Adolescence and the Path to Maturity in Global Retail

Bart J. Bronnenberg and Paul B. Ellickson

23 July 2015

Bart Bronnenberg is Professor of Marketing and CentER Research Fellow, Tilburg University, Tilberg, Netherlands and Research Fellow, Centre for Economic Policy Research, London, United Kingdom. Paul Ellickson is Professor of Marketing and Economics, Simon Business School, University of Rochester, Rochester, New York. Their e-mail addresses are bart.bronnenberg@tilburguniversity.edu and paul.ellickson@simon.rochester.edu.

Acknowledgements: We thank Emek Basker, Bryan Ellickson, Gordon Hanson, Enrico Moretti, and Timothy Taylor for helpful comments and suggestions. Bart Bronnenberg gratefully acknowledges financial support from the Netherlands Organization for Scientific Research (NWO).

Distributing goods from producers to consumers constitutes a large fraction of overall economic activity. Using the United Nations National Accounts database, the distributive trades--retailing, wholesaling and transportation—account for a constant 20-21 percent of global GDP going back at least as far as 1970, amounting to 1.3 times the GDP share of manufacturing in 2013. The share does not vary much across continents. The size of the distributive trades alone suggests that productivity growth in retailing could have a substantial impact on consumer welfare.

We argue that, over the past several decades, the adoption and diffusion of "modern retailing technology" represents a substantial advance in productivity, providing greater product variety, enhanced convenience and lower prices. While the impact of this retail revolution is seen most clearly in the world's most developed countries, we conjecture that its impact may be even more profound for consumers in the developing world, where modern retailing is just starting to spread.

Distributive trades move goods from producer to consumer. Efficient production of transactions minimizes the overall cost of the distribution channel by allocating the costs of storage, handling, and transport to the most efficient provider, which can include the consumer. The benefits of retail innovation are notoriously difficult to quantify. Nonetheless, it seems clear that modern retail technologies provide a wider variety of products and services at lower cost, both in terms of price and the opportunity cost of time, yielding substantial increases in consumer welfare. In their analysis of Walmart's impact on the US grocery industry, Hausman and Leibtag (2007) conclude that the short-term benefit to consumers (mainly due to lower prices) of Walmart's entry is on the order of 25% of food expenditures. In this journal, Basker (2007) claimed that, by at least one measure, Walmart alone may have accounted for almost half of the 35.5% increase in the productivity of the US general merchandise sector between 1982 and 2002, echoing a McKinsey Global Institute (2001) report attributing the bulk of the acceleration in overall US productivity growth in the mid-1990s to innovations introduced by Walmart and subsequently adopted by its rivals. In their analysis of retail globalization in Mexico, Atkin et al. (2015) conclude that entry by foreign supermarkets

led to welfare gains on the order of 6.2 percent of initial household income. In this article, we seek to explain the source of such gains and the likelihood that they will be replicated in other developing markets.

We first describe modern retailing, highlighting the role of modern formats, scale (often transcending national boundaries), and increased coordination with upstream and downstream partners in production and distribution. In developed markets, the transition to modern retailing is nearly complete. In contrast, many low-income and emerging markets continue to rely on traditional retail formats, i.e., a collection of independent stores and open air markets supplied by small scale wholesalers, although modern retail has begun to spread to these markets as well. E-commerce is a notable exception: the penetration of e-commerce in China and several developing nations in Asia has already surpassed that of high-income countries for some types of consumer goods. To understand the forces governing the adoption of modern technology and the unique role of e-commerce, we propose a framework that emphasizes the importance of scale and coordination in facilitating the transition from traditional to modern retailing. We conclude with some conjectures regarding the likely impact of increased retail modernization for the developing world.

Developments in Global Retail Since 2000

In this section, we use country-level retail volume data, obtained from Euromonitor[1], to study the evolving market share of different store-based formats in food retailing between 2000 and 2014. We then look at the extent to which internet-based retailing is replacing brick-and-mortar sales.

Format Innovation in Store-Based Retailing

In the late 19th and early 20th century, food and non-food retailing took place in individually owned stores with limited selection, high margins, and low turnover of the items on

[1] The retail volume data used in this study collected by Euromonitor are available from their Passport database. The data used in this study are collected directly from retailers, store checks, surveys of the retail trade, desk research, and public data sources. The data are subject to validation and a consistency check of separately collected micro and macro data. The Passport database claims to be fully cross-country comparable. For more detailed notes see, http://www.euromonitor.com/research-methodology. We have data for 50 large economies spread over all continents.

their shelves. The rise of chain stores, which occurred in the 1920s in the United States with a sharp increase in the number of stores run by companies like A&P, Walgreen's, and JC Penney, brought a combination of lower prices and higher volume, in part by sharply increasing store size and in that way taking over the economic function of traditional wholesalers (Tedlow 1990). Studies covering grocery prices from the 1920s and 1930s reveal that chain stores grocery prices were 4.5-15% lower than mainly single-store rivals. Modern mass-market retailing continues this evolution by integrating not only into wholesaling but also into production and distribution and by fostering increased differentiation through the specialization of formats. Big box retailers such as supermarkets, hypermarkets, club stores and supercenters/mass-merchandisers combine scale and logistical advantages in distribution with the store-level convenience of one-stop shopping. Using data spanning 1998-2003, Hausman and Leibtag (2007) find that Walmart's prices were 15-25% lower than traditional supermarkets, suggesting that much of the benefit of modern retail technology is passed through to consumers. Although supermarkets, department stores, and general merchandisers initially targeted the whole population, recent growth in more specialized formats suggests an increasing role for segmentation and differentiation aimed at customers who place greater emphasis on variety, price, or convenience, especially in the most developed countries.

Table 1 examines the impact of this move toward modernization and differentiation in retail store types, presenting 2014 revenue shares and annual 2000-2014 share growth rates for each store format across a selection of high-income countries. We focus on grocery products since they are relatively well defined compared to other retail categories and are among the first to experience modernization. Of course, there is significant variation across rich countries, and we will point out some specific examples. Shares and growth rates across all rich and developing nations in our database are provided in an online appendix.

The top part of Table 1 shows revenue shares of traditional retail formats. Retailers in the ‘‘Independent/Other’’ category have 10 or fewer outlets. These traditional ‘‘mom and pop’’ markets are primarily family owned, and include a diverse collection of kiosks, open-air markets, and souvenir stores selling food and drink items. The table shows that in 2014, traditional retailers in high-income nations have a joint revenue share of just 18 percent on average. Some nations, e.g., Japan, the UK, or the US, are approaching a complete transition

out of traditional retail formats, whereas others, e.g., Italy and other nations in southern Europe, still have a larger presence. Revenue shares of traditional retail formats declined at a rate of 2.5-2.7 percent per year on average from 2000-2014. This downward trend is consistent with the pattern documented by Foster et al. (2006), who examined the major restructuring of the US retail trade sector during the 1990s. They identify the key role of reallocation dynamics—replacing small, low productivity firms with large, high productivity entrants—in explaining the sharp increase in US retail productivity over this time period. In particular, they find that almost all of the robust growth in labor productivity over the 1990s (about 14% over this 10-year period) is due to new entrants displacing inefficient incumbents. These new entrants exclusively operate modern store formats. We discuss these modern store formats in three groups, roughly organized by whether they appeal to consumers mostly seeking variety, low prices, or convenience.

The first group consists of formats that offer substantial variety: supermarkets and hypermarkets/mass merchandisers (appearing in two rows in Table 1).[2] This format is the dominant method of selling grocery products to consumers in high-income regions, collectively accounting for an estimated 58 percent of the grocery trade in these markets. Given its mass appeal, this specialized format is the one most likely to be introduced first as retail markets develop. Between 2000 and 2014, hypermarkets grew at a steady pace, whereas the revenue share of supermarkets essentially remained constant. Hypermarkets (e.g., Walmart) grew strongly while the pure supermarket format contracted somewhat in the UK and US. This pattern is consistent with the increased role of format specialization in the most advanced retail economies.

The second group consists of formats that offer low prices with limited variety, known as discounters and warehouse/club stores. This group includes firms like Costco in the United States and Lidl or Aldi in Europe. Discounters and club stores capture a modest 11 percent of

[2] The distinction between supermarket and hypermarkets/mass merchandisers is not particularly sharp. Euromonitor International defines a hypermarket as a retail outlet with a selling space of at least 2500 square meters (27,000 square feet) and a primary focus on groceries. In the United States, most supermarkets would easily fall into this category. Mass merchandisers like Wal-Mart and Target combine grocery with general merchandise and, to accommodate these additional product categories, tend to be significantly larger than supermarkets. In Europe and other parts of the world, a hypermarket is closer to what would simply be considered a large supermarket in the United States. For this reason, it is easiest to view this collection as a single category.

the grocery trade in high-income nations, but their revenue share has been rising at an annual rate of 2.8 and 3.9 percent on average, the highest among any retail format. In the United States, the rise of club stores occurred alongside the rapid expansion of supercenters (mostly Walmart) and may represent an attempt to differentiate from this dominant firm. Costco, in particular, targets primarily high-income, suburban consumers who have ample space to store large "club packs" and less need for high-touch service. Aldi or Lidl attract low-income consumers by focusing on unbranded goods and offering little in the way of service. The discounter format is very popular in Germany relative to the US, suggesting that discounters and warehouse clubs (and to some extent hypermarkets/mass merchandizers) are alternative business models that cater to a similar need. In Germany, land use restrictions and a population more clustered in central cities favors the smaller footprint of the discount store, whereas the suburbanized US is better served by more remote "big box" formats like hypermarkets and clubs.

