Manufacturers and Retailers in the Global Economy

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Abstract

In many consumer-goods industries big-box retailers have become the gatekeepers of product variety. Manufacturers come knockin’ on these retailers’ doors to gain access to consumers. We first construct a general-equilibrium model of manufacturing and retailing in a global economy to study the causes and consequences of this development and how resources are being allocated between manufacturing and retailing. We then investigate how the equilibrium in the retailing and manufacturing sectors reacts to shocks such as market integration or technological changes. By doing so we are able to shed light on the circumstances under which multi-product retailers might increase their assortment, sales per product might fall, slotting allowances may become more important, and more resources might be allocated to retailing, as well as the welfare impact of these changes. In the process we identify a novel gain from trade, consisting of efficiency gains in the vertical distribution chain.

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1 Introduction

This paper develops a simple general equilibrium model with retailers acting as intermediaries between manufacturers and consumers. The paper has two main purposes. The first one is to propose a model capturing key features of the retailing and of the manufacturing industry in order to understand important characteristics of the equilibrium in these two sectors and how resources are being allocated between them. The second purpose is to investigate how this allocation of resources and the equilibrium in the retailing and manufacturing sectors reacts to shocks such as market integration or technological changes. By doing so we are able to shed light on the circumstances under which multi-product retailers might increase their assortment, sales per product might fall, slotting allowances may become more important, and more resources might be allocated to retailing, as well as the welfare impact of these changes.

When considering intermediation and more specifically retail trade, several stylized facts should be taken into account. The first one is that, over the last 40 years, there has been a fundamental increase in the importance of services in general and of wholesale and retail trade in particular. In the United States, for instance, this shift took place especially strongly from the end of the 1970s and it took place at the expense of manufacturing. Simply put, US employment fell in manufacturing between 1970 and 1990, but rose by 71% in wholesale and retail trade (see Blum, 2008). Today (to check), the overall US retail industry is the second largest industry responsible for about 10.5% of employment (US Bureau of Labor Statistics, 2009) and $4.2 trillion annual sales (Betancourt, 2004).

Second, retailers are typically multi-product retailers, selling often a large number of products. The case of the grocery sector is especially revealing in that regard. In the US, this sector is dominated by supermarkets (i.e. with sales in excess of $2 million annually). In 2008, there were 35,394 supermarkets selling on average 46,852 items. The average number of products sold in 1970, employment in wholesale and retail trade was 22% lower than in manufacturing and it was 31% higher in 1990. The switch in employment remains valid when corrected for the fact that retail and wholesale trade have a greater proportion of part-time jobs than manufacturing.

In 2002, the sales of supermarkets represented 77% of all US grocery sales for a total sale value of $547.1 billion and they collectively employed 3.2 million workers; see www.fmi.org.
by a supermarket has also increased significantly over the last 30 years and, with it, the size of supermarkets which has reached an average size of 46,755 square feet in 2008. Interestingly, this has resulted in a steady increase in the ratio of square footage to sales (see Klein and Wright, 2006, Figure 1).

Third, slotting allowances, which are lump-sum payments made by manufacturers to retailers to carry their products, are today an important feature of retailing used in a variety of product lines such as grocery food, tobacco, household supplies, health and beauty aid, textiles, shoes and footwear, and automotive parts (see Sundhir and Rao, 2006; Wilkie et al., 2002). These allowances, which first emerged in 1982-84, are often explained by the fact that retailers are powerful gatekeepers. They are gatekeepers because they know that many products are new and that many of them fail, and they are powerful because, as large multi-product retailers, they often have little to lose by not selling a particular variety. Importantly, slotting allowances are not used by all retailers in a given segment of the market and they can vary a lot across products. This suggests that they are less the result of retailer’s characteristics, such as whether they are powerful or not, than of the retailer-manufacturer relationship. Our general equilibrium model not only sheds light on these slotting allowances but it does so by making clear what is meant by powerful retailers with respect to manufacturers.

Fourth, intermediaries, whether at the wholesale or at the retail level, often engage in international trade. Bernard and al. (2010) documents international trade activities at the wholesale and retail activities in the US and find that 13% of importing firms are pure retailers responsible for a small proportion of overall US import value but 35% of the value of imports from China. Basker and Van (2008b) find that over the period 1997 to 2002 U.S. imports from China and other less-developed countries rose especially quickly in retail sectors and that Wal-Mart alone accounts for around 15% of total US imports from China (Basker and Van, 2008a). This phenomenon

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3In 2002, the number of supermarkets was 32,981 selling on average 35,000 items and had an average size of 44,000 square feet; see FTC (2003).

4FTC (2003) reports, for instance, that slotting allowances are higher and more prevalent for products like ice cream and salad dressings than they are for bread and hot dogs.

5It is also important to make clear that slotting allowances are not associated with high market concentration. Although concentration in retailing has been rising, often faster than at the manufacturing level (see Raff and Schnitt, 2010), it is important to keep market concentration in retailing separate from the use of slotting allowances and from the concept of ‘powerful’ retailers.
is not limited to the United States and has taken place in many industries, including electronics, computers, cameras, housewares, toys, games, clothing, footwear and groceries.\footnote{For instance, in 2003, the share of imports in Canada was 55\% for clothing, 82\% for clothing accessories, 86\% for footwear, 100\% for audio, video, small electrical appliances, as well as for toys and games (Jacobson, 2006, Table 33).} Blum and al. (2009, 2010) find that considerable size difference exists between matching foreign exporters and importers in Chile. In particular, they find that large multi-product retailers facilitate trade for small exporters (and small exporting countries) because they provide an efficient way of reaching consumers who otherwise would be difficult to find.

