Do Large Modern Retailers Attract More Productive Small Entrants? Evidence from Retail Modernization in Korea

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November 6, 2016

Abstract

The massive restructuring and reallocation driven by the entry of large modern retailers substantially contributed to productivity growth in the retail trade sector. Using establishment-level Census data, we examine the role of large modern retailers in reallocation and productivity growth in the Korean retail trade sector. We find that new entrants in counties with pre-existing large modern retailers are more productive than those that entered in counties without large retailers. Furthermore, entry is more active in counties with large retailers. The high productivity-level is not uniformly observed among all new entrants, but is concentrated among small stores. Our finding provides new mechanism that large modern retailers in emerging economies may stimulate the reallocation process in the local retail sector, by not only just driving out less efficient stores but also attracting more efficient small stores. It contrasts to the evidence from advanced countries that retail productivity growth is mainly accounted for by more productive entering large retailers such as Wal-Mart displacing less productive stores.

JEL Classification: L81, O47, R12
Keywords: Entry and Exit, Large Modern Retailers, Productivity, Reallocation, Retail Trade

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An earlier version of this paper circulated under the title "Productivity Growth in the Retail Sector: Entry, Exit and Reallocation." We thank Emek Basker, Tim Dunne, Hugo Hopenhayn, Taewhan Kim, Shawn Klimek, Florin Maican, Matilda Orth, Margaret Slade, Janne Tukianen, Doo Yong Yang, and participants at the Annual Conference of the European Association for Research in Industrial Economics (EARIE), Bank of Korea, Comparative Analysis of Enterprise Data (CAED) Conference, Hitotsubashi Summer Institute, International Industrial Organization Conference (IIOC), the KEA International Conference, the Korea Academic Society of Industrial Organization Workshop, Midwest Macro Meeting, and the Pac Rim 3 Conference of the Association for Comparative Economic Studies for their helpful comments. This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2015S1A5A2A0304967). We also thank Statistics Korea and the Korea Statistics Promotion Institute for allowing us access to the data used in this paper in a secure data center. All results have been reviewed to ensure that no confidential information is disclosed.

1. Introduction

The massive restructuring and reallocation driven by the entry of large modern retailers[1] has contributed substantially to productivity growth in the retail trade sector around the world. According to the studies on the U.S. and advanced countries, this sector-wide productivity growth is mainly accounted for by the reallocation process across stores, in particular, more productive entrants replacing less productive existing stores (Foster, Haltiwanger, and Krizan, 2006).[2] The diffusion of large modern retailers, represented by the modern retail formats with advanced distribution systems and better technologies, has radically transformed retail sectors in developing and emerging countries as well (Bronnenberg and Ellickson, 2015).

In advanced countries where the transition to modern retailing is nearly completed, more efficient modern retailers such as Wal-Mart replaced *pre-existing* modern retailers such as regional and local supermarket chains. In contrast, traditional retailers such as small independent stores still account for a large share in the retail market in developing and emerging countries. The diffusion of modern retail technology in those countries may not be limited to simply replacing existing small and independent retailers. It is likely to involve sector-wide modernization away from traditional retail formats. Thus, the impact of large modern retailers with new technologies and formats may have greater impacts on consumer welfare and productivity growth in developing and emerging countries than advanced countries. For example, Atkin, Faber, and Gonzalez-Navarro (2015) find that the entry of foreign-owned supermarkets into Mexico, increases consumer welfare through offering lower prices, higher quality products, and better shopping amenities than existing domestic retailers. However, the literature have so far paid little attention to the underlying micro-mechanism of how the diffusion of large modern retailers in developing and

[1] These large, national chains are often called big boxes, superstores, supercenters, or hypermarkets. We label them "large modern retailers" since they are not just large in terms of size but provide "modern" retail services that were not available in traditional retail stores. They provide more convenient, modern shopping amenities such as parking, credit card payment, indoor shopping areas with air conditioning and heating, and food courts. Such modern chain stores did not exist in Korea until early 1990s when the first modern retailer appeared. A typical large modern retailer in Korea is a national retail chain store selling food and general merchandise. The store format is similar to a hypermarket or superstore because food products comprise about half of store sales.

[2] See also Matsuura and Motohashi (2005) for Japan, Hijzan, Upward, and Wright (2010) for the U.K., and Baldwin and Gu (2011) for Canada.

emerging countries affected the retail sector's productivity growth.

How does the productivity effect of large modern retailers in the emerging markets differ from that in advanced countries in terms of the reallocation process? In this paper, we provide new evidence on the reallocation and modernization process driven by large modern retailers and their impacts on productivity growth in the Korean retail trade sector. Recent changes in the Korean retail sector provide a showcase to explore the impact of large modern stores on the retail sector in an emerging country. Since the first large modern retailers (hypermarkets or superstores) opened in Seoul in 1993, the Korean retail sector, previously dominated by traditional small and independent retailers, underwent a rapid modernization and significant restructuring process.[3] Using establishment-level micro data from the Economic Census in 2005 and 2010, we measure the contributions of reallocation between less productive incumbents and more productive entrants to productivity growth in the retail trade sector. Following Foster, Haltiwanger, and Krizan (2006), we decompose the sector-wide productivity growth during the sample period. We find that entry-exit driven reallocation explains more than 70% of labor productivity growth from 2005 to 2010. The net entry effect is mostly explained by the entry of more productive stores rather than the exit of less productive ones. Moreover, we find that virtually all of the net entry effect on productivity growth is accounted for by the entry of small and medium-sized stores rather than that of large modern retailers.[4]

In order to explore the role of large modern retailers in productivity growth, we quantify the net entry effects in a regression context and examine the extent to which net entry effects vary across store size and location (i.e., whether there exists a large modern retailer in the county or not). We find that new entrants in counties with a large modern retailer are more productive than those that entered in counties without a large modern retailer. Moreover, entry was more active in the counties where a large modern store opened.

[3] According to Bronnenberg and Ellickson (2015), supermarkets and hypermarkets account for about 50% of the revenue shares in Korea in 2014. On average, these two typical modern formats of retailers account for about 60% of revenue shares in in high-income countries.

