. 05**	. 015**	-.029**	.02**	.019**
	(.00)	(.003)	(.003)	(.002)	(.002)	(.014)	(.002)	(.003)	(.002)	(.002)
CONSTANT	-6.81**	-3.63**	-2.46**	-2.93**	-1.43**	-2.3**	-2.04**	-4.20**	-.41	-2.73**
	(.063)	(.145)	(.158)	(.081)	(.542)	(1.08)	(.528)	(.61)	(.54)	(.539)
BRAND CHAR		Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR	Country dummies NATUR PREMIUM	Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR	Country dummies PREMIUM NATUR
OTHER EXPL VARIABLES	SUMMER	regional dummies SUMMER	regional dummies SUMMER	regional dummies SUMMER	regional dummies SUMMER	regional dummies SUMMER	Period and regional dummies SUMMER	regional dummies SUMMER	regional dummies SUMMER	regional dummies SUMMER
INSTRUMENTS			DISTDIES PRICINST		BLP DISTDIES POPUL	BLP DISTDIES POPUL	BLP DISTDIES POPUL	PRICINST DISTDIES	BLP DISTDIES POPUL	BLP DISTDIES POPUL
Sample	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Total market: Liter per person and month	9.025	9.025	9.025	9.025	9.025	9.025	9.025	9.025	4	30
Adj R2	0.25	0.51		0.8						
Root MSE	2.31	1.85	1.6	1.17	1.3	1.6	1.3	1.6	1.3	1.3
NOBS	6786	4898	4898	6552	6387	6387	6387	4898	6387	6387

a) Variables starred with ** are significant at the 1 percent level, with * at the 5 percent level.

Table 3. Implied own-price elasticities and markups for May 2001. Descriptive statistics for May 2001.

Main specification (col. 5)	own price elasticity 1st	10^{th}	median	90^{th}	99th	markup (p- $\hat{c}/e$)/p 1st	10^{th}	median	90^{th}	99th
all brands	-18.45	-13.10	-4.94	-3.30	-2.57	.054	.076	.208	.416	.605
imported brands	-20.56	-16.07	-5.58	-3.61	-2.61	.048	.062	.183	.277	.384
domestic brands	-15.07	-10.44	-4.71	-2.96	-2.4	.06	.101	.228	.453	.699
	Price 1st	10^{th}	median	90^{th}	99th	$\hat{c}/e$, marginal cost 1st	10^{th}	median	90^{th}	99th
all brands	3.29	4.23	6.63	16.56	23.33	1.19	2.51	5.17	15.30	22.07
imported brands	3.29	4.58	6.77	20.35	26	2.03	3.31	6.29	19.08	24.73
domestic brands	3.04	3.91	6.48	13.24	19.07	1.08	2.22	5.01	11.63	17.81

	Markup for Alternative specifications; 1st	*10^{th}*	*median*	*90^{th}*	*99^{th}*
Logit (col 3)	.094	.111	.335	.523	.685
Not instr (col 4)	.149	.21	.575	1.15	1.67
Cournot (col 5)	.054	.763	.217	.329	.416
Altern (col 7)	.014	.02	.057	.131	.226

Calculations based on estimates from Table 2.

Table 4. Comparison of welfare under trade with simulated values when no imports and blocked entry. All of Sweden for May 2001, million kronor.

	Bertrand Nested logit α=-.239 σ=.698 (1)	Bertrand Nested logit α=-.239 σ=.698 (2)	Bertrand Nested logit α=-.239 σ=.698 (3)	Bertrand Nested logit α=-.239 σ=.698 (4)	Bertrand Logit α=-.453 (5)	Cournot Nested logit α=-.239 σ=.698 (6)	Bertrand Nested logit α=-.235 σ=.968 (7)
COUNTERFACTUAL	10 percent higher marginal costs for imports	10 percent lower marginal costs for imports	No imports	Domestic brands at counterfactual prices and imports at current prices	No imports	No imports	No imports
Current consumer surplus	3.66	3.66	3.66	3.66	1.93	3.66	9.24
Counterfactual consumer surplus	3.63	3.70	3.57	3.64	1.86	3.58	9.12
Current aggregate foreign profits	0.44	0.44	0.44	0.44	0.66	0.53	0.13
Current aggregate domestic profits	13.7	13.7	13.7	13.7	16.5	14	4.58
Counterfactual aggregate domestic profits	13.8	13.5	14.2	14.2	16.6	14.5	5.30
Total difference in welfare (CS+PS);Current-counterfactual	-0.03	-0.16	0.01	-0.11	0.65	0.08	-0.46
Total difference in welfare (CS+PS) in percent of welfare under current situation; Current-counterfactual	-0.14	-0.89	0.03	-0.6	3.42	0.42	-3.34
Average cost under trade	5.14	5.14	5.14	5.14	4.72	5.09	6.39
Average cost, counterfactual	5.12	5.21	5.03	5.16	4.63	4.99	6.29

Calculations based on estimates from Table 2.

Figure 1. The welfare effects of reciprocal dumping.