We use these stylized facts to build a general equilibrium model with monopolistic competition among retailers and among manufacturers. It has three main components. The first is a standard Krugman (1980) monopolistic-competition manufacturing sector. Each manufacturer produces a single variety of a consumer good with a technology involving fixed and constant marginal costs. Of course, this is a simplification as manufacturers are often multi-product firms as well; however they produce a much smaller number of varieties than sold by retailers (see Eckel et al., 2009 for Mexico). The second component is the retailing sector through which all differentiated products are distributed. Retailers choose their product assortment and retail prices. These two choices give them power although limited one since competition is monopolistic. Moreover, each of them understands that distributing more varieties within its own store leads to a cannibalization effect in the sense that the demand for a new product ‘eats up’ some of the demand for the other varieties sold in the store. We model this cannibalization effect as in Feenstra and Ma (2008), who have developed this idea for multi-product manufacturers.\footnote{See Dhingra (2010) for an alternative model of cannibalization and for showing that intra-firm cannibalization is empirically relevant at the manufacturing level.} Importantly no variety is sold by more than one retailer; thus all retailers sell differentiated products that are unique to their store.

The third component is the critical link between the manufacturers and the retailers. We follow Raff and Schmitt (2009a) in distinguishing between buyer and seller power. In the first instance, we assume that retailers have buyer power in the sense that each retailer not only chooses their assortment and retail prices but also offers a two-part tariff to manufacturers that the latter may accept or reject. This take-it-or-leave-it offer to manufacturers is composed of a wholesale price paid for each unit bought from a manufacturer...
and of a lump-sum payment between the retailer and the manufacturer. Because
the retailer has all the bargaining power, it has an incentive to offer a
wholesale price that corresponds to the marginal cost of the manufacturer.
This implies that the manufacturer has to receive a lump-sum payment from
the retailer to cover his fixed cost. Obviously this lump-sum payment is not
a slotting allowance but simply a necessary payment for the manufacturer
to survive and to produce, and at the same time for the vertical relationship
between the retailer and the manufacturer to be ‘efficient’ given the presence
of fixed costs. The retailer chooses optimally the number of varieties he
distributes since he can take into account the cannibalization effect associ-
ated with taking on more products. Hence in this environment there are no
slotting allowances, even though lump-sum payments are being made. We
characterize the general equilibrium of the economy, in which both retailers
and manufacturers earn zero profits, and the labor market clears.

In the second instance, we consider the case of seller power. In this case
it is the manufacturers that make take-it-or-leave-it offers to the retailers.
These offers again consist of two-part tariffs. The distinguishing feature
of this case is that, because retailers carry many products and still choose
their product assortment, manufacturers are unable to capture the entire
profit of the retailer. Rather, each manufacturer is only able to extract
an amount equal to the contribution of its product to the retailer’s profit.
This induces manufacturers to set wholesale prices above its marginal cost.
In addition, since the monopolistically competitive retailers also charge a
positive mark-up, seller power leads to double marginalization. Another
way to understand the role of slotting allowances in this model is to note
that in equilibrium manufacturers have to induce retailers to distribute their
product by compensating them for the cannibalization effect. This allows
us to characterize precisely slotting allowances and to determine forces that
affect them.

Comparing the equilibria under buyer power and under seller power not
only shows that slotting allowances emerge only in the case of seller power\(^8\),
but also that more resources are allocated to retailing under seller power
than under buyer power as seller power brings more product variety, bigger
retailers and higher retail prices than under buyer power. As a result, buyer

\(^8\)This is consistent with differences in the use of slotting across different retail sectors.
For instance, it appears that Wal-Mart does not get slotting allowances from its suppliers
whereas other (smaller) retailers do.
power leads to higher social welfare than seller power.

Next we consider the comparative static properties of the model and we concentrate on two types of shocks. The first one is linked to market integration by considering two different types of integration. One is trade liberalization by allowing manufacturers to export their product to more countries and by allowing retailers to have access to more differentiated products from different source countries. The other is to consider that retailer’s services themselves can be accessed from more countries allowing each retailer in a given country to reach and to sell to more consumers. We identify a novel source of gains from trade, and identify the conditions under which these gains may arise. In particular, we show that the gains from trade derive not only from lower average production costs and greater product variety as in standard monopolistic competition models, but also from greater efficiency in the vertical distribution chain. The second type of shock is a technological change whether with respect to retailer’s technology. We find that both technological changes and market integration may explain the rise in resources devoted to retailing with respect to manufacturing but that only technological changes in retailing are consistent with the increase in average market share enjoyed by retailers and a higher slotting allowance per variety.

Our paper is linked to the literature in the following way. There is a growing literature on intermediaries in international trade and in particular on the role of intermediation. It includes Akerman (2010), Antras and Costinot (2010), Blum et al. (2009), Bardhan et al. (2009), and Eckel (2009). Our paper is closer in spirit to Eckel (2009) which also studies retailers and manufacturers in a general equilibrium model with monopolistic competition. However, his results critically depend on retailers facing a fixed cost that increases with their assortment. By contrast, retailers in our model are able to spread their fixed cost over more sales and more varieties when trade is liberalized. Thus, contrary to Eckel, international trade in our model unambiguously raises welfare and we show that these gains are especially high in sectors exhibiting seller power and thus slotting allowances.

The role of international trade on retailers and the amplifying role of scale economies and technological change have been analyzed by Basker and Van (2008a) who investigate the effects of trade liberalization on competition between a chain retailer (such as Wal-Mart) and small single-market retailers. They find that trade liberalization raises the size of the chain retailer, and

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9 This is consistent with stylized facts reported by Basker (2007) and Holmes (2008).
that the growth of the chain gives an additional boost to imports. Their model is a partial equilibrium model and focuses its attention on big-box retailers such as Wal-Mart. Retail markets have also been investigated by Campbell and Hopenhayn (2005) who show that establishments tend to be larger in larger markets.