[4] Small and medium-sized chain stores, such as convenient stores and super-supermarkets (SSM), have also rapidly expanded during the sample period as large national retailers expanded across countries. These new stores, the first modern format of national retailer chains with modernized shopping infrastructures and advanced technologies, led structural change and productivity growth in the Korean retail sector.

The regression results suggest that the positive net entry effect is driven not only by the larger productivity difference between the entrants and existing stores in the counties with a large modern retail store but also by the higher number of entrants in those locations.

Our findings on both a significant contribution of entrants to the aggregate retail productivity growth and the role of large modern retailers in attracting more productive small entrants in the local markets are robust to not only endogeneity but also various alternative constructions. To address a potential endogeneity issue associated with the location of a large modern retailers, we use an instrumental variable based on the exogenous geographic diffusion pattern in the opening of retail chain stores. Because retail chains open stores close to each other to exploit economies of density in distribution (Neumark, Zhang, and Ciccarella, 2008; Holmes, 2011), the probability of store opening in a location is inversely related to the distance from the location of the first store opened. Our results were robust when we repeated the analysis using an alternative set of treatment variables (i.e., county with a pre-existing large modern retailers), which were derived from the predicted probability from regressions estimating the probability of a county being entered by a large modern retailer. Our results are also robust to alternative productivity measures related to omitted capital and etc.

Our finding suggests that opening of a large modern retail store may stimulate the reallocation process in the local retail market, by not just driving out less efficient stores but also attracting another small modernized stores into the neighborhood. The finding enhances our understanding of productivity dynamics in the retail sector by providing new evidence on the reallocation process driven by retail modernization. While we share the conclusion of existing studies that the entry and exit process is at the core of productivity gains in the retail industry, the selection mechanism observed in Korea is quite different from what was previously documented in advanced countries in the following two perspectives.

First, the findings of higher entry rate of other stores (i.e., small and specialized stores) and the higher productivity level of such entrants suggest that the selection process driven by the large retail stores is more likely to occur at the entry margin, rather than at the exit margin. Furthermore, the *indirect* net entry effect,

driven by small stores not by the large modern retailer itself, is more important in explaining the aggregate productivity growth in Korea retail sector than the direct effect from the entry of large retailers. The finding suggests that transition of traditional to modern retailing driven by the entry of modernized small stores may play a key role in productivity growth in the Korean retail sector. This is in sharp contrast to the U.S. (Foster, Haltiwanger, and Krizan, 2006), in which the entry of more efficient large retailers (e.g., Wal-mart) with new technology itself plays an important role in productivity growth in the retail trade.

Second, the result highlights the importance of dynamic, modernization process in which the presence of large modern retailers stimulates the entry of different types of stores (e.g., small and specialized ones). It is worth noting that the selection process is *dynamic*, occurring among *potential* entrants. So far, previous studies focusing on productivity dynamics have found that increased competition from large entrants with higher productivity forces low productivity incumbents to improve their productivity and induces exit of low productivity firms. Overall the selection effect discussed in previous studies is *static* given that it occurs among *existing* stores: driving out less efficient incumbents or inducing survivors to improve productivity. For example, Foster, Haltiwanger, and Krizan (2006) find that the dominant role of net entry is associated with the entry of more productive stores (e.g., large, national chain stores such as Wal-mart) replacing less productive stores. Maican and Orth (2015) find that large entrants force low productivity stores out of the market and increase productivity among survivors.[5,6]

The ongoing structural change in retail trade is a worldwide phenomenon. During the past decades, developing and emerging countries have accessed to more productive, modern retail technologies. However, they are not always prevalent in these countries and there exists a substantial productivity difference across

[5] In this case, the incumbents' productivity growth, driven by entrants, is classified as the within-effect, not the entry or reallocation effects. Such indirect effect of competition is also observed in other industries. For example, in U.S. iron ore industry, producers attempted to lower costs facing increased foreign competition (Schmitz, 2005). We focus on the selection effect driven by entry and exit because the net entry effect is known to dominate productivity dynamics in the retail industry.

[6] The increased competition driven by large entrants make incumbents strategically respond in various ways such as lowering prices (Basker and Noel, 2009) and increasing product offerings (Matsa, 2011). Unlike medium-sized (modern) incumbent supermarkets, very small independent (traditional) incumbent stores are not capable of changing product prices or service quality to maintain their competiveness.

countries. A recent study of Lagakos (2016) shows that a slow or lack of adoption of the modern retail technology may explain the much lower retail productivity level observed among developing countries. Weak competition and misallocation also may be another sources of low productivity (Schmitz, 2005; Hsieh and Klenow, 2009). In many developing and emerging countries, the intensified competition, along with the adoption of modern retail technologies, is often carried by multinational retailers (Jing, 2016). For this reason, restrictive FDI policies (e.g., India) can be a key obstacle for the modernization and productivity growth in the retail sector (Arnold *et al*., 2016). Thus, the modernization process and its impact may vary across countries depending upon government policies as well as different development stages.

Recent studies suggest that the spillover effect of the entry of big-box stores in developing and emerging countries may occur beyond the retail sector such as agriculture and manufacturing sectors. For example, Iacovone *et al*. (2011) find that the diffusion of Wal-Mart in Mexico resulted in product upgrading by upstream manufacturers. Javorcik and Li (2013) also find that the expansion of global retail chains increased the productivity in the supplying manufacturing industries in Romania. Head, Jing, and Swenson (2014) find that multinational retailers may promote the growth of exports of retail goods. By providing unique evidence that large modern retailers in Korea may increase aggregate productivity with the help of some positive spillovers to small retail stores, our paper contributes to the recently growing literature focusing on the reallocation and development process and also extends our knowledge on the ongoing evolution of the retail industry around the world.

The remainder of this paper is organized as follows. Section 2 provides a brief background of the diffusion of large modern retailers and retail modernization in Korea. Section 3 describes datasets used in the paper. Section 4 explains the productivity decomposition methods and the results. Section 5 provides empirical findings for the roles of large modern retailers in reallocation and modernization of the retail trade sector. Section 6 presents robustness checks for empirical results. Section 7 concludes.