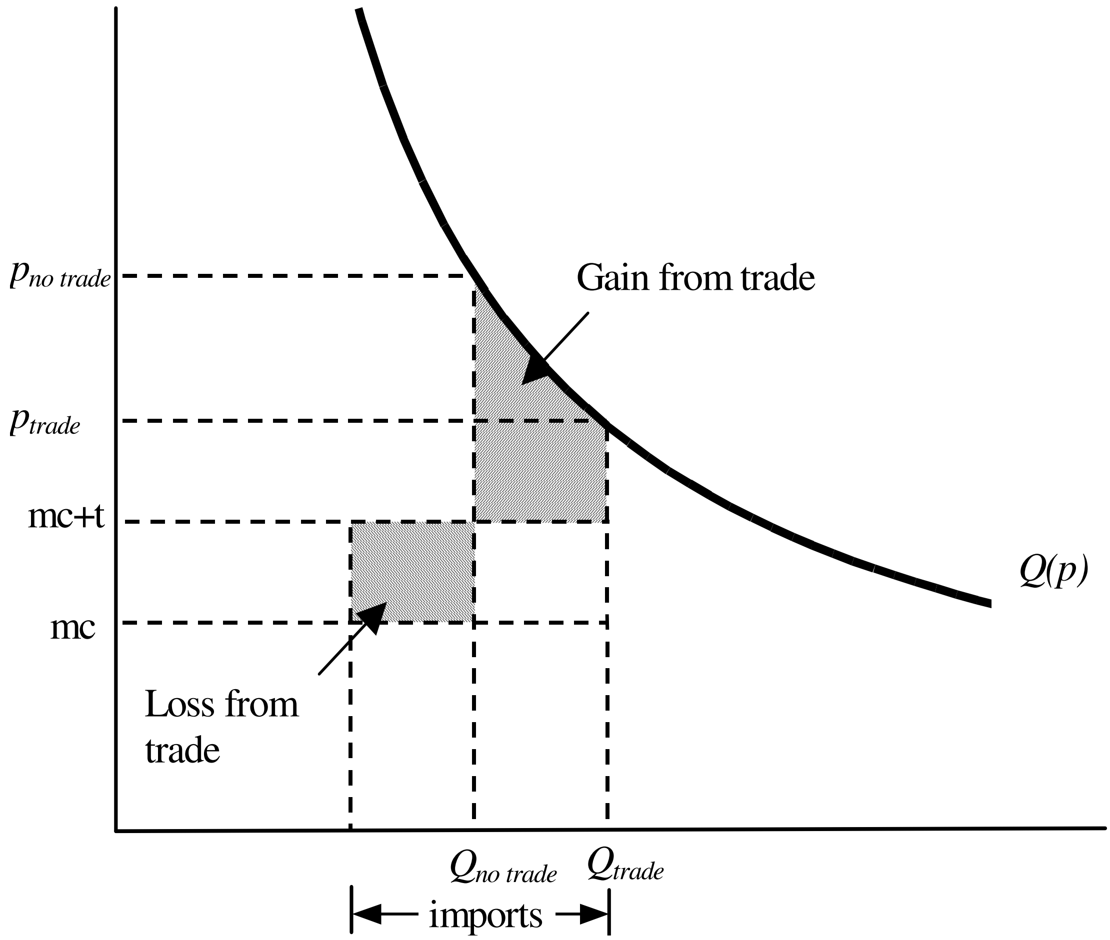
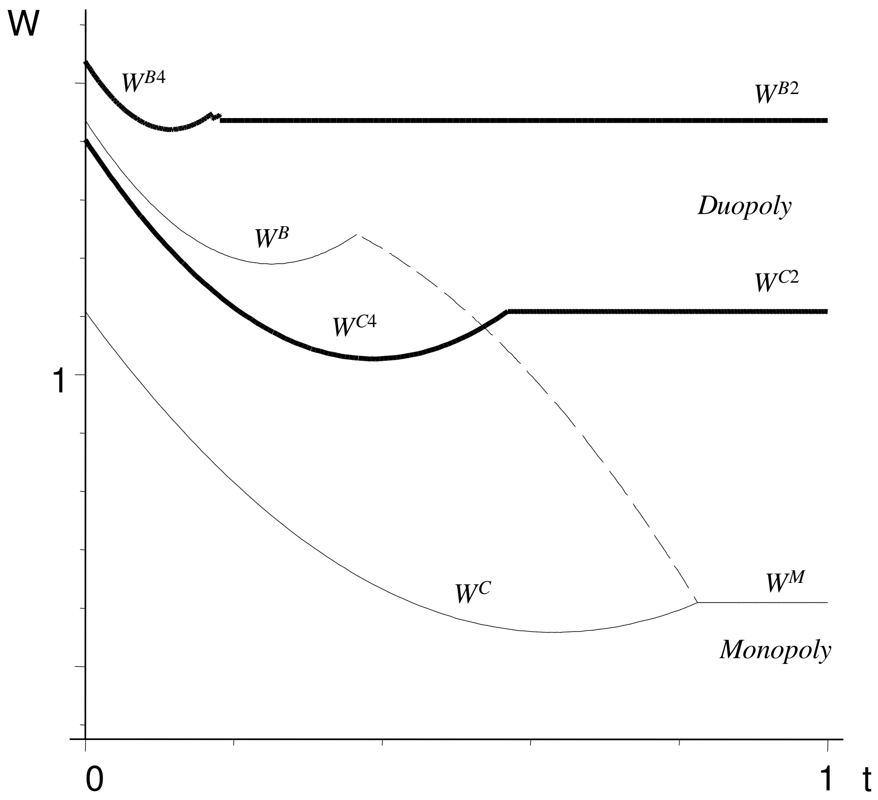


Figure 2. Welfare as a function of transport costs with differentiated products under different assumptions about competition.



$Parameters : a = 2, b = 1, c = 0.5, \theta = 0.9$

Figure 3. Still water segment, market shares of leading brands, 1998-2001.