Other papers examining the interaction between trade liberalization and retail market structure include Raff and Schmitt (2005, 2006, 2009a,b). Raff and Schmitt (2005, 2006) examine the effects of trade liberalization on markets where manufacturers have power over retailers, while Raff and Schmitt (2009a) studies the effects of trade liberalization in a partial equilibrium oligopoly model with buyer power. It shows that the gains from trade tend to be greater in industries characterized by seller power as opposed to buyer power, and that trade liberalization in the case of buyer power may even reduce social welfare. Raff and Schmitt (2009b) examines the effects of trade liberalization on retail market structure, retail mark-ups and the pass-through of import into consumer prices when retail market structure is endogenous and retailers are heterogenous. Francois and Wooton (2008) show that market structure in distribution becomes increasingly important for trade as tariffs fall; and Richardson (2004) studies market access to retail distribution.

The literature on slotting allowances includes Shaffer (1991) where these allowances as tools controlled by and for the benefit of imperfectly competitive retailers whose purpose is essentially to soften price competition in retailing and shift rents from manufacturers to retailers. Others such as Sullivan (1992) and Klein and Wright (2006) view slotting allowances as a price for scarce shelf space.

The paper continues as follows. In Section 2, we present a simple general equilibrium model with manufacturers and retailers. The equilibrium in a closed economy is presented in Section 3 first when retailers have buyer power and then when manufacturers have seller power. Comparative static results are presented in Section 4 with respect to market integration and in Section 5 with respect to technological changes in retailing. Section 6 concludes.

2 The Model

In this section, we develop a simple model of manufacturing and retailing in general equilibrium. Consumers have Dixit-Stiglitz preferences over dif-
differentiated goods that are produced by manufacturers and distributed by monopolistically competitive retailers. Of particular interest is the wholesale market, in which manufacturers and retailers interact. Prices in that market are determined through bargaining and thus depend on the bargaining power of the two parties. We first develop a model of a single economy and, in a later section, turn to a world economy consisting of identical countries 1, ..., C.

2.1 Households
The economy has $L$ consumers/workers, each endowed with one unit of labor. Preferences are given by the utility function

$$U = y_0 + \rho \ln(Y), \quad \rho < 1,$$

(1)

where $y_0$ denotes the consumption of an outside good, taken as the numeraire, and $Y$ is the aggregate consumption of the differentiated manufacturers. Letting $y(i)$ denote the quantity consumed of variety $i \in \Omega$, we assume that $Y$ takes the following CES form:

$$Y = \left( \int_{i \in \Omega} y(i) \frac{\eta}{\eta - 1} \, di \right)^{\frac{\eta}{\eta - 1}},$$

(2)

where $\eta > 1$ is the elasticity of substitution between varieties.

Labor, the only factor of production, is inelastically supplied and perfectly mobile between the production and the retailing sectors. The numeraire good, $y_0$, is produced by a competitive industry under constant returns to scale and a unit labor requirement of one. The price of labor is hence also equal to one. Maximizing utility subject to the consumer’s budget constraint yields the following demand for variety $i$:

$$y(i) = \frac{\rho L}{P^{1-\eta}} p(i)^{-\eta},$$

(3)

where $p(i)$ is the retail price of variety $i$, and $P$ is the CES price index.

2.2 Firms
There are two kinds of firms, manufacturers and retailers. We have in mind an economy in which retailers are large relative to manufacturers in the
sense that each manufacturer produces a single variety and sells that variety exclusively through one retailer, whereas retailers carry many varieties. Each retailer decides what mass of varieties to carry. The number or retailers and the mass of varieties carried by each retailer are endogenously determined, which implies that the total mass of manufacturers is also endogenous.

Our modelling of retailers as multi-product firms follows Feenstra and Ma (2008) who use this approach to study producers. There are \( R \) retailers. The mass of varieties handled by retailer \( r \) is \( M_r > 0 \). We assume that each retailer carries a different set of varieties, and choose the ordering of the products such that retailer 1 carries the first \( M_1 \) varieties, retailer 2 the following \( M_2 \) varieties, and so on. Hence the total mass of varieties consumed is \( \bar{M} \equiv \sum_{r=1}^{R} M_r \), and the aggregate consumption of varieties is

\[
Y = \left( \int_{0}^{M_1} y(i)^{\frac{\eta-1}{\eta}} di + \int_{M_1}^{M_1+M_2} y(i)^{\frac{\eta-1}{\eta}} di + \cdots + \int_{M-M_R}^{\bar{M}} y(i)^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}}.
\] (4)

Similarly, the CES price index is given by

\[
P = \left( \int_{0}^{M_1} p(i)^{1-\eta} di + \int_{M_1}^{M_1+M_2} p(i)^{1-\eta} di + \cdots + \int_{M-M_R}^{\bar{M}} p(i)^{1-\eta} di \right)^{\frac{1}{1-\eta}}.
\] (5)

Since wholesale prices will be identical across varieties sold by a retailer, he will set the same retail price for all varieties in his assortment. Denoting the price retailer \( r \) charges for each of the varieties he sells by \( p_r = p(i) \), the CES price index (5) simplifies to

\[
P = \left( \sum_{r=1}^{R} M_r p_r^{1-\eta} \right)^{\frac{1}{1-\eta}}.
\] (6)

Since retailers are big, a change in \( p_r \) has an effect on the price index \( P \) as long as \( M_r > 0 \). It is both realistic and useful to assume that retailers take this into account when setting prices. The usefulness of this assumption, as explained further below comes from the fact that retailers acknowledge that adding a product to their assortment lowers the demand for the other products they carry. This "cannibalization" effect becomes bigger as the retailer adds products, thus putting a limit on product assortment. To see how this works, consider the price elasticity of demand for each variety sold by
retailer \( r \). Unlike in the usual CES framework, this elasticity is not constant but rather depends on \( r \)’s market share, \( s_r \):

\[
\frac{\partial y_r}{\partial p_r} y_r = \eta(1 - s_r) + s_r, \tag{7}
\]

with

\[
s_r = \frac{M_r p_r y_r}{\sum_{r=1}^{R} M_r p_r y_r} = \frac{M_r p_r^{1-\eta}}{\sum_{r=1}^{R} M_r p_r^{1-\eta}}. \tag{8}
\]

Hence for \( M_r > 0 \), the price elasticity is decreasing in retailer \( r \)’s market share.