The final group consists of retail formats that offer convenience in location or opening hours, including convenience stores and "forecourt" retailers attached to gas stations. These formats are not as new as hypermarkets, discounters, and club stores, but are considered "modern" in the sense that they are specialized and exploit the scale economies offered by a chain of stores to drive down costs. The trend toward larger, more remote supermarkets and hypermarkets (and the subsequent exit of mid-sized outlets) evidently yields pockets of underserved local demand, especially amongst consumers with limited transportation options, creating new markets for these older formats. Convenience and forecourt formats account for 12 percent of the grocery trade on average in high income nations and are especially common in countries with dense urban populations (e.g. Japan and the UK). Overall, the convenience store format grew at an annual rate of 2 percent. Forecourt retailers in the US account for a large share of retail sales relative to convenience stores. Many US cities were designed to accommodate car traffic, and chains like 7-Eleven, Circle-K and am/pm often bundle food service with gas (landing them in the forecourt category).

Taken together, these trends reveal a grocery industry in the process of shifting from independent stores to a collection of formats specialized at serving different consumer needs, but organized under the banner of a chain to exploit economies of scale. The migration of

retailing, from traditional single-store proprietorships to modern chains of specialized formats, took place mainly across firms rather than within firms, consistent with the capital reallocation hypothesis proposed by Foster et al. (2006). Clearly, some of these efficiency gains are due to the replacement of skilled full-time workers with less skilled part-time workers, which could impact the overall wage structure. However, Basker (2007) notes that the existing empirical evidence reveals that Walmart's net impact on jobs in the US retail and wholesale sectors is small, and likely positive, though small negative effects have been found for retail wages. In their study of Mexico, Atkin el al. (2015) find that entry by foreign supermarkets has little impact on average municipality-level income or unemployment, while the impact on consumer welfare is positive and significant.

How do markets in the lower-income nations compare with these high-income nations in terms of format evolution? Table 2 shows 2014 shares and 2000-2014 annual share growth of store-based retail formats in UN-designated developing countries, first as an aggregate and next for a selection of nations chosen for their size and geographic dispersion: Argentina, India, Nigeria, South Korea and Turkey. We discuss the so-called BRICS (Brazil, Russia, India, China and South Africa) nations in more depth later in the article. Relative to high-income countries, lower-income countries continue to support a large fraction of traditional retailers. In 2014, 57 percent of grocery revenue took place through the two traditional formats. However, this pattern has been rapidly changing. Starting at 80 percent of grocery revenue in 2000, the shares of these traditional retail formats have been declining at 1.2 and 2.8 percent per year.

There are also striking patterns in the evolving composition of modern retail formats. The joint share of high-variety formats—supermarkets and hypermarkets/mass merchandisers— was 37 percent in 2014 and growing at approximately 6 percent a year. The growth rates are particularly strong in nations in Africa and the Middle East, where the supermarket revolution occurred most recently, while quite a bit lower in Latin America countries, which experienced the "first wave" of retail modernization in the 1990s (Reardon and Timmer 2012). The prevalence of the second format group, low price/limited assortment formats, currently lags far behind the high-income countries. Recall that this format was the last to develop in most high-income countries as well. Discounters and warehouse/club stores only have a 3 percent share in emerging markets. However, their growth rates are especially

strong in Latin America (here exemplified with Argentina, but growth is even stronger in Brazil, Chile, and Columbia), consistent with a transition to a second phase of modernization of retail and increased specialization. The third group, convenience stores and forecourt formats has 4 percent of the market in developing nations. Forecourt retailers are virtually absent outside of Latin America, presumably because low car ownership per capita in many developing countries limits the market for the food/gas pairing. The convenience store segment is much smaller than that in high-income regions but is growing more rapidly.

Hausman and Leibtag (2007) provide evidence that retail modernization leads to lower food prices. To investigate whether this translates into expenditures, we collected Euromonitor data on per-capita expenditures on food and non-alcoholic beverages and expressed these as a percentage of total per-capita consumption expenditure. These measures are available for 50 countries across 15 years (2000-2014). We then relate these expenditure shares to the fraction of food retailing that takes place in the 6 modern formats in table 1 and 2 as a measure of retail modernization. Pooling across 750 observations using a two-way (country and time) fixed effects regression, we find that a full transition to modern retail formats is associated with a drop of 8.2% of the food expenditure share (t = -6.2) from 26.3% to 18.1%.

The First 20 Years of Online Retailing

Along with the proliferation of modern store formats, the other transformative innovation in modern retailing has been the introduction of online sales platforms. By selling items online, firms can offer a wider selection of products at reduced cost, primarily by aggregating demand across a larger set of consumers and removing key links of the supply chain. The elimination of physical stores is the most obvious example of the latter, but the practice of “drop-shipping” directly from a manufacturer’s warehouse also removes the need for a distribution center to hold that inventory that supplies retail stores, and reduces the cost and risk associated with offering products for which demand is locally thin (Lieber and Syverson 2012).

Online purchases have benefits and costs that vary by product category. For example, online purchase of physical goods introduces a delay between purchase and delivery, but also gives consumers a greater opportunity to comparison-shop by lowering search costs and travel

time and provides a seamless method of gathering information on the experience of previous customers (through online reviews). On the other hand, online retail offers less ability to inspect goods before purchase (and adds the risk of not having a product delivered at all), which renders the reputation of the firm all the more important. Whether a purchase is made online or in-store clearly depends on the frequency of purchase, the homogeneity of the product, and the number of products typically purchased in a given occasion, amongst other factors. Books fall at one end of this spectrum, and thus in modern retailing systems are primarily bought online, while groceries fall at the other, and are typically bought in-store. Here, we provide an overview of the relative penetration of online retailing across several types of goods in both high-income and developing markets. For a fuller treatment of the tradeoffs in online retailing, Lieber and Syverson (2012) provides a useful starting point.

Table 3 contains the share of total retail revenue from online transactions in high-income countries, along with its annual 2004-2014 growth. To focus the discussion, we present the two retail categories with the greatest online presence: apparel and footwear, and electronics and appliances. For comparison, we also report on a composite category consisting of all retailed goods, along with a separate breakout for groceries.

First, after 20 years of e-commerce growth and the ubiquitous presence of firms like Amazon and Ebay, online sales in high income nations still represent only a small fraction of overall retail sales, accounting for 6 percent of all retail sales on average. However, this average is somewhat misleading as there are big differences across countries. For instance, Italy has an online retail market share of less than 2 percent compared to 10 percent in the UK.

Across consumer goods industries, e-commerce is heavily concentrated in categories such as Apparel and Footwear and Electronics and Appliances, where online sales account for a substantial 15 and 20 percent of retail volume in high income countries, reaching 18 and 30 percent in the US.[3] The share of online sales across all high-income nations has witnessed double-digit growth in the period from 2004 to 2014.

[3] Lieber and Syverson (2012) report broadly consistent fractions for the United States circa 2007 (that is, similar but lower than our data, which are 2014), based on data from a Forrester survey. They also provide detailed breakouts by product category, finding the highest fractions of online purchase in books, apparel, footwear and consumer electronics.

In contrast, online sales remain an insignificant fraction of grocery retailing, with an estimated 1 percent of sales transacted online. This pattern is perhaps not surprising, given that groceries are purchased more frequently than any other retail category, in part because consumption often closely follows purchase. Moreover, physical search (for example, for fresh produce) remains a key aspect of grocery shopping, since many perishable products are not of uniform quality and the ingredients for a particular meal might depend on what is currently on hand. Furthermore, consumers are often shopping for an entire basket of goods, rather than a single product or handful of items, and this form of shopping is likely to be more challenging online. From the retailer's perspective, impulse purchases likely play a lesser role online, eliminating a key source of revenue.

How do developing markets compare to high-income ones in terms of online penetration? Table 4 examines the diffusion of online retailing in the developing world. The overall average share of online retailing across all categories is, as in high-income nations, quite low at 4 percent.

Interestingly, we now see even larger differences across nations. Across developing nations, migration to online sales in the low-income regions has primarily taken place in Asia, represented in Table 4 by South Korea (we discuss China, for which this pattern is also true, momentarily). Indeed, whereas African and South American nations generally remain far behind high-income nations (in terms of share of online sales), several Asian countries close in on 2014 levels of online retailing in the US. The difference between Asia and South America is not explained by Internet penetration, which is lower in the former (35 percent) than the latter (52 percent), as reported at http://www.internetworldstats.com (last accessed on 7/2015).

Summary

Comparing a typical supermarket in the 1970s to the retail outlets of 2014, we first see vast improvements in both the supply and availability of fresh products and the diversity and quality of products on offer: for example, consider the quality and variety of bread or coffee, the uniform presence of large assortments, or the much greater year-round availability of fresh produce in a modern store. Moreover, investments in IT have led to increases in labor productivity that are at least partly passed on to consumers through lower prices (Basker 2015).

Second, the dominant retailers have diversified into a more varied set of store formats, each specialized to better deliver variety (hypermarkets), quantity (discounters), or time savings (convenience stores, online stores) to a more diverse and time-constrained consumer base. While such specialization may lead to a decrease in the level of service experienced by some consumers, it seems likely that the overall shopping experience has improved markedly over this period for almost all consumers. Indeed, the limited empirical evidence currently available (e.g. Hausman and Liebtag 2007), suggests that the associated increase in consumer surplus is sizable. Third, the retail sector continues to make it easier for consumers to find and buy goods both online and off.