2. Modernization of the Korean Retail Trade Sector

The Korean retail sector had remained underdeveloped, dominated by small, traditional shops until the early 1990s. As large modern retailers expanded across the country, the retail trade sector has experienced rapid modernization and massive restructuring. A number of factors contribute to this change. First, the demand for modern shopping environments has steadily grown as the household income increased with the help of economic growth. The rapid increase in car ownership during the 1990s also played an important role in the expansion of modern large-scale retailers and fall of small traditional mom-and-pops.[7] The number of cars per household in Korea was 0.35 in 1990 and increased to 0.85 in 2000. More importantly, the deregulation process in early 1990s helped large *domestic* conglomerates expand their businesses in the retail sector by introducing large modern retailers. For example the first, and the largest modern retail chain was founded by Shinsegae, which was originally part of the Samsung Group until separated in the 1990s. In addition, the Korean government fully opened the retail market to foreign companies in 1996. The devaluation of the Korean currency after the Asian financial crisis of 1997–1998 offered good opportunities for foreign retailers (e.g., Wal-Mart and Carrefour) to acquire retail and real estate assets at relatively cheap prices (Coe and Lee, 2006). In consequence, the number of large modern retailers increased from 11 in 1996 to 228 in 2005, and to 370 in 2010. Large modern retailers accounted for approximately 15% of 2005 (10% of 2010) retail trade sector's total sales and are located in nearly 50% (more than 60%) of counties in Korea.

The openings of large modern retailers in the mid-1990s triggered the modernization process of the Korean retail trade sector. Large modern retailers in Korea are the first large-scale retail establishments with advanced technology as well as nationwide store chains in the country. In this perspective, the restructuring process in Korea sharply contrasts with the case of the U.S., where big-box stores such as Wal-Mart competed with existing regional and local chain retailers, as well as mom-and-pop stores, by lowering prices. As a matter of fact, large modern retailers in Korea mainly competed with (less productive) traditional mom-and-pops because national (and regional) chains of supermarkets and retailers were not established in

[7] This is consistent with Lagakos (2016)'s theory in which car ownership is important in the diffusion of modern retail technology in developing countries.

the 1990s. The competition strategy of large modern retailers did not always involve lowering prices. They, along with newly entered, modernized small shops provided better services than traditional stores. Modernized shopping environment provided by large modern retailers satisfied the middle-income households' demand for better retail services. In fact, large modern retailers did not simply substituted traditional stores but created new demand for modern shopping environment. Better and more convenient shopping infrastructure, such as indoor parking, a shopping cart that carries children, air conditioning, and food courts, attracted more customers especially, middle-income household with children. Moreover, large modern retailers attracted various new stores, including (more productive) small stores. These include modernized small GMS such as convenient stores and specialized stores such as franchised bakery (Kwon and Chun, 2016). The modern shopping infrastructure provided by large modern retailers attracted small, specialized shops, which can share the convenient, modern shopping amenities.[8] Consistent with this view, the households' real retail expenditures grew on average at 2.99% between 2001 and 2010, faster than their real income, which grew on average 2.81% a year.

This is a new perspective of the structural changes that may occur in the process of retail industry modernization. The structural changes initiated by the entry of large modern retailers are not limited to drive out stores at the lower tail of productivity distribution or relatively less efficient incumbents (e.g., exiting traditional mom-and-pops). This process is distinguished from a *static* selection process (e.g., Syverson, 2004) because the heightened competition also shifts the distribution of entrants to the right by inviting more productive, modernized stores. Previous studies overlooked such a *dynamic selection* process in which a large modern retailer attracts new entrants that benefit from sharing modern shopping infrastructure. Such spillover may occur in the process of modernization of the retail sector, which was expedited with the spread of large modern retailers. The entry of various small-sized franchised stores

[8] In a study examining the impact of large retail store entry on the local supermarket, Zhu, Singh, and Dukes (2011) show that the entry generates positive demand externality to the incumbents located in the same shopping plaza, by attracting consumers. However, the positive externality created by the entry of large discount store in Korea is not just limited to an increase in the traffic. The entry of large modern retailers accompanied the build-up of a modern shopping plaza, which attracted small, specialized shops.

increased during the rapid expansion period of large modern retailers between the mid-1990s and the mid-2000s and continued even after the expansion of large modern retailers became stabilized in the late 2000s.

3. Data

We use establishment-level data from the 2005 Census of Service Industry and 2010 Economic Census. Statistics Korea conducts a survey of all establishments with at least one worker every five years, collecting data on the kind of business, location, sales, and employment.[9] We construct labor productivity at the establishment-level. Labor productivity is defined as real gross output divided by total hours of an establishment. Real gross output is defined as nominal sales deflated by the 4-digit level producer prices published by the Bank of Korea. To construct labor hours at the establishment, we multiply the 4-digit industry average hours for full-time and part-time workers by the number of each type of workers of an establishment. The average working hours of each 4-digit industry is obtained from the Survey on Labor Conditions by Employment Type, published by the Ministry of Employment and Labor. Since the Economic Census does not provide information about capital for establishment, it is not possible to construct total factor productivity (TFP). We thus use alternative measure of TFP using the sales floor space as a proxy for capital in the robustness check section.

In our analysis, we define the retail trade sector based on the Korean Standard Industry Classification Code (47).[10] We exclude mail order and online retailers (479) and used goods retailers (4786) because of difficulty in defining stores' geographic coverage. Total number of establishments in the retail trade sector in 2005 and 2010 is on average approximately 0.6 million, which accounts for about 20% of total establishments in Korea. Compared to the U.S., the majority of retailers are relatively small, on average, employing approximately 2.5 workers. Small establishments with 1–4 workers accounts for 94% of

[9] In 2010, Statistics Korea conducted the first Economic Census combing both the Industrial Census (Mining, Manufacturing, and Electricity, Gas, and Water Supply) and the Census of Service Industry.
[10] Using the concordance table at the 5-digit industry-level provided by Statistics Korea, the KSIC rev. 8 used in the 2005 Census of Service Industry is converted into KSIC rev. 9 used in the 2010 Economic Census.

establishments and employ 67% of workers in the retail trade sector.