Retailers are homogeneous in that they all use the same technology; we may therefore drop retailer subscripts whenever this can be done without causing confusion. Retailing involves a fixed cost, \( k_0 \), as well as a cost per variety carried, \( k_1 \). The former include the usual headquarter costs, including payments for information technology that plays a crucial role in retailing. An important example of the costs that arise per variety carried is the cost of shelf space. This and other costs related to increasing the product assortment are arguably more important than the marginal cost of selling another unit of a given variety. We hence postulate \( k_1 > 0 \) but normalize the marginal cost of selling a unit of any variety to zero. Hence the labor requirement of a retailer carrying a mass of \( M \) varieties is given by

\[
l_r = k_0 + k_1 M. \tag{9}
\]

Manufacturers are single-product firms; their technology exhibits increasing returns to scale. We follow Krugman (1980) in assuming that production requires a fixed labor input, \( \alpha \), and a variable labor input, \( \beta \), both identical across firms. Hence the total labor input required to produce \( y \) units of a given variety is given by

\[
l^m = \alpha + \beta y, \quad \alpha, \beta > 0. \tag{10}
\]

### 2.3 Bargaining Power

The manufacturing and the retailing side of the economy are linked through the wholesale market. With manufacturers and retailers both potentially exercising market power on this market, the distribution of bargaining power plays a crucial role in determining market structure and market outcomes.
We follow Raff and Schmitt (2009a) in considering two polar cases by allocating all bargaining power either to the retailers (buyer power) or to the manufacturers (seller power). In the case of buyer power, retailers make take-it-or-leave-it offers to the manufacturers; each retailer determines the mass of varieties he wants to carry and hence how many manufacturers to make an offer to. Seller power implies that the manufacturers make offers to the retailers, which the later may accept or reject; thus each retailer still determines how many varieties to carry. This puts retailers in a unique position as gatekeepers to the consumer market, irrespective of whether there is buyer or seller power. As we will show below, this has important implications for how consumer goods markets function.

An implicit assumption already used above (and one that is natural in the context of monopolistic competition) is that each variety is distributed exclusively by one retailer, for otherwise we would have to model Bertrand competition between the retailers selling the same variety. An offer in each case consists of a two-part tariff \((w, T)\), where \(w\) is the wholesale price and \(T\) is a payment/transfer from the retailer to a manufacturer; \(w\) and \(T\) may be positive or negative. When necessary to avoid confusion we will use subscripts for retailers or manufacturers, depending on who makes the offer.

3 Equilibrium in the Closed Economy

In this section we characterize the equilibrium of the closed economy. For given \(w\) and \(T\), a retailer chooses the retail price \(p\) and the mass of varieties \(M\) to maximize:

\[
\max_{p,M} \Pi^r = M \,(p - w)\,y - M \,(k_1 + T) - k_0. \tag{11}
\]

Substituting for \(y\) from (3), the corresponding first-order condition with respect to the retail price reads:

\[
p = \left(1 + \frac{1}{(\eta - 1)(1 - s)}\right)w. \tag{12}
\]

The higher is a retailer’s market share, \(s\), the less elastic is the demand he faces and the higher therefore his mark-up. The first-order condition with respect to \(M\) can be written as:

\[
(p - w)\,y - s\,(p - w)\,y = k_1 + T. \tag{13}
\]
The left-hand side of (13) gives the marginal benefit of adding a variety. It has two elements: the first term is the additional operating profit generated by this variety. The second term represents the cannibalization effect, that is, the reduction in the demand for the other varieties sold by the retailer times the mark-up on these other varieties. The higher the retailer’s market share, the bigger is this cannibalization effect. On the right-hand side of (13) we have the marginal cost of adding a variety, which consists of the direct cost, \( k_1 \), and the transfer to the manufacturer producing the additional variety.

Using (12) to substitute for \( p \) in (13) we can solve for the sales per variety:

\[
y = \frac{(k_1 + T)(\eta - 1)}{w}. \tag{14}
\]

To close the model we impose zero-profit conditions on retailers and manufacturers, and a labor-market clearing condition on the differentiated goods sector. The zero-profit condition for retailers is obtained by using (12) - (14) in (11) and setting the resulting profit equal to zero. This yields an expression for the mass of varieties carried by each retailer as a function of the number of retailers:

\[
M = \frac{k_0}{(k_1 + T)} (R - 1). \tag{15}
\]

The second equation linking \( M \) and \( R \) is the labor-market clearing condition. Since in equilibrium a fraction \( \rho \) of the labor force is employed in the differentiated goods industry (i.e., in manufacturing and in retailing), this condition can be written as:

\[
R k_0 + R M (k_1 + \alpha) + R M y \beta = \rho L. \tag{16}
\]

The zero-profit condition for manufacturers implies a relationship between \( T \) and \( w \), namely the transfer from the retailer to the manufacturer has to offset any shortfall between the fixed cost of production, \( \alpha \), and the rents earned by the manufacturer, \((w - \beta)y\); this transfer can, of course, be negative:

\[
T = \alpha - (w - \beta)y. \tag{17}
\]

It is helpful to think of this transfer as the net amount of two payment flows. First, in order to be willing to supply output a manufacturer obviously must receive a compensation for his fixed cost. Second, rents earned by the manufacturer flow in the opposite direction as payment from the manufacturer to the retailer carrying his product. This second payment has a natural
interpretation in the context of our model, namely as a slotting allowance. Denoting the slotting allowance by $A$, we have:

$$A \equiv \alpha - T = (w - \beta)y.$$  \hfill (18)

Slotting allowances thus arise only if the wholesale price exceeds the marginal production cost so that manufacturers earn a rent. Naturally, if manufacturers do not earn any rent, they are unable to pay a retailer for adding products to his assortment.