Although constructing a clear productivity measure to quantify these utility gains is challenging, the retail sector of 2014 surely provides far more utility--via superior match value and greater variety--than its 1970s counterpart. Moreover, the challenges inherent in constructing such measures suggest that these productivity gains may be vastly understated.

We now lay out a framework, which we believe helps motivate the necessary and often dramatic transitions that must take place to move a nation's retail sector from traditional to modern, thereby giving consumers access to a greater variety of products at lower cost, as well as time-saving convenience.

The Structure of Modern Retailing

Modern retailing technology includes a constellation of activities encompassing format modernization and specialization, scale economies moderated by spatial competition, supply chain integration, information technology investment, and forward integration into direct delivery. In this section, we describe these activities and the investments required to undertake them. This discussion provides a basis for what it will take for countries, especially those in emerging markets, to develop modern retail practices.

Format Modernization and Differentiation

Modern retail-store formats have steadily replaced traditional ‘‘mom and pop’’ outlets in both high and low income markets. Two distinct aspects of format evolution are especially

important for understanding modern retailing. First, large-footprint stores can offer a much wider variety of products than traditional outlets, and can do so while exploiting scale economies at the level of both outlet and chain (see below), thus offering a price level that sole proprietorships do not have the cost structure to match. This description applies not just to supermarkets carrying groceries, but also to mass merchandisers like Wal-Mart offering general merchandise and ‘‘category killers’’ like Home Depot, Best Buy and Staples, which offer a deep selection within a narrow set of products. Their ability to do so reflects innovations in IT and logistics that have increased labor productivity and reduced inventory costs.

Second, retail outlets have shown increasing specialization in targeting their customers, particularly in the grocery category. In high-income countries, retailers target segments of the population that differ in either their willingness or ability to pay for variety and services. For example, high-quality service-oriented firms like Whole Foods attract wealthy, time-constrained urban and suburban professionals with organic products and prepared meals. At the other end of the spectrum, limited assortment chains like Save A Lot and Aldi target the urban poor with small footprint stores offering unbranded products at very low prices. Diverse formats also allow firms to adjust to local market conditions. For example, European hypermarkets combine food and non-food products in the same store, which allows firms to accommodate government restrictions on the number of large footprint stores. Similarly, German limited assortment stores are partly a response to tight zoning restrictions. More broadly, as populations become more diverse by preference or income, the set of formats in this ‘‘retail ecosystem’’ expands accordingly.

The same patterns are in play in emerging markets. While much of the growth in modern retailing in these countries is amongst the high variety formats (as shown earlier in Table 2), the remaining modern formats develop as well. For example, Wal-Mart operates multiple formats in Mexico. In addition to its classic superstore format, it carries a mini-grocer format called ‘‘Bodega Aurrera Express,’’ that is aimed at consumers with incomes too low to shop in Walmart's flagship stores. Moreover, real estate development in many Mexican cities is too dense to accommodate a big box outlet. In France, Carrefour operates hypermarkets, supermarkets (Carrefour Marché), convenient stores (Carrefour Express), and multi-channel

retail (Carrefour Drive) where consumers can pick up baskets of products bought online if they choose not to have them home-delivered.

Economies of Scale and Supply Chain Integration

Economies of scale contribute to modern retail technology at two levels: the outlet and the chain. The importance of outlet-level scale is evident in the physical footprint of the stores themselves, which have been increasing in size across many retail sectors for many decades. This increase in store size can be partly explained by what Oi (1992) refers to as the "economies of massed reserves." Oi viewed the primary goal of retailing as minimizing the frictions resulting from transport and inventory costs. Thus, he noted that economies of scale arise naturally from the connection between the arrival rate of consumers and the flow capacity of the outlets built to serve them. In particular, as consumers' storage and transportation capabilities improve—say, as a result of increased automobile ownership and re-location to large suburban homes—average transactions sizes also increase. The result is efficiency gains for the larger footprint stores, which have faster inventory turns and therefore lower storage costs.

Economies of store size lead to large firms because logistics systems and information technology allow stores to provide an ever-expanding array of products. A combination of information technology and the use of barcode-based re-stocking algorithms favor higher-frequency delivery schedules, which in turn contributes to larger optimal store sizes (Holmes 2001). Distribution involves fixed costs that can be spread across many stores, but is moderated by distance. In the US retail sector, the increasing importance of information technology and logistical innovations coincided with a sharp increase in the number of products (Messinger and Narasimhan 1995). In turn, this change shifted the focus of competition from price to variety, provided an additional justification for increased selling space, and created a link between outlet scale and the overall size of the chain (Ellickson 2007).

One key linkage between scale at the store and chain level is the regional distribution center, which is tasked with replenishing the stores in its catchment area with the bulk of the products carried by the chain (Ellickson 2007). Almost all modern supermarket, club, mass merchandise and big box retail chains are vertically integrated into distribution, operating their own distribution centers. This suggests it is difficult to coordinate delivery and replenishment

schedules through a third party logistic system. Moreover, many of the data interchange protocols employed by these firms are proprietary and take place over closed networks.

The size of the catchment area determines the geographic scope of the market and, consequently, the efficient scale of the chain. The catchment area, in turn, is determined by how far products can be cost-effectively transported. For grocery products, the maximum distance is on the order of a few hundred miles. For general merchandise and durables, the distance is much farther. As a consequence, the US retail sector is served by a large number of regional supermarket firms (only a handful of which are national), while European supermarkets typically cross national boundaries. In contrast, national or international chains dominate the mass merchandise market on both sides of the Atlantic, largely because their products are less costly to ship.

In addition to distribution-related economies, large chains can also exploit quantity discounts from manufacturers and economies of scale in advertising. Unlike economies related to distribution, these other efficiencies can scale up indefinitely with the size of the chain (or market), ultimately providing an economic rationale for global retailing (even for groceries). In addition, the largest firms may also choose to integrate further upstream into production, by offering store-branded "private-label" products that compete directly with the national brands. While employing this strategy requires a consumer base that is loyal to the retailer, it gives that retailer an additional source of bargaining power with manufacturers, and constitutes another manifestation of scale. Private-label programs been particularly effective in Europe, where consumers are extremely loyal to a single chain and product advertising was historically limited (Dobson 2005).

Economies of scale are apparently also significant at the global level. In 2012, the 100 largest retailers in the world by revenue were active in 11.8 countries on average (based on data from Deloitte 2014). For instance, in 1970, Carrefour confined its business area to its native France and neighboring Belgium. It then spread to other European nations, and currently operates 10,000 stores in 34 countries on four continents. Walmart didn't expand outside the United States until 1991, but now operates in 27 countries on five continents.

Still, these firms are exceptional – for most multinational retailers, international expansion is more geographically focused. Of the top 100 retailers, 50 are in 5 or fewer markets

(including their country of origin). For food retailers such as Portugal's Jerónimo Martins entering Poland, or Carrefour entering Brazil, trade areas are not necessarily adjacent or even proximate. This lack of a clear geographic pattern seems consistent with the existence of multiple equilibria at the global level (for example, such an outcome can arise when there is some limit to the benefits of scale, implying that many potential market structures can be supported).

At the same time, increasing scale makes modern retail chain stores also face significant coordination costs. For example, grocery supermarkets must procure a variety of (often fresh) goods at a scale that is commensurate with their expanding reach, which requires coordination with several independent suppliers and manufacturers. For retail firms, coordination involves investment in information technology systems, storage facilities and packaging technologies. Some of these investments are relationship-specific with other firms, creating the potential for hold-up. Coordination can also involve large financial commitments in inventories, which are sometimes financed with short-term debt. For a retailer, the need for coordination implies supply chain risk, such as disruptions in quantity and quality, which are costly in this low-margin business. As we will argue later, these are critical concerns in developing markets.

In addition to backward coordination, there is also a need for coordination and integration with forward links in the supply chain. Oi (1992) notes that, because the consumer's time is an input to the retail production function, it is natural for innovative retailers to explore methods of affecting the consumer's cost of transaction or home production if they can profitably do so (see also Bronnenberg 2015). This process results in forward integration of at least two forms. First, modern retailers complement their business with delivery services that are either owned (for example, in the case of the grocery chain Peapod) or contracted (for example with UPS or Fedex). Second, retailers such as Whole Foods offer ready-to-eat products, cutting food preparation time for time-constrained consumers, while bouquets of flowers can now be purchased at local supermarkets, eliminating a separate trip to a florist. Meal kit services such as startups Hello Fresh and Blue Apron, each shipping more than a million fresh meal kits per month as of 2014, is another manifestation of a continuing trend of retailers forward integrating their services into the consumer's kitchen.

The Expansion of Online Retailing

Because the vast majority of retail sales still occurs in physical stores, we have primarily emphasized the aspects of retail modernization that involve reallocating economic activity from small, low productivity, single-store outlets to large, high-productivity chains. However, many retail categories are experiencing a shift to online sales, which reduces the need for physical outlets but continues to require sophisticated upstream integration. In a sense, online retailing is a natural extension of the move toward forward integration mentioned a moment ago. E-commerce firms, which replace the physical store with an online marketplace, eliminate the consumer's need to travel to the store, shifting the role (but not the cost) of distribution entirely onto the firm. Distributing directly to the consumer relies on the same information and logistic technology that facilitates store-based retailing, suggesting that, at least on the supply side, these channels might be complements, rather than substitutes.