The unit of observation in our study is an establishment. We do not distinguish between entry by new, single establishments (i.e., single unit firms) and entry through the opening of new establishments by multi-establishment firms (i.e., multi-unit firms). In a similar way, we do not distinguish between exiting establishments by exiting firms and exiting establishment that belong to continuing, multi-establishment firms. Because multi-establishment firms in the retail trade sector are not very common and are mainly concentrated in large GMS (4711) and medium-sized supermarkets (47121), our results based on the entry and exit of small establishments are not affected.

In addition to the Census datasets, we collect information on the locations and opening dates of large modern retailers obtained from the *Yearbook of Retail Industry* published by the Korea Chain Stores Association. A typical large modern retailer in Korea shares the format similar to a hypermarket or superstore because food products, including fresh food, comprise approximately 50% of store sales. Thus, large modern retailers in Korea play the roles of both supermarkets and discount stores that sell general merchandises at low prices. In order to focus on the impact of modern, large retail chains, we include only national chains with at least 10 stores in 3 provinces or more (among the total of 16 provinces in Korea). Therefore, we classified the following seven brands as large modern retailers: E-mart, Homeplus (Tesco), Lotte Mart, Hanaro, Wal-Mart, Homever (Carrefour), and Aram Mart. Not all the foreign retail transnational corporations (TNCs) that entered Korea were successful. For example, both Carrefour (which entered in 1996) and Wal-Mart (which entered in 1998) failed to attract local customers and withdrew from the Korean market in 2006; on the other hand, Tesco, a late entrant (allied with Samsung in 1999) became one of the three leading discount store chains.[11] In 2010, these seven national chains accounted for over 95% of all large chain discount stores. Most of these chains were active during our sample period; however, Wal-Mart was merged to E-Mart in 2006 and Aram Mart and Carrefour were merged to Homeplus in 2005 and 2008, respectively.

[11] See Coe and Lee (2013) for the detailed discussion about the success and failure of multinational retail chains in Korea and their strategies.

In a study analyzing the impact of large modern retailer entry on local retail employment, Cho, Chun, and Lee (2015) find that it is important to distinguish the spillover effect of the entry of large retail chain stores on other retail industries from the direct effect on the industry that large modern retailers belong to. Following the method, we divide Total Retail into two groups: i) Large GMS including large modern retailers and department stores and ii) Other Retail excluding Large GMS. In a regression analysis that will examine the net entry effect in more detail, we will break down Other Retail into GMS which includes small (1–9 employees) and medium-sized (10–49 employees) GMS (mom-and-pop groceries, convenience stores, and supermarkets) and non-GMS (e.g., clothing, electronics, bakery, butcher shops, etc.).

4. Productivity Dispersion, Reallocation, and Productivity Growth

4.1 Productivity Decomposition

Aggregate labor productivity of the Korean retail trade sector grew at 4% per year on average between 2005 and 2010. Using establishment-level data, we examine the extent to which entry, exit, and shifts in the share of inputs across stores affect the aggregate productivity growth of the retail trade sector. Following Foster, Haltiwanger, and Krizan (2006), we decompose the change in each 4-digit industry-level productivity ($P_{i,t}$) into components that reflect a within-store effect and other effects that reflect the reallocation of shares across stores including the effect of entry and exit:[12]

$$\Delta P_{i,t} = \sum_{e\in CN} \theta_{e,t-1}\,\Delta P_{e,t} + \sum_{e\in CN}\left(P_{e,t-1} - P_{i,t-1}\right)\Delta\theta_{e,t} + \sum_{e\in CN}\Delta\theta_{e,t}\,\Delta P_{e,t} + \sum_{e\in EN}\theta_{e,t}\left(P_{e,t} - P_{i,t-1}\right) - \sum_{e\in EX}\theta_{e,t-1}\left(P_{e,t-1} - P_{i,t-1}\right) \quad (1)$$

where $P_{e,t}$ is labor productivity at the store level and three store types are continuing stores (*CN*), entering

[12] Throughout the paper, we focus on the within-industry reallocation at the narrowly defined 4-digit level, which accounts for most of the aggregate productivity growth in the retail trade sector. Between-industry reallocation across 4-digit level industries explains only about 15% of the aggregate retail productivity growth.

stores (*EN*), and exiting stores (*EX*). $\theta_{e,t}$ is the share of store e within an industry at year t. We use total hours as share weights. The first term in the equation reflects changes in productivity from continuing stores, holding output shares fixed (often interpreted as a "within" effect). The second term reflects changes in output shares from continuing stores for fixed levels of productivity (often interpreted as a "between" effect) and the third term represents a cross term that shows whether stores with positive productivity changes are more likely to have increased employment share or not. The last two terms represent the contribution of entering and exiting stores, respectively. These two terms, together constituting the net entry effect, along with the between and cross effects, represent the effect of reallocations across stores on aggregate productivity changes.

[Table 1 about here]

Table 1 reports the aggregate labor productivity growth rate in the retail trade sector and their decomposed components. The aggregate productivity growth rate is defined as the weighted average of industry productivity growth rates at the 4-digit level using industry total hours as weights. Column (1) reports the results for the entire retail sector (i.e., Total Retail). Column (2) reports the results for the group of Large GMS, which accounts for 6.6% of employment in Total Retail and column (3) reports the results for Other Retail, which accounts 93.4% of employment in Total Retail.