We can now examine the determination of $w$ and $T$. We start out with the case of buyer power. As will become clear below, this case is a useful benchmark, since it yields a second-best allocation. The case of seller power involves distortions in the economy that, as we will show, reduce social welfare compared to the case of buyer power.

3.1 Buyer Power

For a retailer who has all the bargaining power it is easy to establish that his optimal strategy is to choose a two-part tariff such that $w^B = \beta$ and $T^B = \alpha$, where the superscript $B$ denotes the case of buyer power. A wholesale price equal to the marginal cost of production implies that there is no double marginalization, and the transfer is set so as to extract the entire profit from each of the manufacturers whose variety the retailer carries. We see from (18) that the slotting allowance in this case is equal to zero, that is, $A^B = 0$, as manufacturers do not earn any rents that could be captured by the retailer.

Using this two-part tariff in (14) - (16), we can compute the equilibrium number of retailers:

$$R^B = \frac{1}{\eta} \left( \frac{\eta - 1}{2} + \sqrt{\frac{(\eta - 1)^2}{4} + \frac{\eta \rho L}{k_0}} \right).$$  \hfill (19)

Moreover, we obtain:

$$M^B = \frac{k_0}{(k_1 + \alpha)} (R^B - 1),$$  \hfill (20)

$$y^B = \frac{(k_1 + \alpha)(\eta - 1)}{\beta},$$  \hfill (21)

$$p^B = \left( 1 + \frac{1}{(\eta - 1)(1 - s^B)} \right) \beta,$$  \hfill (22)
where \( s^B = 1/R^B \). It is easy to establish that \( R^B \), \( M^B \) and \( p^B \) decrease with higher values of the elasticity of substitution, \( \eta \), while \( y^B \) rises. Note also that a higher marginal cost of retailing, \( k_1 \), and a higher fixed cost of production have the same effects by decreasing the retailer’s assortment and increasing the volume of sales of each variety without affecting the number of retailers.

### 3.2 Seller Power

Now consider the case where a manufacturer is the "first mover" and makes a take-it-or-leave-it offer to a retailer. This offer has to maximize the manufacturer’s profit,

\[
\max_{w,T} \Pi^m = (w - \beta)y + T - \alpha, \tag{23}
\]

subject to the retailer’s participation and incentive constraints. In particular, when accepting an offer from a manufacturer specifying a wholesale price \( w \), a retailer with market share \( s \) will set a retail price according to (12). The retailer only accepts to carry a manufacturer’s variety if the marginal benefit of adding this variety exceeds the marginal cost. That is, the transfer cannot exceed the amount that makes (13) hold with equality. Solving (13) for \( T \) and using the resulting expression in (23), the first-order condition with respect to \( w \) is

\[
\frac{\eta y}{\eta - 1} + \left( \frac{\eta w}{\eta - 1} - \beta \right) \frac{dy}{dp} \frac{dp}{dw} = 0. \tag{24}
\]

We may obtain \( dy/dp \) from (7) and \( dp/dw \) from (12) and then solve (24) for the equilibrium wholesale price under seller power, \( w^S \):

\[
w^S = \beta + \frac{s\beta}{\eta(1 - s)} > w^B \quad \text{for } s > 0. \tag{25}
\]

Thus the wholesale price under seller power exceeds the manufacturer’s marginal cost by a margin that is increasing in the retailer’s market share, \( s \). The reason for this inefficiency is straightforward: since a manufacturer can only extract his contribution to the retailer’s profit, he has an incentive to raise his profit by demanding a mark-up over marginal cost on his sales to the retailer. Seller power thus leads to double marginalization, and, as a result, the output of an individual variety has to be lower than under buyer power:

\[
y^S = (1 - s)\frac{(k_1 + \alpha)(\eta - 1)}{\beta} = (1 - s)y^B < y^B \quad \text{for } s > 0. \tag{26}
\]
From (17) we see that the equilibrium transfer between a retailer and manufacturer is:

\[ T^S = \alpha - \frac{s(\eta - 1)}{\eta} (k_1 + \alpha) < T^B. \] (27)

This transfer is smaller than in the buyer power case by an amount equal to the slotting allowance:

\[ A^S = s \frac{(\eta - 1)}{\eta} (k_1 + \alpha). \] (28)

A first result thus emerges from our discussion:

**Proposition 1** In equilibrium, slotting allowances arise under seller power but not under buyer power. Slotting allowances are increasing (i) in the marginal cost incurred by a retailer when adding a variety to his assortment, \(k_1\); (ii) in the manufacturer’s fixed cost, \(\alpha\); (iii) in the retailer’s market share, \(s\); and (iv) in the elasticity of substitution between varieties, \(\eta\).

We can easily solve for the equilibrium number of retailers, and find that \(R^S = R^B\), as defined in (19). That is, the number of retailers and hence retail market concentration is the same whether there is seller or buyer power: \(s^B = s^S\). It then follows immediately from (15) and (27) that:

\[ M^S = \frac{\eta}{\eta(1-s) + s} M^B > M^B. \] (29)

Concerning retail prices, we can see from (12) and (22) that:

\[ p^S = p^B + \left( 1 + \frac{1}{(\eta - 1)(1-s)} \right) \frac{s\beta}{\eta(1-s)} > p^B. \] (30)

The above results can be summarized as follows:

**Proposition 2** In a closed economy and relative to seller power, buyer power leads to (i) the same number of retailers, (ii) a smaller product assortment per retailer, (iii) a smaller mass of varieties, (iv) lower retail and wholesale prices, and (v) higher output of each variety.
3.3 Resource Allocation and Welfare under Buyer and Seller Power

The analysis in the previous subsection has shown that the distribution of bargaining power in the wholesale market has important implications for market structure and efficiency in the closed economy. We now show that this is also true for the allocation of labor between manufacturing and retailing as well as for social welfare.