Online sales are growing quickly and already have a strong position in several retail categories, as illustrated in Tables 3 and 4. Goldmanis et al. (2010) argue that the primary competitive impact of online retailing falls on the small, high-cost retailers (that is, the "mom and pop" stores) rather than large, low-cost chains. In fact, low-cost "big box" retailers can in some cases become more profitable as e-commerce expands. At least in some retail categories, store-based retailing appears to hold its own against online. In others, it may play a complementary role. Pozzi (2013) analyzes the introduction of an online shopping service by a large bricks-and-mortar US supermarket chain and finds that the new online channel led to a 13 percent increase in revenue, with little cannibalization of existing sales. He attributes the increase in sales from online expansion to a mix of market expansion (due to a reduction in travel costs) and taking business from competing chains. Similarly, Einav et al. (2014) find that an expansion of mobile commerce tends to increase the total sales for firms. While some product categories are destined to be dominated by online sales, many others are likely to continue to be served by a mix of both online and offline offerings.

Explaining Retail Modernization

A Coordinated Exploitation of Scale

What determines the timing of adoption and speed of diffusion of modern retail technology? To structure the argument, we frame the phenomenon as the coordinated

exploitation of scale economies. Murphy, Shleifer, and Vishny (1989) suggest a similar mechanism to account for industrialization of manufacturing. In particular, we define retail industrialization as the application of scale economies and supply chain integration to the production of retail sales. We focus on modernization by country, which parallels the emphasis of Murphy, Shleifer, and Vishny on the importance of relatively distinct domestic markets in constraining the push towards industrialization. Reardon and Timmer (2012) note that, "at present only 10 percent of global processed food output is traded across national borders." The perishable or fragile nature of many products, including food products, places even tighter constraints on the geography over which scale economies can be spread.

In the Murphy, Shleifer, and Vishny (1989) framework, the failure to industrialize is caused by the inability to coordinate on a Pareto superior equilibrium, which arises out of an externality problem stemming from the need to modernize several sectors at once. In retail, that coordination problem occurs along the vertical chain from production to wholesaling to retailing to consumption. To take full advantage of scale, all elements of the chain must act in concert. With this framing in mind, we restate the retail modernization question in two parts: 1) What slows or speeds the leveraging of scale economies in retailing? 2) Why do certain countries remain stuck in a traditional equilibrium with outdated technology?

Three key players determine the speed of retail industrialization: consumers, governments, and firms. We start with consumers. A major impediment to retail modernization in many countries around the world is low consumer income: that is, consumers must achieve a minimal level of disposable income to facilitate a substantial shift from home to market production. Reardon and Timmer (2012) note that the "share of packaged food in food expenditures is 7 percent in low-income countries, 30 percent in lower-middle-income countries, and 45 percent in upper-middle-income countries." To understand the role of consumer demand in driving the adoption of modern retail technology, it's important to recognize that (unlike with manufacturing), the consumer's time is a key input to the retail production function (Oi 1992). As the opportunity cost of time becomes more valuable, technologies that minimize it (for example, by allowing fewer trips with larger basket sizes) become more dominant. Urbanization tends to reduce the time input of shopping. Higher female labor force participation tends to increase the opportunity cost of time. The big box

retail format also requires a co-investment on the part of consumers in both transportation and storage technology—that is, cars and refrigerators. Lagakos (2015) demonstrates the importance of car ownership in driving the adoption of modern grocery formats in six developing countries. He argues that the continued reliance on traditional formats is an optimal supply response when ownership of complementary durables is sufficiently limited.

The government provides a set of inputs to the retail production function via shared infrastructure. Physical retailing is inherently local, and the scale economies that drive it are constrained by the logistics of physical transportation. The local nature of retailing makes this a country-specific investment: distributing goods in Argentina requires good roads in Argentina, and road building is usually a task left to the government. Among the earliest emerging-market countries to modernize their retail industries were the former Soviet-controlled countries of Eastern Europe, exploiting the transportation infrastructure built during the cold war.

Governments also play a pivotal role in setting regulations on the use of land, the ease of obtaining building permits, the regulation of corruption, the availability of autos (through policies allowing the imports of used cars), and the minimum wage structure. In discussing a report from the McKinsey Global Institute on productivity, Baily and Solow (2001) note that "the teams working on the case studies also concluded that a proliferation of regulations – land use, business hours, permits – created a much more frequent problem for productivity in domestic service industries and construction than in manufacturing." They give the example of Korea, whose reliance on outdated retail formats was attributed to a mix of national investment policy, land use restrictions, and entry regulations.

In many emerging markets, another way in which government affects the retail sector lies in its ability to set policies regarding foreign direct investment. In an empirical study aimed at explaining the share of modern retail formats in 42 countries, Traill (2006) identifies GDP per capita and openness to foreign investment as the two most important explanatory factors. In their study of Walmart in Mexico, Iacovone et al. (2015) note that the impact of foreign direct investment in retail goes beyond simply the retailers themselves, as it "can induce structural changes in the domestic manufacturing industries that supply retailers with consumer goods." The increased level of competition can yield large efficiency gains. Studying the case of Romania, Javorcik and Li (2013) find that a 10 percent increase in the number of retail outlets

run by foreign chains is associated with a 2.4-2.6 percent increase in the total factor productivity of the supplying industries. In their analysis of Chinese exports, Head et al. (2014) find that increased exposure to multinational retailers led to rising exports from the regions those retailers entered, suggesting that the increased familiarity with the quality control and product requirements necessary to export goods is transferable across firms.

Firms are clearly the foremost strategic players driving the adoption of modern retailing technology. A modern chain of vertically integrated, large format stores relies on an upstream distribution system of local producers, third-party logistics firms, and either third-party or integrated wholesalers who must all modernize together. Transactions that were often historically informal must be formalized through contracts with local suppliers and intermediaries. In a case study of Chile, Berdegué (2001) found that small farming cooperatives had to incur significant costs to deliver products of homogeneous quality, to coordinate harvest cycles, and to grade, sort and package in a manner that met the downstream chain's requirements. Also, adopting formal accounting processes makes previously informal transactions subject to taxes.

Among the toughest coordination problems is the joint adoption of commonly used technology. Iacovone et al. (2015) note that to work with Walmart, "suppliers often need to make complementary investments in office technologies and computerized tracking systems." They must also invest in modern warehousing facilities, cold storage capability and standardized packaging equipment. All of these investments require sufficient scale to cover their costs, which means that upstream and downstream firms need to modernize together. The problem of broad-based coordination (and the existence of many levels of externalities) suggests the potential importance of a centrally positioned decision-maker to coordinate these decisions.

Particularly in the smaller countries, which do not have the population size to warrant local provision of large scale retail distribution, it may often be most efficient for an outside firm to play the central role in coordinating the vertical chain, often by relying on existing relationships with regional suppliers and global logistics firms. In this situation, rules that limit foreign direct investment may be the main constraint on developing a modern retail sector in such countries. For instance, Reardon et al. (2007) note that "a fear and complaint of a retailer

entering a developing country is often the lack of a developed logistics sector." Rather than waiting for a logistics sector to develop within the country, international retailers frequently rely on third party logistics firms via a method known as "follow-sourcing," in which large international firms convince partner firms to co-locate in new markets. In addition, large retailers often need to upgrade the capacity of farmers and suppliers to meet their requirements. In the mid 2000s, Walmart worked to help establish micro-finance for farmers in Central America and India, and Carrefour was instrumental in building third-party supply chains in Indonesia and Thailand.

Emerging economies with larger domestic markets, like India or China, are clearly big enough to support the organic growth of domestic firms. However, they still face the issues of scale and the ability of third-party support networks to keep up. Firms that initially rely on local sources eventually turn to regional and later global sourcing. Firms that start out by relying on third party wholesalers eventually integrate into more and more aspects of distribution and possibly production.

Apart from food retailing, minimum efficient scale in other areas of retail is less constrained by space. Because non-perishable goods can be shipped much greater distances, the efficient chain size of firms specializing in these products can be much larger. The coordination problem across a distribution chain may be substantially mitigated in product categories amenable to e-commerce distribution, which requires only an Internet-connected consumer base and a sufficiently developed third party logistics system. In particular, in developing countries that do not have the infrastructure or local supply chains to support efficient store-based retailing for goods that are purchased infrequently (consumer electronics, clothing) or that have large physical transportation costs (large consumer durables), e-commerce may become the dominant mode of retail commerce.

Modernization of Retail in the BRICS Nations

Depending on the success of all required channel partners modernizing in concert, the process of moving from an uncoordinated equilibrium (of traditional retailers) to a modern, integrated system can be quick or might not begin at all. To close, we provide some anecdotal

evidence of adoption of modern retailing systems in Brazil, Russia, India, China, and South Africa (BRICS), using the United States as a point of reference.

The top panel of Figure 1 shows the 2000-2014 joint share of all "modern formats" included in Tables 1 and 2. The US has all but completely converted to modern grocery retailing. Brazil and South Africa have adopted mostly modern systems during or before the time period graphed, with modest growth. India, on the other hand, shows very low penetration of any form of modern retailing and still operates in a traditional equilibrium. In contrast, Russia and China have jumped from a complete traditional equilibrium like in India to the widespread adoption of new retail formats covering 65 percent of grocery retailing since the year 2000.