During the 2005 to 2010 period, the average of industry labor productivity growth rates was 9.23% (approximately 2% per year). As in Foster, Haltiwanger, and Krizan (2006), we find that the net entry effect plays an important role in productivity growth, accounting for more than 80% of productivity gains. The net entry effect is mostly contributed from more productive entering stores rather than less productive exiting stores. The contribution of entry accounts for approximately 85% of net entry effect. This contrasts the finding of Foster, Haltiwanger, and Krizan (2006) who report both entrants and exiters similarly

contributing to the net entry effect.[13] Examining the productivity growth separately by two groups, we find that most of productivity growth comes from Other Retail. In fact, net entry effects in the Large GMS is negative, which suggests that entrants in the Large GMS have lower productivity that existing stores in the same industry. This finding is due to the fact that the entrants in our sample is late comers. During the 2005-2010 period, the market for large modern retailers became saturated and thus newly opened stores lees productive than incumbent stores.

On the other hand, net entry plays a critical role in the productivity growth in Other Retail. In particular, the contribution of entry accounts for virtually all of net-entry effect. Given that this Other Retail category excludes the Large GMS sector from the retail trade sector, the entry effect mainly reflects the entry of small single-unit establishments rather than that of large chain stores. This also contrasts the significant role of entry of national-chain stores in the U.S. (Foster, Haltiwanger, and Krizan, 2006). In the next section, we will investigate the more detailed feature of entry effect focusing on the Other Retail.

4.2 Productivity Dispersion and Reallocation

In this section, we present basic facts about the shape and evolution of the productivity distribution across establishments. Following Foster, Haltiwanger, and Krizan (2006) we examine the percentiles of the labor productivity distribution across businesses after removing 4-digit industry fixed effects. In order to analyze the dynamics of establishment-level productivity, Table 2 presents the transition of individual stores in the distribution of labor productivity between 2005 and 2010. In each year, establishments are classified into quintiles of the labor productivity distribution. The table shows where the establishments in 2005 end up in 2010 in the productivity distribution and where the establishments in 2010 came from (in italics).

[13] Foster, Haltiwanger, and Krizan (2006) distinguish entering stores of continuing firms from those from entering firms; and also exiting stores of continuing firms from those from exiting firms. Although we cannot identify types of entrants and exiters because of data limitation, the share of multi-unit firms is very small in the Korea retail sector, suggesting that the entry effect is mainly contributed from entering firms rather than from the expansion of continuing firms.

[Table 2 about here]

Table 2 presents the important role of entry and exit in the transition of productivity distribution. Both entry and exit rates are at about 52% in the Korean retail trade sector, much higher than those found in the U.S. The most striking pattern of the matrix is that entrants are more likely to arrive with relatively higher productivity.[14] 57.4% of stores in the highest quintile in 2010 are new entrant, while 43.2% stores in the lowest quintile are new entrants. In contrast, Foster, Haltiwanger, and Krizan (2006) find that the productivity of entrants in the U.S. retail trade is uniformly distributed across five quintiles.[15] Larger proportion of entrants in high productivity quintiles is not likely due to more active entry of medium or lager stores with higher productivity. The result is qualitatively the same after controlling not only 4-digit industry fixed effects but also store size fixed effects.

In contrast to the productivity distribution of entering stores, Foster, Haltiwanger, and Krizan (2006) find that exiting stores are concentrated in lower quintiles. The share of exiting stores in Korea decreases as productivity quintiles change from the lowest to the highest ones, but differences in exit shares are much smaller than those in the U.S. For example, 53.9% of stores in the lowest quintile in 2005 exited the industry, and 49.3% of stores in the highest quintile did.[16] Overall, Table 2 shows that the Korean retail trade sector attracted more productive entrants than incumbents between 2005 and 2010, but did not exhibit a strong selection replacing less productive incumbents with more productive ones.

The relative productivity ranking of surviving stores in both the lowest and highest quintiles in 2005 are persistent, whereas that of those in the other three quintiles are not. For example, stores in the highest quintile in 2005 had a 22.1% chance of staying in the same quintile in 2010. Surprisingly, stores in

[14] The reported numbers are weighted average across 4-digit industries, in which labor hours are used as weights. The results did not change much when we used alternative weights. Table A1 reports the results with the number of establishments used as weights.
[15] Uniformly distributed productivity of entrants is also observed in Matsuura and Motohashi (2005) for the Japanese retail trade, and de Vries (2008b) for the Brazilian retail trade.
[16] Concentration of exiters in the lowest productivity quintile and uniformly distributed productivity of entrants are also observed in Matsuura and Motohashi (2005) for the Japanese retail trade, and de Vries (2008b) for the Brazilian retail trade.

the bottom quintile in 2005 also had a 22.7% chance of staying in the same quintile in 2010, which is consistent with the low exit rates of less productive stores. In contrast to stores in the lowest quintile, stores in the second to fourth quintiles have a higher probability of moving to either higher or lower productivity groups. Our finding of the transition probability pattern of surviving stores in the Korean retail trade contrasts markedly with that in the U.S. retail trade reported in Foster, Haltiwanger, and Krizan (2006) where the probability of staying in the same quintile substantially increase as the relative productivity ranking rises. The persistence of productivity ranking of stores in the low quintile along with their low exit rates may reflect an issue of subsistence-based mom-and-pop stores that may operate without profit long time before exit.

5. The Anatomy of Net Entry Effects: The Role of Large Modern Retailers

5.1 Net Entry Effects: Counties with LMR versus Other Counties

In the previous section, we find that productivity dynamics due to entry and exit play a crucial role in productivity growth in the retail trade sector. In this section, we quantify the net entry effects in a regression context and explore the extent to which net entry effects vary across store sizes and industries. In particular, we focus on the role of large modern retailers in the reallocation process and examine the difference in net entry effects between counties with pre-existing large modern retailers and other counties. That is, we consider a simple regression of labor productivity on a set of dummies that account for the characteristics of the store (e.g., entrants, exiting stores, continuing stores, size, and industry) and its location (e.g., the presence of large modern retailers in the county). Note that our sample period covers the period after the active entry of large modern retailers is over and we focus on the entry effect of large modern retailers on other retailers. Table 3 reports the summary statics for the variables used in the regressions.

[Table 3 about here]

As a first step to analyze the role of entry and exit in productivity dynamics, we consider a simple regression of labor productivity on a set of dummies indicating the status of the establishment (continuing, entering, or exiting), the year dummy to control the effect of the recession in 2010, 4-digit industry dummies, and urban area dummies. Given that population of Korea is very highly concentrated in and around Seoul and the other six metropolitan areas (defined as urban), it is important to control for unobservable regional differences between these 7 metropolitan areas and others.