It is immediate from (20) and (29) that resources devoted to retailing are greater under seller power than under buyer power (i.e., \( R^S(k_0 + k_1M^S) > R^B(k_0 + k_1M^B) \)). Given fixed resources devoted to the differentiated good industry \((\rho L)\), this implies that more resources are devoted to the production of differentiated products under buyer power than under seller power.

The fact that buyer power brings lower retail prices along with a smaller mass of varieties makes a welfare comparison between the two cases non-trivial. However, notice that the aggregate consumption of the differentiated products under buyer power is captured by:

\[
Y^B = \left( R^B M^B \right)^{\frac{\eta}{\eta - 1}} y^B,
\]

whereas in the case of seller power (26), (20) and (29) can be used to obtain:

\[
Y^S = \left( \frac{\eta}{\eta(1-s) + s R^B M^B} \right)^{\frac{\eta}{\eta - 1}} (1-s)y^B.
\]

Since, according to (1), consumers spend a fixed share of their income on the differentiated goods, it follows that aggregate consumption is greater under buyer than under seller power.

These results can be summarized as follows:

**Proposition 3** In a closed economy, buyer power implies fewer resources devoted to retailing and higher social welfare than seller power.

**Proof**: see Appendix.

The main reason why seller power leads to lower welfare compared with buyer power is that it is associated with inefficiencies (double marginalization). This inefficiency is coming from the fact that retailers sell a whole range of products while the manufacturers are single-product firms. This implies that retailers retain some power even in the case where manufacturers have seller power as the latter are only able to extract the contribution of their product to the retailer’s profit.
4 The Effects of Economic Integration

Consider now a world consisting of identical countries the number of which is captured by the index $1, ..., C$. We may examine the effects of economic integration by increasing the number of countries in the world economy and studying how this affects the equilibrium. Our setup allows us to distinguish between two types of market integration, namely the integration of product markets and the full integration of all the markets (product and retail markets). By product market integration we mean a scenario in which goods become tradable across countries but retail services remain non-tradable. Manufacturers are thus able to reach more consumers by exporting goods to foreign markets. From the point of view of retailers, however, the number of households served does not change when moving from one country to $C$ countries, simply because there is no cross-border shopping.

In the case of full market integration, retail services like products become tradable. Retailers are thus able to access foreign customers, for instance, through the use of the Internet, and they sell domestic as well as foreign products. This is of course an extreme case but, in the context of the present model, one which is closest to market integration a la Krugman (1980).

4.1 Product-Market Integration

Examining product-market integration requires a few straightforward modifications of the equilibrium conditions. The assortment that each retailer carries now consists of a mass of varieties, $M$, of which $M/C$ are domestic varieties. However, from the point of view of the manufacturers, the market has expanded as each of them is now able to sell his products to retailers in $C$ countries. If we let $y$ denote the quantity sold in a single country and $T$ the transfer received from a retailer in a single country, then the effect of allowing manufacturers to access additional countries is to reduce the fixed cost of manufacturing per country, so that the fixed cost of manufacturing is $\alpha/C$. This simply reflects the fact that manufacturers are able to take advantage of economies of scale in production by spreading their fixed cost over $C$ markets.

This adjustment is also reflected in the labor market clearing condition: only a mass $RM/C$ varieties sold by retailers in a given country are locally produced varieties, but each producer now has an output equal to $Cy$. The
new labor market clearing condition of a given economy hence is:

\[ Rk_0 + RM \left( k_1 + \frac{\alpha}{C} \right) + RM \gamma \beta = \rho L. \]  \hfill (33)

With these simple modifications it is clear that the number of retailers is unaffected by trade liberalization under both buyer and seller power. The same holds true for wholesale and retail prices. What changes is output and the number of varieties. In the case of buyer power, we have

\[ M^B = \frac{k_0(R^B - 1)}{(k_1 + \alpha/C)}, \]  \hfill (34)
\[ y^B = \frac{(k_1 + \alpha/C)(\eta - 1)}{\beta}. \]  \hfill (35)

With seller power we obtain:

\[ M^S = \left( \frac{\eta}{\eta(1 - s) + s} \right) \frac{k_0(1 - s)}{(k_1 + \alpha/C)s} = \frac{\eta}{\eta(1 - s) + s} M^B > M^B, \] \hfill (36)
\[ y^S = (1 - s)\frac{(k_1 + \alpha/C)(\eta - 1)}{\beta} = (1 - s)y^B < y^B \text{ for } s > 0. \] \hfill (37)

Hence under both buyer and seller power the mass of product varieties carried by each retailer as well as the total mass of varieties available to consumers rise, whereas the consumption of each variety declines. This has implications both for the allocation of labor between manufacturing and retailing, and for social welfare.

Product-market integration implies that labor is shifted from manufacturing into the retail sector. This can be seen from (33), where the amount of labor allocated to retailing, \( RMk_1 \), rises, and the fixed labor requirement in manufacturing, \( RM\alpha/C \), declines; note that the variable labor input in manufacturing, \( RM\gamma \beta \), is independent of \( C \). What makes this reallocation of labor possible is the fact that while the mass of varieties available to consumers rises with market integration, the mass of varieties produced in each country falls so that less labor is required in manufacturing.

It is easy to check, using (31) and (32), that trade liberalization raises aggregate consumption and therefore social welfare under both buyer and seller power. We may therefore state:
Proposition 4 Product-market integration has the following effects under both buyer and seller power: (i) the number of retailers serving each country is unchanged; (ii) the product assortment carried by each retailer rises; (iii) the total mass of varieties available to consumers rises; (iv) the quantity consumed of each variety falls; (v) labor is reallocated from manufacturing to retailing; and (vi) aggregate consumption and social welfare rise.

These results are broadly consistent with the observed shift in employment from manufacturing into retailing. More specifically, they are consistent with the observed increase in retailer product assortment and thus with the rise in the retailers’ size, as well as with the increase in the square footage of retail space relative to sales (since sales per variety fall). However product-market integration does not explain why retailer’s market share (or retailing concentration) might have increased.