The lower panel of Figure 1 portrays the development of e-commerce as measured by online sales of two categories of durable goods often sold online: Apparel and Footwear plus Electronics and Appliances. For reference, the share of online sales in the United States in these two categories grew from 5 to 23 percent of total category value between 2000 and 2014. Over this time span, online sales in India and South Africa lag far behind, never reaching more than 3 percent of total category value. In contrast, Russia and Brazil show strong growth in e-commerce sales. At historic growth rates, Russia will reach the 2014 US level in just 5 or 6 years. However, the big story here is the spectacular development of e-commerce in China. In just five years, Chinese online retailing leapfrogged that of the United States, going from essentially non-existent online in 2009 to 31 percent of total retail value in 2014 (representing more than 320 billion US dollars revenue by Euromonitor's data) in 2014. Indeed, we speculate that with this type of growth in online retail, big box retailing in these categories in China may instead be skipped in favor of a dominant e-commerce retail channel.

What explains the rapid modernization of retail in China and its near absence in India? In keeping with the framework laid out above, we propose that a coordinated set of events allowed Chinese retail entrepreneurs to achieve scale and vertical coordination at a surprisingly rapid rate. At the *consumer* level, GDP per capita in China grew to US$13,130 by 2014 (source: World Development Indicators). Increases in income, combined with a high savings rate, meant that between 2000 and 2014 many Chinese consumers passed the wealth-threshold to purchase relatively expensive durable goods. Urbanization in China doubled from 26 percent of

the population in 1990 to 54 percent in 2014 (source: UN World Urbanization Prospects). For comparison, the same transition took 55 years in the United States from 1870 until 1925 (source: US Census Bureau). As a result, China's new middle class was living in metropolitan areas with modern roads and widespread Internet access, presenting the perfect conditions for e-commerce to blossom. At the *government* level, Chinese economic policy has recently promoted household consumption and provision of domestic services, relative to export-based growth. This pro-consumption policy encourages consumers to purchase big-ticket items such as cars, electronics and appliances. In turn, car and appliance ownership drives demand for storable food products and larger durables. The Chinese government also initiated large-scale infrastructure projects that facilitate more efficient mass distribution by sellers. China's expressway system, which connects cities and supports inter-city supply chains, tripled in length between 2004 and 2013 (source: National Bureau of Statistics of China). At the *firm* level, large sellers, both Chinese and foreign, have entered food and consumer durable markets sourcing their products via a relatively reliable supply chain. These large firms are investing in shared resources. Launched in 2013, Alibaba and eight other companies invested the equivalent of billions of US dollars in the China Smart Logistic Network (CSN), consisting of fulfillment centers, distribution centers, and various forms of transportation, with the goal of delivering parcels to the entire country in 24 hours.

In contrast, consumers in India have lower incomes on average—about half the GDP per capita of their Chinese counterparts (source: World Development Indicators). Moreover, India's policies concerning foreign direct investment have been among the worlds most restrictive and were only recently liberalized in 2012. Local regulations across India continue to severely impede investment. Road construction and infrastructure development in India—for example, as measured by expressway miles— greatly lags China's. Firms in India find their growth bogged down by these restrictions. As one example, a recent article in the Wall Street Journal (2015) describes how Indian internet giant Flipkart struggles to deliver products in the traffic-jammed streets of most Indian cities and has been forced to develop a different delivery technology that relies heavily on scooters and motorbikes—thus sharply limiting the set of products that can be home delivered.

Conclusion

Modern retailing technology depends on the close coordination of many interdependent agents in the supply chain. Moving from a traditional retail system consisting of small-scale wholesalers and retailers to a modern one with large-scale integrated firms requires a coordinated set of complementary investments by consumers, government, and firms.

We argue that retail modernization offers important potential for welfare growth. In the absence of modern retailing, consumers face implicit tariffs in the form of inefficient transportation, distribution, wholesaling, and retail. Consumers pay these tariffs in terms of high prices, less variety, and less leisure (inefficient home production). Evidence suggests that the magnitude of these effects is large. Indeed, if one uses differences in market shares of modern retail as a proxy for the productivity gap, the static productivity difference between high income and emerging nations is responsible for a large fraction of the differences in GDP. This proxy almost certainly understates the full productivity gains, as the dynamic gains arising from producers operating in more competitive and flexible markets are also important.

References

Atkin, David, Benjamin Fabver, and Marco Gonzalez-Navarro. 2015. "Retail Globalization and Household Welfare: Evidence from Mexico." Working paper.

Baily, Martin Neil, and Robert M. Solow. 2001. "International Productivity Comparisons Built from the Firm Level." *Journal of Economic Perspectives* 15(3): 151-172.

Basker, Emek. 2007. "The causes and consequences of Wal-Mart's growth." *The Journal of Economic Perspectives,* 177-198.

Basker, Emek. 2015. "Change at the Checkout: Tracing the Impact of a Process Innovation." *Journal of Industrial Economics*, 63(2), 339-370.

Berdegué, Julio. 2001. *Cooperating to Compete: Associative Peasant Business Firms in Chile.* Wageningen, NLD: Thesis Wageningen University.

Bronnenberg, Bart J. forthcoming. "The Provision of Convenience and Variety by the Market." *RAND Journal of Economics.*

Dobson, Paul W. 2005. "Exploiting Buyer Power: Lessons from the British Grocery Trade." *Antitrust Law Journal* 72(2): 529-562.

Einav, Liran, Jonathan Levin, Igor Popov, and Neel Sundaresan. 2014. "Growth, Adoption, and Use of Mobile E-Commerce." *American Economics Review: Papers & Proceedings* 104(5): 489-494.

Ellickson, Paul B. 2007. "Does Sutton Apply to Supermarkets?." *Rand Journal of Economics* 38(1): 43-59.

Foster, Lucia, John Haltiwanger, and C.J. Krizan. 2006. "Market Selection, Reallocation, and Restructuring in the U.S. Retail Trade Sector in the 1990s." *The Review of Economics and Statistics* 88(4): 748-758.

Galakos, David. forthcoming. "Explaining Cross-Country Productivity Differences in Retail Trade." *Journal of Political Economy*

Goldmanis, Maris, Ali Hortaçsu, Syverson Chad, and Emre Цnsel. 2009. "E-Commerce and the Market Structure of Retail Industries." *The Economic Journal* 120651-682.

Hausman, Jerry, and Ephraim Leibtag. 2007 "Consumer benefits from increased competition in shopping outlets: Measuring the effect of Wal-Mart." *Journal of Applied Econometrics* 22.7 (2007): 1157-1177.

Head, Keith, Ran Jing, and Deborah L. Swenson. 2014. "From Beijing to Bentonville: Do multinational retailers link markets?" *Journal of Development Economics* 110: 79-92.

Holmes, Thomas. 2001. "Bar Codes Lead to Frequent Deliveries and Superstores." *RAND Journal of Economics* 32(4): 708-725.

Iacovone, Leonardo, Beata Smarzynska Javoric, Wolfgang Keller, and James R. Tybout. 2015. "Supplier Responses to Wal-Mart's Invasion of Mexico." NBER Working paper 17204.

Javorcik, Beata S., and Yue Li. 2013. "Do the Biggest Aisles Serve a Brighter Future? Global Retail Chains and Their Implications for Romania." *Journal of International Economics* 90(2): 348-363.

Lagakos, David. forthcoming. "Explaining Cross-Country Productivity Differences in Retail Trade." *Journal of Political Economy*

Lieber, Ethan, and Chad Syverson. 2012. "Online Versus Offline Competition." in: Peitz, Martin, and Joel Waltfogel (Eds.). *Oxford Handbook of the Digital Economy.* Oxford University

Press. 189-223.

McKinsey Global Institute. 2001. U.S. Productivity Growth 1995-2000: Understanding the Contribution of Information Technology Relative to Other Factors. Washington, D.C.: McKinsey Global Institute.

Messinger, Paul R., and Chakravarthi Narasimhan. 1995. "Has Power Shifted in the Grocery Channel?." *Marketing Science* 14(2): 189-223.

Murphy, Kevin M., Andrei Shleifer, and Robert W. Vishny. 1989. "Industrialization and the Big Push." *The Journal of Political Economy* 97(5): 1003-1026.

Oi, Walter Y. 1992. "Productivity in the Distributive Trades: The Shopper and the Economies of Massed Reserves." in: Griliches, Zvi (Eds.). *Output Measurement In the Service Sectors.* University of Chicago Press/ NBER. 161-191.

Pozzi, Andrea. 2013. "The Effect of Internet Distribution on Brick-and-Mortar Sales." *RAND Journal of Economics* 44(3): 569-583.

Reardon, Thomas, Spencer Henson, and Julio Berdegué. 2007. "'Proactive Fast-Tracking' Diffusion of Supermarkets in Developing Countries: Implications for Market Institutions and Trade." *Journal of Economic Geography* 7399-431.

Reardon, Thomas, and C. Peter Timmer. 2012. "The Economics of the Food System Revolution." *Annual Review of Resource Economics* 4225-264.

Shaw, Arch W. 1912. "Some Problems in Market Distribution." *Quarterly Journal of Economics* 26(4): 703-765.

Tedlow, Richard S. 1990. *New and Improved: The Story of Mass Marketing In America.* New York, NY: Basic Books.

Traill, W. Bruce. 2006. "The Rapid Rise of Supermarkets?." *Development Policy Review* 24(2): 163-174.