The baseline regression specification is given by:

$$\ln(LP_{e,t}) = \alpha + \beta\, EN_{e,t} + \gamma\, EX_{e,t} + \tau\, YR2010_{e,t} + \varphi_i \sum_i^{20} IND_{i,e,t} + \mu URBAN_{e,t} + \varepsilon_{e,t}. \quad (2)$$

Among the four types of establishments (continuing establishments in 2005 and 2010; entering establishments in 2010 and exiting establishments in 2005), the omitted baseline type is continuing establishments in 2005. Coefficients of the establishment types in equation (2) exhibit relative labor productivity. For example, the productivity of entrants in 2010 relative to that of continuers in 2010 is β while the productivity of exiters in 2005 relative to that of continuers in 2005 is γ. Since there were average differences in productivity between 2005 and 2010, the productivity of entrants in 2010 relative to that of continuers in 2005 is $\beta + \tau$.

[Table 4 about here]

The results of the baseline model are reported in column (1) of Table 4. We find that entrants are more productive than continuing stores in 2010 ($\beta > 0$). On the other hand, exiting stores are less productive than continuing stores in 2005 ($\gamma < 0$). The negative coefficient of the year 2010 dummy ($\tau < 0$) captures decrease in productivity in 2010 due to the global financial crisis started in 2008. However, entering establishments in 2010 exhibit higher productivity than continuing establishments in 2005 ($\beta +$

$\tau > 0$). The finding of significantly higher productivity of entrants is in line with that of Foster, Haltiwanger, and Krizan (2006) and suggests that entry plays an important role in the aggregate productivity growth of the Korean retail trade sector.

In order to explore the role of large modern retailers in productivity growth of the Korean retail trade sector, we interact the right-side variables in the baseline model with an indicator variable that is equal to 1 if the store is located in a county where a large modern retailer entered before 2005. The specification of the extended model is given by

$$\ln(LP_{e,t}) = \alpha + \beta_1 EN_{e,t} + \beta_2 EN_{e,t} \cdot M_{e,r} + \gamma_1 EX_{e,t} + \gamma_2 EX_{e,t} \cdot M_{e,r} + \delta_1 CN_{e,t} \cdot M_{e,r} + \delta_2 CN_{e,t} \cdot M_{e,r} \cdot YR2010_{e,t} + \tau YR2010_{e,t} + \varphi_i \sum_i^{20} IND_{i,e,t} + \mu URBAN_{e,t} + \varepsilon_{e,t} \quad (3)$$

where $M_{e,r} = 1$ if a store (e) is located in a county (r) where a large modern retailer entered before 2005; = 0 otherwise.

Columns (2) of Table 4 present the results from the extended model with the interaction terms. The productivity of entrants in counties with a large modern retailer is higher than the average productivity of entrants ($\beta_2 > 0$). As shown in column (1), entrants have substantially higher productivity than continuers in 2010 (β_1), but have little productivity difference for continuers in 2005 ($\tau + \beta_1 \approx 0$) because of the recession effect. However, entering stores in LMR counties have significantly higher productivity than continuers in 2005 ($\tau + \beta_1 + \beta_2 > 0$).[17] This implies that the entry of more productive stores in the LMR counties made a significant contribution to the aggregate productivity growth in the retail trade sector for the 2005−2010 period.

Both exiting and continuing stores in the LMR counties also have higher productivity than those

[17] The entry effect of productive stores in the LMR county is different from the increased traffic effect around or in the shopping mall. The entry of more productive stores in the LMR county is not confined to the neighborhood near the LMR, but is also observed other areas in the LMR county. This results is reported in the section of robustness checks.

in other counties. This high productivity of exiters in the LMR counties relative to that of continuers weakens the contribution of exiters to the aggregate productivity growth. Continuing stores in the LMR counties have higher productivity growth than continuing stores in other counties, but the magnitude is relatively small (δ_2). The results of column (2) in Table 4 confirm that entrants in counties with a large modern retailer play an important role in the aggregate productivity growth in the retail trade sector.

The effect of entry may vary depending on industries, GMS vs. non-GMS. Columns (3) and (4) of Table 4 report the results for the GMS and non-GMS, respectively. The distinction between GMS and non-GMS is important because the degree and pattern of product differentiation may be different between these two industries. In Korea, product differentiation in the non-GMS is likely to occur in forms of chain stores of a unique brand. It is relatively rare to observe product differentiation among single-unit non-GMS stores. On the other hand, the degree of product differentiation is relatively low for GMS stores. Stores in the GMS are more likely to compete by lowering price rather than by providing differentiated products. Therefore, the productivity differences between stores in the GMS is less likely to subject to measurement errors due to product differentiation. Moreover, the finding of previous studies that modern large retailers have an impact of lowering the price levels (Basker, 2005) suggests that the higher productivity of entrants in LMR counties is not likely to be driven by the price difference associated with higher product and service quality. We find that entrants in counties with LMR are more productive in both the GMS and non-GMS industries. The difference in productivity between entrants in the LMR area and those in other area is stronger in the GMS, a sector in which product differentiation is less likely to occur. Nonetheless, the finding of the entry of more productive stores in the LMR counties is observed in both the GMS and non-GMS industries.

5.2 Large Modern Retailers and Dynamic Selection

A natural question is what makes entrants in counties with a large modern retailer are more productive. In 2010, over 60% of the counties in the country had at least one large modern retailer. The entry of the LMR provides modern shopping infrastructure in the local market and also gives customers to experience

shopping in the modern environment, which ultimately affects customers' shopping patterns. These provide a ground that attracts new stores into the LMR county who are complementary with the modern infrastructure preferred by customers. The modernization process transformed local retail sectors away from traditional shopping environments in the county. In this section, we first explore the difference in reallocation process between counties with a large modern retailer (LMR area) and other counties (non-LMR area), in terms of productivity distribution and entry rates. Then we investigate characteristics of more productive entrants (e.g., size) in the LMR county. In other words, we focus on which entrants get benefits from the retail modernization.