The above results do not imply that there are no differences in the impact of product-market integration under buyer and seller power. In the case of seller power it follows from (28) and (36) that economic integration has no effect on the total slotting allowance received by each retailer, $AM^S$. However, since each retailer carries more varieties, it is obviously the case that the slotting allowance received by a retailer for each variety falls. Recall that the distortion associated with the slotting allowance implies that the quantity of each variety produced under seller power has to be smaller than under buyer power. By reducing slotting allowances on a per-variety basis, free trade has an additional pro-competitive effect under seller power. In particular, under seller power the mass of varieties rises faster than under buyer power, whereas the quantity consumed of each variety declines more slowly. Specifically we obtain

$$\frac{dY^S}{dC} = \left[ \frac{\eta}{\eta(1 - s) + s} \right] \frac{dY^B}{dC} > \frac{dY^B}{dC} > 0.$$  

Hence we conclude:

Proposition 5 The gains from product-market integration are unambiguously greater under seller power than under buyer power.

4.2 Full Market Integration

Fully integrating the markets is equivalent to an increase in market size, $L$. Hence the labor-market clearing condition (16) for $C$ integrated countries
Rk₀ + RM (k₁ + α) + RMγ = ρCL, \hspace{1cm} (38)

where \( y \) denotes the aggregate sales of a variety (equal to the aggregate production) in the \( C \) countries, \( R \) is the total number of retailers in the \( C \) countries, \( M \) is still the retailer’s assortment, and \( L \) is the number of consumers in one of the \( C \) countries.

Given this new interpretation of some of the variables, it is easy to see that an increase in \( C \) raises the total number of retailers in the \( C \) countries—but less than proportionally as can be seen from (19)—and thus decreases the market share of each retailer, \( s \). This decline in retailer market share raises the mass of varieties (as can be seen from (20) and (29)), and reduces retailer mark-ups under both buyer and seller power (see (12)). Output per variety is unaffected in the case of buyer power, but increases under seller power. Hence, using (31) and (32), it is straightforward to show that aggregate consumption and social welfare rise, and this must also be the case for each of the \( C \) countries taken individually.

To see how the allocation of labor between manufacturing and retailing adjusts to market integration it is useful to divide both sides of (38) by \( C \) to obtain the allocation of labor within a given country. Since \( R \) rises less than proportionately with \( C \), the fixed labor requirement in retailing, \( Rk₀/C \), falls. The labor that is released in the process goes into the production and distribution of additional varieties of manufactures and, in the case of seller power, into an increase in the output per variety, \( y^S \). Hence labor is clearly shifted from retailing into manufacturing. These results can be summarized as follows:

**Proposition 6** Full market integration has the following effects under both buyer and seller power: (i) the number of retailers per country falls; (ii) the product assortment carried by each retailer rises; (iii) the total mass of varieties available to consumers rises; (iv) retailer mark-ups fall; (v) labor is reallocated from retailing to manufacturing; and (vi) aggregate consumption and social welfare rise.

As in the case of product markets, the integration of retail markets has stronger effects under seller than under buyer power. As can be seen in (13), a decrease in \( s \) reduces the cannibalization effect. As a result, the wholesale price moves closer to the marginal cost (see (25)) and the slotting allowance shrinks (see (28)). A lower wholesale price implies a higher output per variety.
In addition, the mass of varieties rises faster under seller power than under buyer power (see (29)). Hence we conclude:

**Proposition 7** The gains from full market integration are unambiguously greater under seller power than under buyer power.

It is not surprising that the results are very similar with respect to the case of product-market integration since the only difference between the two cases is the fact that retailers share CL consumers instead of only L consumers as when only products are traded. Naturally, the gains from trade are stronger with complete integration than with product-market integration since there is more competition among retailers.

5 **Technological Change in Retailing**

As shown in the previous section, economic integration especially in product markets may explain a number of the stylized facts. First, it provides an explanation for the reallocation of labor from manufacturing to retailing. Second, it is consistent with the rise in the average product assortment of retailers and with the rise in retail space relative to sales. However, product-market integration cannot explain the emergence and rise of slotting allowances nor the increased market concentration in retailing. Full market integration is also not consistent with the stylized facts regarding slotting allowances; it is also not a plausible cause of retail market concentration, simply because this kind of integration has so far been very limited.

This suggests that other changes may be driving these stylized facts. A likely candidate is technological change in retailing. Arguably, the widespread adoption of information technology in retailing has significantly raised $k_0$ relative to $k_1$ and relative to any retailing marginal cost. What are the effects of an increase in the fixed cost of retailing, $k_0$?

Not surprisingly, an increase in $k_0$ reduces the equilibrium number of retailers ($dR^S/dk_0 < 0$ and $dR^B/dk_0 < 0$), and thus raises market concentration in retailing. This has two effects on the mass of varieties sold under buyer power, as can be seen from (20) after applying $s^B = 1/R^B$:

$$\frac{dM^B}{dk_0} = \frac{R^B - 1}{(k_1 + \alpha)} + \frac{k_0}{(k_1 + \alpha)} \frac{dR^B}{dk_0}. \quad (39)$$
The first term of (39) is the direct effect which is positive. It implies that an increase in \( k_0 \) requires retailers to carry a larger product assortment in order to raise their profit again. The second term is an indirect effect associated with the problem of cannibalization, and it has a negative sign: an increase in market concentration implied by a rise in \( k_0 \) raises the cost of expanding the assortment, because adding a variety reduces demand for the other varieties carried by the retailer. Using (19) it can be shown that the direct effect outweighs the indirect effect so that \( dM_B/dk_0 > 0 \).