WSJ. 2015. "Why E-Commerce Can Be a Big Pain for India's Deliverymen." *Wall Street Journal.*

Table 1:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (High Income Nations)

Store type	All high income nations	Germany	Italy	Japan	United Kingdom	United States
Traditional formats						
Independent/	9.4	6.2	11.3	9.6	5.4	6.6
Other	(-2.7)	(-3.9)	(-0.5)	(-2.7)	(-5.0)	(-2.4)
Food/Drink/	8.9	10.3	14.5	6.8	5.9	6.0
Tobacco specialists	(-2.5)	(-1.5)	(-2.7)	(-6.4)	(-4.7)	(-1.3)
Modern formats						
Supermarkets	33.5	28.1	34.6	37.4	20.9	29.6
	(-0.1)	(-0.5)	(1.0)	(0.8)	(-2.1)	(-1.4)
Hypermarkets/	24.9	17.0	17.5	17.8	41.8	32.5
Mass merchandisers	(0.9)	(-0.9)	(0.5)	(-0.1)	(1.6)	(1.5)
Discounters	7.2	33.8	10.4		5.7	1.3
	(2.8)	(3.0)	(2.7)		(5.2)	(1.3)
Warehouse	3.9			0.6		10.5
clubs	(3.9)			(21.6)		(3.7)
Convenience	7.3		11.6	27.8	17.1	2.0
stores	(2.1)		(-0.5)	(3.6)	(4.0)	(0.0)
Forecourt	5.0	4.3			3.1	11.4
retailers	(-0.3)	(-0.5)			(-0.7)	(-0.0)

Notes: 2014 shares report on fraction of national grocery revenue. Whereas some revenue of Mass Merchandisers and Warehouse Clubs is non-grocery, these formats constitute a major source of grocery retailing and are included. In parenthesis, average annual percentage growth is computed over the years 2000-2014: if $s_{f,y}$ is the revenue share of a store format f in year y then define $g_{f,t} = s_{f,t}/s_{f,t-1}$. Next, define g_f as its geometric mean, computed over the years that sales is recorded. The reported percentage change is $100 \times (g_f - 1)$. No share or growth rates are reported if the 2014 regional share of a particular store type is less than one half of a percent of the market. Data: Euromonitor 2015.

Table 2:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (Emerging Nations)

Store type	All developing nations	Argentina	India	Nigeria	South Korea	Turkey
Traditional formats						
Independent/	44.4	47.4	81.0	86.7	15.6	47.4
Other	(-2.8)	(0.7)	(0.1)	(-0.3)	(-2.4)	(-3.4)
Food/Drink/	12.2	12.7	17.3	6.7	13.9	15.6
Tobacco specialists	(-1.2)	(-0.7)	(-1.1)	(-0.9)	(-4.4)	(1.1)
Modern formats						
Supermarkets	24.9	22.6	0.8	2.9	14.7	20.1
	(5.4)	(-0.6)	(8.6)	(7.3)	(-3.8)	(6.5)
Hypermarkets/	11.8	12.3	0.8	1.4	35.8	2.7
Mass merchandisers	(6.6)	(-1.1)	(29.3)	(86.0)	(3.4)	(13.2)
Discounters	2.6	2.3				11.6
	(4.0)	(8.6)				(19.9)
Warehouse	0.5				5.8	
clubs	(7.6)				(15.2)	
Convenience	2.7	0.8			14.2	1.7
stores	(9.5)	(32.2)			(10.9)	(33.6)
Forecourt	0.9	1.9		1.9		1.0
retailers	(4.5)	(-3.3)		(4.6)		(5.8)

Notes: 2014 shares report on fraction of national grocery revenue. Whereas some revenue of Mass Merchandisers and Warehouse Clubs is non-grocery, these formats constitute a major source of grocery retailing and are included. In parenthesis, average annual percentage growth is computed over the years 2000-2014: if $s_{f,y}$ is the revenue share of a store format f in year y then define $g_{f,t} = s_{f,t}/s_{f,t-1}$. Next, define g_f as its geometric mean, computed over the years that sales is recorded. The reported percentage change is $100 \times (g_f - 1)$. No share or growth rates are reported if the 2014 regional share of a particular store type is less than one half of a percent of the market. Data: Euromonitor 2015.

Table 3:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (High Income Nations)

sub category	All high income nations	Germany	Italy	Japan	United Kingdom	United States
All	5.7	5.6	1.5	6.7	9.9	7.1
	(13.7)	(15.4)	(16.4)	(11.2)	(17.7)	(12.5)
Apparel and	14.8	21.3	2.8	11.2	23.4	18.4
footwear	(15.7)	(16.3)	(34.1)	(15.4)	(16.5)	(12.2)
Electronics and	20.2	21.5	9.7	6.6	28.6	30.3
appliances	(13.0)	(20.0)	(14.4)	(10.1)	(28.3)	(9.7)
Grocery	1.0			1.8	3.3	0.6
items	(11.6)			(9.2)	(12.3)	(13.5)

Note: The subcategory "All" is the sum of 6 subcategories: apparel and footwear, electronics and appliances, grocery, health and beauty, home and garden, and personal goods. Personal goods is a miscellany consisting of media products, personal accessories, eye-wear, games and toys, sports goods, and pet care. Shares report on fraction of regional sales that is purchased online. In parenthesis, average annual percentage growth is computed over the years 2004-2014: if $s_{c,y}$ is the online share of a subcategory *f* in year *y* then define $g_{c,t} = s_{c,t}/s_{c,t-1}$. Next, define g_c as its geometric mean, computed over the years that online sales is recorded. The reported percentage growth is $100 \times (g_c - 1)$. No share or growth rates are reported if the 2014 regional share of a particular transaction type is less than one half of a percent of the market. Data: Euromonitor 2015.

Table 4:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (Emerging Nations)

sub category	All developing nations	Argentina	India	Nigeria	South Korea	Turkey
All	4.2	1.5	0.8	0.6	11.6	1.7
	(25.5)	(25.9)	(50.1)	(57.5)	(9.3)	(27.6)
Apparel and footwear	13.5	0.6	3.2	1.5	23.5	2.9
	(32.9)	(30.6)	(51.1)	(64.0)	(14.9)	(53.4)
Electronics and appliances	15.0	14.9	2.5	1.0	9.8	6.9
	(22.1)	(21.0)	(30.5)	(67.3)	(0.8)	(16.1)
Grocery items	0.8				6.3	
	(26.9)				(15.8)	

Note: The subcategory "All" is the sum of 6 subcategories: apparel and footwear, electronics and appliances, grocery, health and beauty, home and garden, and personal goods. Personal goods is a miscellany consisting of media products, personal accessories, eye-wear, games and toys, sports goods, and pet care. Shares report on fraction of regional sales that is purchased online. In parenthesis, average annual percentage growth is computed over the years 2004-2014: if $s_{c,y}$ is the online share of a subcategory *f* in year *y* then define $g_{c,t} = s_{c,t}/s_{c,t-1}$. Next, define g_c as its geometric mean, computed over the years that online sales is recorded. The reported percentage growth is $100 \times (g_c - 1)$. No share or growth rates are reported if the 2014 regional share of a particular transaction type is less than one half of a percent of the market. Data: Euromonitor 2015.