Figure 1 presents the distribution of productivity for entrants in LMR area and non-LMR area. As previously discussed in the regression results, we find that there exists a noticeable difference in productivity between entrants in LMR areas and those in non-LMR areas. Moreover, there are relatively fewer number of less productive entrants in LMR areas than in non-LMR areas.

[Figure 1 about here]

Such a difference among entrants between LMR and non-LMR areas is not limited to the distribution of productivity. We find that LMR areas have experienced more active entry of stores. Figure 2 shows that entry rates are higher in LMR counties than in non-LMR counties for all three groups of retail sector.[18] This is an important finding because it suggests that higher productivity of entrants in LMR counties may not driven by a strong selection due to increased competition. If an increase in competition after entry of LMR had caused stronger selection, we would have observed a decrease in the number of entrants. However, entry rates are higher in counties with LMR, implying an increase of retail activity after a LMR enters.

[18] For the three groups between LMR and non-LMR counties, *t*-test results for the differences of the entry rates are reported in Table A2 in Appendix.

[Figure 2 here]

So far, our analysis suggests that there are more entrants in counties with a LMR. Moreover, entrants in these counties are more productive than those that enter in counties without a LMR. We believe that positive spillovers associated with modernization process led to the higher entry rate in the LMR county. As a large modern retailer enters a county, it brings new, modern shopping infrastructure to the town, which generates positive spillovers that attract more entrants into the county. Such positive spillovers may have helped increase the productivity of entrants in the LMR county.

Then, it is natural to ask which entrants get the benefit from the modernized shopping environment. We believe that modern shopping environment, initiated by the entry of large modern retailers, helped new and small stores enter the town. To explore the productivity differences across the types of entrants (in terms of size and locations), we regress the productivity of entrants on dummies indicating the size and the interactions with the location dummies. For the size group, we classify establishments into the following three groups: very small (1–4 employees), small (5–9 employees), and medium and large (10 and more).

$$\ln(LP_e^{En}) = \alpha + \beta_s \sum_{s=2}^{3} SIZE_{s,e} + \gamma_s \sum_{s=1}^{3} SIZE_{s,e} \cdot M_{e,r} + \varphi_i \sum_{i}^{20} IND_{i,e} + \mu URBAN_e + \varepsilon_e \quad (4)$$

In columns (1) and (2) of Table 5, we focus on the 264,409 entrants and explore the extent to which productivity of entrants varies across size and location (i.e., whether the store is located in a county with a LMR). Coefficients of the size variables show relative productivity to the omitted group of very small stores. Overall stores with more employees have higher productivity ($\beta_3 > \beta_2 > 0$). Moreover, the productivity level is higher for very small entrants (with fewer than 5 employees) in counties with a large modern retailer. The finding of higher productivity for small stores in counties with large modern retailers suggests that these stores get the benefit of locating with large modern retailers, possibly from increased demand for

services provided from modern shopping environments. The difference in productivity observed among different size of entrants in LMR area suggests that such a positive demand spillover is not evenly distributed among entrants. In particular, such a spillover effect is stronger for very small stores which are not in direct competition with a large modern retailer.

In columns (3) and (4), higher productivity of very small entrants is observed in both GMS and non-GMS, when we examined each group separately. Complementarity between small stores and LMRs for both the GMS and non-GMS sectors suggests that the source of complementarity might be related to not only modernized services provided by small convenience stores in the GMS but also types of products provided by small specialized shops in the non-GMS. The magnitude of the higher productivity of small entrants in the LMR country is greater in the GMS than in non-GMS. This suggests that both the modernized services and shopping environments provided by LMR and small entrants in the LMR county may play a crucial role in making their productivity-enhancing complementary relationship for small entrants.

[Table 5 about here]

6. Robustness Checks

To assess the robustness of the productivity effect of the entry of a LMR, we examine issues related to endogeneity and productivity measures (i.e., capital and traffic effects). First, we use instrumental variables to address a potential endogeneity problem with the location of a LMR that might be correlated with productivity growth of stores in that county. With respect to the productivity measures, we examine whether the productivity difference is driven by omitted capital inputs or unobserved capital of chain stores. Overall, the robustness checks produce qualitatively similar results.

Endogeneity

To address a potential endogeneity problem in the location of LMR stores, we construct an instrumental

variable based on exogenous diffusion patterns of chain stores. As shown in Holmes (2011), retail chains open new stores close to existing stores to exploit benefits associated with economies of density in the distribution of store location. This suggests that the probability of store opening in a location decreases as the distance from the location of the first store opened. If the distance from the first store opened is uncorrelated with county characteristics related to productivity growth that may affect the LMR store opening, the distance variable can be a valid instrument.[19]

However, it is difficult to apply 2SLS methods in this paper not only because the LMR variable is a binary variable but also because our regression models have several cross-product variables interacted with the LMR variable.[20] In the study, we use an alternative approach that constructs the (treatment) sample of counties with a LMR using instrumental variables as follows. In our sample of 249 counties, there are 119 counties where a LMR entered before 2005. Instead of using a dummy variable for 119 counties where a LMR *actually* entered, we pick the same number of counties based on the magnitude of the *predicted* probability from a model estimation based on the distance instrument. To do this we estimate the probability of a county being entered by LMR, using a probit regression that includes a distance measure from each county to the county where a LMR entered for the first time in each of 7 provinces and an urban dummy (Specification 1). We include the urban dummy variable that allows the distance difference among the stores between urban and non-urban areas. As an alternative specification, we includes the area of county in addition (Specification 2)[21] because the country area itself can affect the distance from the first LMR. Based on the results of the first stage regressions, we select 119 counties with the highest predicted probability of a LMR entry. The LMR county dummy variables for the 119 counties are assigned the value 1 and those for the remaining 130 counties are assigned the value 0. Out of these 119 counties selected from the first

[19] In order to address endogeneity issues with the location and timing of Wal-Mart's entry, Basker (2005) and Neumark, Zhang, and Ciccarella (2008) also use the store-planning dates of Wal-Mart and distance from the first Wal-Mart store in Bentonville Arkansas as instrumental variables, respectively.