In the case of seller power:

\[
\frac{dM^S}{dk_0} = \frac{\eta R^B}{\eta (R^B - 1) + 1} \frac{dM_B}{dk_0} - \frac{(\eta - 1) \eta M^B}{(\eta (R^B - 1) + 1)^2} \frac{dR^B}{dk_0} > 0. \tag{40}
\]

Thus, the increase in product variety is unambiguously larger in the case of seller power not only because \( \eta R^B > \eta (R^B - 1) + 1 \), but also due to an additional effect as can be seen from (40). We can summarize these results as follows:

**Proposition 8** An increase in the fixed cost of retailing reduces the number of retailers but increases the mass of varieties carried by each retailer under both buyer and seller power. The increase in the product assortment is bigger in the case of seller power.

**Proof:** see Appendix.

In other words, an increase in \( k_0 \) implies fewer and bigger retailers. This market concentration process is more pronounced in retail segments exhibiting seller power. But these are exactly the segments where we should observe slotting allowances being used. Because an increase in the fixed cost of retailing increases both the concentration of retailers and the number of varieties each of them carries, slotting allowances received by each retailer must increase as well. They do so both with respect to each variety and as a total compensation.

An increase in \( k_0 \) also raises the mark-up retailers charge in both the buyer and the seller power case. In the case of buyer power, this happens because the retail sector becomes more concentrated, which lowers the price elasticity of demand. In the case of seller power, there is an additional effect on the retail price: the increase in retail market concentration also leads to a higher wholesale price, which gives an additional boost to retail prices and reduces the output of each variety. To summarize,
Proposition 9  An increase in the fixed cost of retailing raises retail prices. In the case of seller power, it also leads to higher wholesale prices, lower output and higher slotting allowances.

6 Conclusions

This paper examined the causes and consequences of the increase in market concentration in retailing relative to manufacturing that has been observed in many consumer-goods markets. As for the causes of the trend toward big-box retailing, our model suggests that it is consistent both with technological changes in retailing, such as the increased use of information and communication technology that has raised the fixed cost of retailing and with trade liberalization. A higher retailer fixed cost reduces the equilibrium number or retailers, raises the mass of manufacturers, and makes retailers bigger. It also leads to a rise in the slotting allowance per product.

Free trade leaves the number of retailers in a country unchanged but raises retailer size in the sense that each retailer carries a larger variety of products. The economic process that is at work here is that the integration of markets allows manufacturers to realize economies of scale by selling to more customers; the mass of manufacturers in each country falls. Still consumers gain access to more varieties than before as they now turn to imported varieties. What makes this possible is that labor that is saved in the manufacturing sector is reallocated to retailing, allowing each retailer to carry more varieties, including a larger share of imported varieties. In the case of seller power there is an additional positive effect on welfare, since trade lowers the per-variety slotting allowance that a manufacturer must pay a retailer to induce him to carry its product. Hence trade leads to a bigger expansion of product variety and a smaller reduction in consumption per variety under seller power than under buyer power. Thus the gains from trade are unambiguously greater in the case of seller power. Note however that this does not imply that the total slotting allowances received by each retailer does not increase with greater integration as the number of products carried by each retailer rises as well. Indeed this total transfer to each retailer rises with economic integration and thus so is the aggregate slotting allowances received by all the retailers in a country.

Interestingly trade moves the resource allocation of an economy in which sellers have all the bargaining power closer to the allocation of an economy
dominated by buyers, which tends to be more efficient. In the absence of trade liberalization, the right policy to combat inefficiencies in the vertical distribution chain would be to make buyers more powerful. This is reminiscent of Galbraith’s (1952) countervailing power hypothesis, which holds that buyer power may raise welfare in markets in which sellers have market power.

7 Appendix

7.1 Proof of Proposition 3

\( Y^B > Y^S \) provided that \( f(s, \eta) \equiv s - \eta (1 - s) \left[ (1 - s)^{\frac{1}{\eta}} - 1 \right] > 0 \) for \( \eta > 1 \) and \( s \in (0, 1) \). Note that \( f(0, \eta) = 0 \). The proof proceeds by showing that \( f(s, \eta) \) reaches a minimum in \( s \) at \( s = 0 \):

\[
\frac{\partial f(s, \eta)}{\partial s} = 1 + \eta \left[ (1 - s)^{-\frac{1}{\eta}} - 1 \right] - (1 - s)^{-\frac{1}{\eta}} = 0 \quad \text{at } s = 0,
\]

and

\[
\frac{\partial^2 f(s, \eta)}{\partial s^2} = \left( 1 - \frac{1}{\eta} \right) (1 - s)^{-\frac{1+\eta}{\eta}} > 0 \quad \forall s \in [0, 1) \text{ and } \eta > 1.
\]

7.2 Proof of Proposition 8

We first prove that \( dM^B/dk_0 < 0 \). To show this it is convenient to rewrite the labor-market clearing condition as

\[
\eta (M^B)^2 - (\eta - 1) M^B - \frac{\rho L}{k_0} = 0.
\]

Hence

\[
\frac{dM^B}{dk_0} = -\frac{\rho L}{(k_0)^2} \frac{1}{\eta (2M^B - 1) + 1} < 0.
\]

Next, we show that \( dN^B/dk_0 > 0 \):

\[
\frac{dN^B}{dk_0} = \frac{M^B - 1}{(k_1 + \alpha)} + \frac{k_0}{(k_1 + \alpha)} \frac{dM^B}{dk_0} \]

\[= \frac{1}{(k_1 + \alpha)} \left( M^B - 1 - \frac{\rho L}{k_0} \frac{1}{\eta (2M^B - 1) + 1} \right). \]
Hence \( dN^B/dk_0 > 0 \) if

\[
M^B - 1 - \frac{\rho L}{k_0 \eta (2M^B - 1) + 1} > 0
\]

\[
\Leftrightarrow (M^B - 1) \left[ \eta (2M^B - 1) + 1 \right] - \frac{\rho L}{k_0} > 0.
\]

Using (41) the left-hand side of this inequality can be simplified to yield

\[
\eta (M^B - 1)^2 - 1 > 0.
\]

References