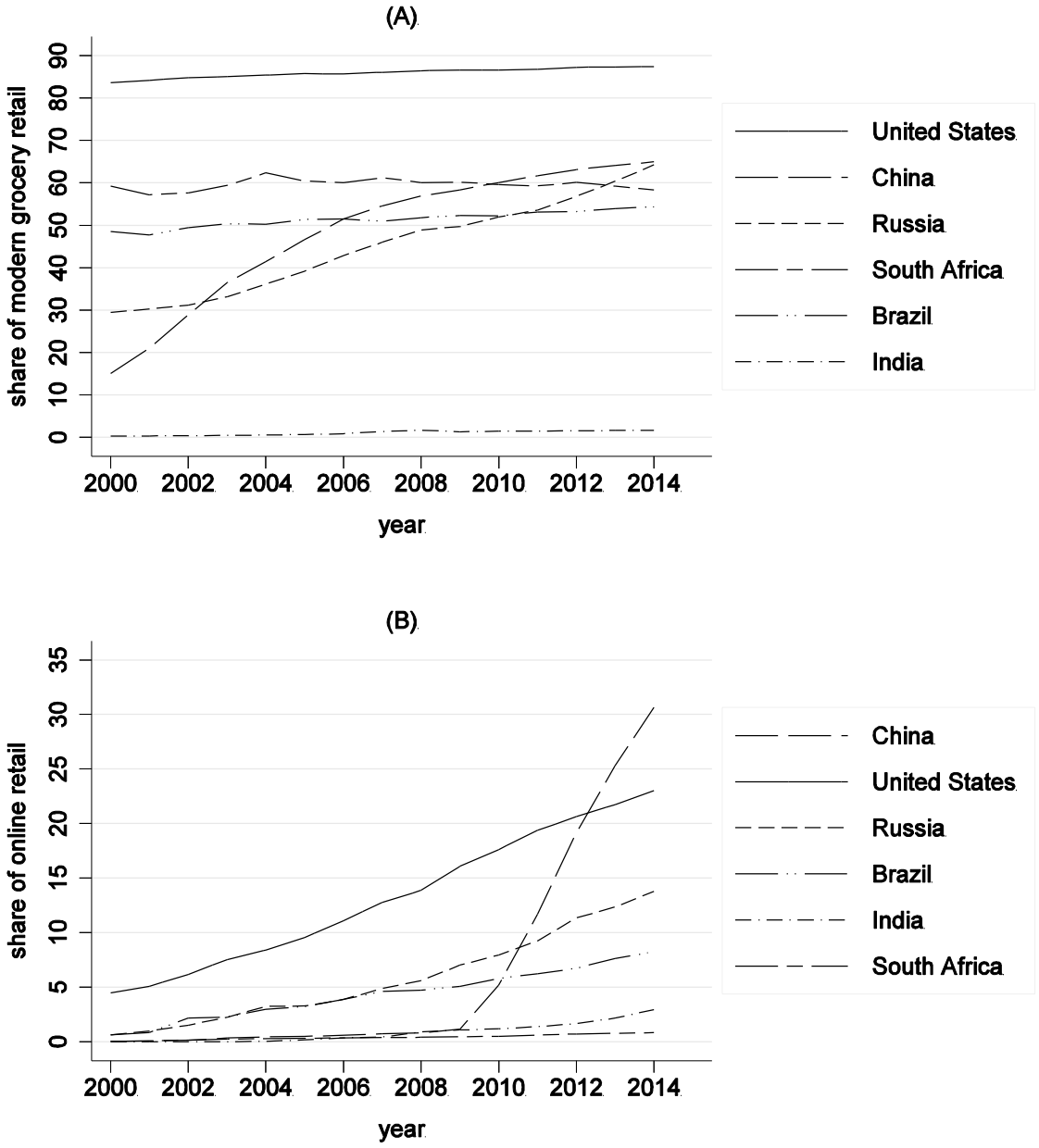

Figure 1: Modern Retailing Systems in BRICS versus US, 2000-2014

Note: Panel (A) shows the grocery revenue share of all modern retailing formats (convenience stores, discounters, forecourt retailers, hypermarkets, mass-merchandisers, supermarkets, and warehouse clubs) as a fraction of the total retail revenue which also includes traditional retail formats (food/drink/tobacco specialists, independent stores, and other stores). Panel (B) shows the share of online retailing as a fraction of total retail revenue for selected consumer durables consisting of "Apparel / Footware" plus "Electronics / Appliances." Data source: Euromonitor 2015.

Online Appendix A: Store Formats for Individual Countries

Table A.1:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (Africa)

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
Algeria	80.6	11.1	7.2	1.1				
	(-0.4)	(-1.3)	(10.8)	(9.1)				
Egypt	36.4	40.8	18.0	2.8			0.7	1.3
	(-0.6)	(-1.4)	(4.4)	(19.4)			(15.1)	(3.3)
Morocco	64.8	15.7	6.6	11.6			0.6	0.5
	(-1.9)	(1.6)	(14.6)	(17.0)			(-0.3)	(2.6)
Nigeria	86.7	6.7	2.9	1.4				1.9
	(-0.3)	(-0.9)	(7.3)	(86.0)				(4.6)
South Africa	23.9	17.8	40.4	6.9	1.1	2.4	4.5	3.2
	(-1.2)	(2.4)	(-1.1)	(6.4)	(13.6)	(0.8)	(1.2)	(1.0)

Notes: 2014 shares report on fraction of national grocery revenue. Whereas some revenue of Mass Merchandisers and Warehouse Clubs is non-grocery, these formats constitute a major source of grocery retailing and are included. In parenthesis, average annual percentage growth is computed over the years 2000-2014: if s_{fy} is the revenue share of a store format f in year y then define $g_{f,t} = s_{f,t}/s_{f,t-1.}$, and define g_f as its geometric mean. The reported percentage change is $100 \times (g_f - 1)$. No share or growth rates are reported if the 2014 regional share of a particular store type is less than one half of a percent of the market. Data: Euromonitor 2015.

Table A.2: **2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (Asia)**

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
China	29.2	5.8	47.4	15.5			1.4	0.6
	(-7.0)	(3.1)	(9.4)	(19.5)			(11.0)	(16.4)
Hong Kong,China	6.6	26.5	55.2				11.2	0.5
	(-5.2)	(-0.5)	(1.0)				(2.1)	(-3.4)
India	81.0	17.3	0.8	0.8				
	(0.1)	(-1.1)	(8.6)	(29.3)				
Indonesia	82.8	1.0	5.5	3.3			7.4	
	(-0.8)	(-2.4)	(2.1)	(8.4)			(23.7)	
Iran	81.4	12.5	3.0	3.1				
	(-0.1)	(-0.9)	(6.4)	(1.9)				
Israel	13.7	14.6	24.3	1.6	38.7		1.7	5.4
	(-5.6)	(-0.6)	(2.3)	(-14.8)	(5.2)		(6.0)	(17.0)
Japan	9.6	6.8	37.4	17.8		0.6	27.8	
	(-2.7)	(-6.4)	(0.8)	(-0.1)		(21.6)	(3.6)	
Malaysia	29.2	28.2	13.6	20.9	0.6		5.1	2.5
	(-5.3)	(-0.4)	(6.5)	(20.0)	(94.8)		(22.1)	(13.8)
Pakistan	94.7	1.6	2.6					0.6
	(-0.1)	(0.2)	(5.5)					(-0.3)
Philippines	65.8	5.3	20.4	6.1		0.7	1.5	
	(-1.2)	(-0.6)	(2.1)	(17.6)		(22.5)	(7.4)	
Saudi Arabia	26.7	16.2	24.0	17.7			10.6	4.8
	(-3.2)	(0.3)	(1.2)	(5.4)			(1.6)	(-0.5)
Singapore	18.7	10.5	53.1	9.2			7.1	1.4
	(-5.4)	(2.2)	(1.6)	(9.2)			(3.3)	(-1.5)
South Korea	15.6	13.9	14.7	35.8		5.8	14.2	
	(-2.4)	(-4.4)	(-3.8)	(3.4)		(15.2)	(10.9)	
Thailand	17.8	37.6	8.8	15.9			16.7	3.1
	(-0.3)	(-2.9)	(-2.3)	(7.2)			(10.3)	(2.4)
Turkey	47.4	15.6	20.1	2.7	11.6		1.7	1.0
	(-3.4)	(1.1)	(6.5)	(13.2)	(19.9)		(33.6)	(5.8)
United Arab Emirates	7.4	10.4	18.2	58.7			0.9	4.3
	(-4.8)	(-0.5)	(0.3)	(1.0)			(17.2)	(-1.6)

Notes: See Table A.1

Table A.3a:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (Europe – part (a))

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
Austria	2.1	8.4	41.6	14.8	27.3		2.4	3.4
	(-4.5)	(-3.9)	(0.2)	(0.1)	(3.6)		(-5.9)	(-0.7)
Belgium	17.1	14.9	38.5	7.0	11.9		9.1	1.5
	(-2.1)	(-0.6)	(2.4)	(-3.7)	(0.4)		(0.3)	(1.4)
Denmark	3.0	5.7	22.0	23.9	33.1		8.3	4.1
	(-4.2)	(-2.1)	(-2.1)	(0.6)	(4.9)		(-2.5)	(-3.4)
Finland	1.1	8.0	28.2	31.5	6.4		22.6	2.2
	(-5.5)	(-2.5)	(0.7)	(1.3)	(26.9)		(-1.9)	(-4.6)
France	5.7	13.6	27.3	41.8	7.7		3.1	0.9
	(-2.9)	(0.5)	(-0.1)	(-0.0)	(3.3)		(-0.2)	(-1.5)
Germany	6.2	10.3	28.1	17.0	33.8			4.3
	(-3.9)	(-1.5)	(-0.5)	(-0.9)	(3.0)			(-0.5)
Greece	29.0	15.9	43.1	2.8	7.5		1.2	
	(-3.0)	(-0.5)	(2.1)	(2.1)	(6.3)		(10.5)	
Italy	11.3	14.5	34.6	17.5	10.4		11.6	
	(-0.5)	(-2.7)	(1.0)	(0.5)	(2.7)		(-0.5)	
Netherlands	5.1	8.7	62.1	3.5	13.3		2.0	5.3
	(-3.6)	(-4.7)	(0.6)	(28.8)	(3.4)		(1.7)	(-2.0)
Norway	2.3	10.0	29.2	5.5	43.8		6.4	2.8
	(-5.6)	(-2.3)	(0.4)	(-0.7)	(2.1)		(-2.5)	(-4.3)

Notes: See Table A.1

Table A.3b:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (Europe – part (b))

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
Poland	17.6	5.2	19.4	15.6	27.0		13.5	1.6
	(-8.2)	(-5.1)	(7.8)	(3.0)	(11.2)		(6.1)	(-0.0)
Portugal	6.9	8.9	53.7	16.8	10.6		1.9	1.1
	(-4.3)	(-2.2)	(1.8)	(-1.3)	(0.2)		(0.4)	(0.9)
Russia	33.2	2.6	41.1	13.8			9.2	
	(-4.9)	(-1.9)	(2.9)	(36.8)			(13.6)	
Spain	3.9	19.3	52.6	13.7	8.3		1.1	1.1
	(-5.1)	(-1.7)	(1.7)	(-1.4)	(2.5)		(-1.6)	(-4.2)
Sweden	4.3	14.5	39.8	23.7	4.4		9.5	3.6
	(-1.8)	(-1.1)	(-1.5)	(4.0)	(5.9)		(1.5)	(-2.2)
Switzerland	3.1	17.8	49.1	11.4	11.0		2.8	4.8
	(0.8)	(-2.8)	(0.1)	(0.3)	(6.8)		(0.9)	(0.4)
Ukraine	39.8	2.5	41.9	11.1			3.6	1.1
	(-5.4)	(-3.7)	(12.1)	(16.2)			(6.9)	(11.3)
United Kingdom	5.4	5.9	20.9	41.8	5.7		17.1	3.1
	(-5.0)	(-4.7)	(-2.1)	(1.6)	(5.2)		(4.0)	(-0.7)

Notes: See Table A.1

Table A.4:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (South America)

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
Argentina	47.4	12.7	22.6	12.3	2.3		0.8	1.9
	(0.7)	(-0.7)	(-0.6)	(-1.1)	(8.6)		(32.2)	(-3.3)
Brazil	36.0	9.6	24.6	22.2	4.0	1.5		1.7
	(-1.2)	(0.6)	(0.7)	(-0.9)	(30.5)	(5.5)		(4.7)
Chile	25.2	16.1	26.4	24.0	6.6			1.0
	(-1.4)	(-2.0)	(-1.9)	(4.8)	(60.7)			(4.4)
Colombia	33.1	25.7	15.8	21.0	2.6	1.3		
	(0.5)	(-3.0)	(-2.6)	(8.1)	(46.8)	(155.3)		
Mexico	29.1	14.1	8.2	17.4	19.2	3.2	7.0	1.8
	(-1.5)	(-1.7)	(0.2)	(0.2)	(1.3)	(3.6)	(7.0)	(14.5)
Peru	69.8	5.6	10.2	14.0				
	(-1.1)	(-1.0)	(0.6)	(12.6)				
Venezuela	33.3	19.7	37.0	4.9	4.7			
	(-2.3)	(-0.3)	(2.2)	(-0.9)	(11.9)			

Notes: See Table A.1

Table A.5:

2014 Share and 2000-2014 Annual Growth by Store Type in the Grocery Trade (North America and Oceania)

	Traditional formats		Modern formats					
			Variety focused		Price focused		Convenience	
Country	Independent/ Other	Food/Drink/ Tobacco specialists	Supermarkets	Hypermrkts/Mass merchandisers	Discounters	Warehouse clubs	Convenience stores	Forecourt retailers
Canada	13.9	14.8	25.6	20.0	11.8	8.9	1.2	3.9
	(-1.6)	(0.9)	(-1.0)	(2.0)	(0.3)	(2.4)	(-1.8)	(-2.5)
United States	6.6	6.0	29.6	32.5	1.3	10.5	2.0	11.4
	(-2.4)	(-1.3)	(-1.4)	(1.5)	(1.3)	(3.7)	(0.0)	(-0.0)
Australia	5.0	18.0	58.0	8.7	3.9	0.5	1.3	4.5
	(-4.6)	(-0.5)	(0.4)	(0.4)	(21.8)	(58.1)	(-2.8)	(-1.8)
New Zealand	7.5	7.5	66.0	8.0			5.1	6.0
	(-2.6)	(-1.2)	(2.0)	(-3.5)			(-3.9)	(-2.2)

Notes: See Table A.1

Online Appendix B: Online Retailing Shares for Individual Countries

Table B.1:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (Africa)

Country	All	Apparel and footwear	Electronics and appliances	Grocery items
Algeria				
Egypt		0.7	1.3	
		(14.3)	(42.6)	
Morocco	0.5		9.8	
	(4.2)		(6.6)	
Nigeria	0.6	1.5	1.0	
	(57.5)	(64.0)	(67.3)	
South Africa	0.6	0.5	2.2	
	(14.0)	(11.2)	(6.9)	

Note: The subcategory "All" is the sum of 6 subcategories: apparel and footwear, electronics and appliances, grocery, health and beauty, home and garden, and personal goods. Personal goods is a miscellany consisting of media products, personal accessories, eye-wear, games and toys, sports goods, and pet care. Shares report on fraction of regional sales that is purchased online. In parenthesis, average annual percentage growth is computed over the years 2004-2014: if s_{fy} is the online share of a subcategory f in year y then define $g_{f,t} = s_{f,t}/s_{f,t-1.}$, and define g_f as its geometric mean. The reported percentage growth is $100 \times (g_f - 1)$. No share or growth rates are reported if the 2014 regional share of a particular transaction type is less than one half of a percent of the market

Table B.2:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (Asia)

Country	All	Apparel and footwear	Electronics and appliances	Grocery items
China	8.2	33.4	28.8	1.6
	(53.6)	(92.0)	(46.6)	(83.3)
Hong Kong,China	2.5	2.0	9.6	
	(9.4)	(5.0)	(7.8)	
India	0.8	3.2	2.5	
	(50.1)	(51.1)	(30.5)	
Indonesia		1.9	1.8	
		(152.1)	(42.6)	
Iran				
Israel	2.7	3.1	7.3	0.9
	(18.9)	(24.9)	(18.0)	(30.5)
Japan	6.7	11.2	6.6	1.8
	(11.2)	(15.4)	(10.1)	(9.2)
Malaysia	0.7	2.3	0.7	
	(15.2)	(16.6)	(36.4)	
Pakistan			0.7	
			(39.4)	
Philippines	0.5	4.0	2.9	
	(9.1)	(4.1)	(29.7)	
Saudi Arabia			1.5	
			(8.4)	
Singapore	2.5	7.6	2.0	0.9
	(7.4)	(8.9)	(-1.1)	(3.9)
South Korea	11.6	23.5	9.8	6.3
	(9.3)	(14.9)	(0.8)	(15.8)
Thailand	1.1	4.3	5.0	
	(15.6)	(4.3)	(17.7)	
Turkey	1.7	2.9	6.9	
	(27.6)	(53.4)	(16.1)	
United Arab Emirates	1.1	1.9	6.2	
	(8.0)	(5.2)	(1.2)	

Note: See Table B.1

Table B.3:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (Europe)

Country	All	Apparel and footwear	Electronics and appliances	Grocery items
Austria	3.9	7.2	9.8	0.5
	(9.1)	(15.3)	(13.4)	(12.3)
Belgium	4.7	8.6	16.1	1.2
	(22.7)	(28.1)	(26.3)	(12.3)
Denmark	9.1	20.2	34.2	0.9
	(19.7)	(26.6)	(12.3)	(31.1)
Finland	8.8	28.8	44.5	
	(5.8)	(4.6)	(4.3)	
France	4.6	15.2	17.4	1.5
	(16.7)	(24.7)	(12.3)	(11.5)
Germany	5.6	21.3	21.5	
	(15.4)	(16.3)	(20.0)	
Greece	2.3	7.1	10.5	
	(25.9)	(32.6)	(18.0)	
Italy	1.5	2.8	9.7	
	(16.4)	(34.1)	(14.4)	
Netherlands	6.2	10.4	20.9	1.3
	(19.0)	(19.0)	(13.9)	(9.9)
Norway	5.9	11.6	33.8	
	(9.9)	(11.0)	(12.3)	
Poland	3.9	10.8	18.8	
	(22.9)	(29.4)	(26.1)	
Portugal	3.3	9.9	17.5	1.3
	(20.7)	(17.7)	(41.1)	(18.0)
Russia	3.2	14.0	13.6	
	(12.8)	(13.9)	(16.1)	
Spain	3.3	7.1	13.2	1.3
	(15.7)	(18.3)	(24.8)	(10.5)
Sweden	5.6	12.3	29.8	1.3
	(13.9)	(14.5)	(12.1)	(27.2)
Switzerland	4.1	7.7	22.7	0.9
	(12.2)	(15.7)	(11.8)	(13.2)
Ukraine	3.1	6.1	15.3	0.6
	(40.1)	(35.4)	(44.2)	(40.3)
United Kingdom	9.9	23.4	28.6	3.3
	(17.7)	(16.5)	(28.3)	(12.3)

Note: See Table B.1

Table B.4:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (South America)

Country	All	Apparel and footwear	Electronics and appliances	Grocery items
Argentina	1.5	0.6	14.9	
	(25.9)	(30.6)	(21.0)	
Brazil	3.2	2.5	15.0	
	(12.7)	(54.2)	(5.8)	
Chile	2.2	2.2	24.5	
	(19.2)	(110.6)	(19.4)	
Colombia	0.9	2.2	4.7	
	(32.7)	(34.2)	(30.6)	
Mexico	1.7	4.7	19.6	
	(32.9)	(71.3)	(30.6)	
Peru	0.6		5.4	
	(14.5)		(6.9)	
Venezuela	0.9	2.0	6.6	
	(29.0)	(15.7)	(22.3)	

Note: See Table B.1

Table B.5:

2014 Share of Online Purchases and 2004-2014 Annual Percentage Growth Rates by Region and Industry (North America and Oceania)

Country	All	Apparel and footwear	Electronics and appliances	Grocery items
Canada	2.0	3.5	7.6	
	(7.8)	(9.4)	(3.6)	
United States	7.1	18.4	30.3	0.6
	(12.5)	(12.2)	(9.7)	(13.5)
Australia	3.3	11.7	9.4	0.8
	(18.8)	(26.9)	(15.1)	(15.0)
New Zealand	3.8	9.3	5.6	1.9
	(28.9)	(32.5)	(26.8)	(29.7)

Note: See Table B.1