[20] Although the distance variable is a good instrument for the LMR location variable, the cross-product of distance and store-type variables is not necessarily a good instrument for the cross-product of LMR dummy and store-type variables.

[21] The results for the first stage probit regressions are reported in Table A3 in Appendix.

stage estimation (i.e., Specification 1), 73 counties actually have a LMR while the other 46 counties did not have a LMR.[22] When we assigned the LMR dummy based on the estimation using Specification 2, 86 counties actually have an LMR while the other 33 did not.

[Table 6 about here]

Table 6 reports results for productivity regressions using the *predicted* LMR country variables. Columns (1)–(3) show the results using the LMR dummy variable based on the first stage probit regression without area variables (Specification 1). The results in columns (4)–(6) are derived from the estimation using the LMR dummy variables based on the first stage probit regression including the area of counties (Specification 2). While the magnitudes of the estimates vary depending on the group and the specification of first stage regression, we find that entrants in a county with the higher probability of a LMR being entered are more likely to have a higher productivity level.

Productivity Measures

The other concern for the finding of higher productivity of entrants in the LMR county is whether the higher labor productivity is driven by higher capital intensity.[23] We address the issue of omitted capital for the entrants in the two ways. First, we directly measure differences in physical capital between stores. Like Census data on the retail trade sector for the U.S. and many other countries, our dataset does not have information about physical capital and it is not possible to compute the total factor productivity. As an alternative, we measure the store area and examine whether the productivity difference observed in the

[22] When we assign the value 1 for 73 counties that actually have a LMR among the 119 counties with the highest predicted probability of the LMR entry, the results are qualitatively the same. The results are reported in Table A4 in Appendix.

[23] Instead of output per worker, Basekr (2012) used nominal sales over payroll as a measure of productivity. Using payroll captures the quality of worker and wage, which is likely to be correlated with the quality and price of the product. However, most of Korean retail stores employ less than 5 workers or family members without pay and it is not possible to utilize the payroll information.

previous section is due to the difference in the store area. In Table 7, we test the difference in store area between continuing and entrants (Panel A), between entrants in LMR area and those in non-LMR area (Panel B), and between very small entrants in LMR area and those in non-LMR area (Panel C). Although we find some statistically significant difference in the store area, the difference is less than 1 square meter for most cases. Given that the difference is relatively small, it is difficult to expect that the capital intensity, measured as a store area, is a key factor explaining higher productivity of entrants, in particular, entrants in the LMR area.

[Table 7 about here]

Second, we exclude chain stores (franchise or company-owned multi-unit stores) in which omitted physical and intangible capital is likely to have larger effects on labor productivity.[24] For example, the headquarter or franchisers may own a distribution center or brand equity. By excluding these stores, we can control for productivity differences caused by these omitted tangible and intangible capital, which may affect the productivity of chain stores.[25] Table 8 presents the results for the sample that excludes chain stores. Table 8 suggests that the findings on productivity differences found in Table 4 may not be driven by the difference in omitted capital between chain stores and single-unit stores.[26]

[Tables 8 and 9 about here]

[24] Compared to other advanced countries, chain stores have not fully diffused in Korea. Except for the convenience store industry, the share of chain stores is less than 10% for all the 4-digit retail trade industries in the sample period.
[25] Moreover, chain stores may purchase more capitals at the store level to provide better shopping environment and services. For example, franchised bakeries and clothing stores may spend more money to provide better product display than single-unit stores. By excluding chain stores in the analysis we may avoid measurement issues caused by (unobserved) differences in these capitals.
[26] In order to control for productivity differences caused by omitted capital, we also dropped the industries, not just chain stores as in Table 8. Our key finding is robust when we excluded 10 non-GMS industries with the share of chain stores is higher than 10% (Table A5).

Finally, in order to exclude the possibility that entrants in a LMR may benefit from the increased traffic after the entry of LMR, we drop narrowly defined geographic areas with a LMR and repeat the analysis. In particular, we drop stores located in areas that can be reached within 10-minute drive from a LMR. Table 9 reports that the magnitude of the difference is somewhat reduced, entrants in counties with a LMR is still more productive than entrants in other area.[27]

7. Conclusion

The ongoing structural change in retail trade—that is, the shift from single-store retailers toward big-box national chains such as large modern retailers and hypermarkets—is a worldwide phenomenon. We provide insights on the role of such reallocations in productivity growth in the retail industry. We find that a presence of a large modern retailer may stimulate the reallocation process in the local retail sector, by not only driving out less efficient stores but also attracting new, modernized stores into the neighborhood. A typical large modern retail store provided convenient, modern shopping amenities, such as indoor shopping areas with air conditioners or heaters, food courts, and convenient parking, which are shared by small, specialized shops. Productivity of small stores are higher in locations with a large modern retailer, possibly thanks to the spillover effects generated by convenient, modern shopping amenities large modern retailers provide. As the modernization process initiated by the entry of large modern retailers creates some positive spillovers, the entry of small and more productive retailers increased as well in the affected locale. Such expansion was possible because modernization process in the retail sector accompanied relatively strong growth in the retail consumption during the sample period. This is a new perspective of the structural changes that may occur in the process of retail industry modernization. Previous studies overlooked such a dynamic selection process. While the analysis of the detailed underlying mechanism is out of scope of this paper, we

[27] In a study examining the impact of large store entry on the local supermarket, Zhu, Singh, and Dukes (2011) show that the entry generates positive demand externality to the incumbents located in the same shopping plaza, by attracting consumers. However, the positive externality created by the entry of large discount store in Korea is not just limited to an increase in the traffic. The entry of large discount store accompanied the build-up of a modern shopping plaza, which attracted small, specialized shops.

believe that such spillover occurs in the process of modernization of the retail sector, which was expedited with the spread of large modern retailers. Further analysis will help enlighten the selection process in entry and productivity dynamics of the retail sector.

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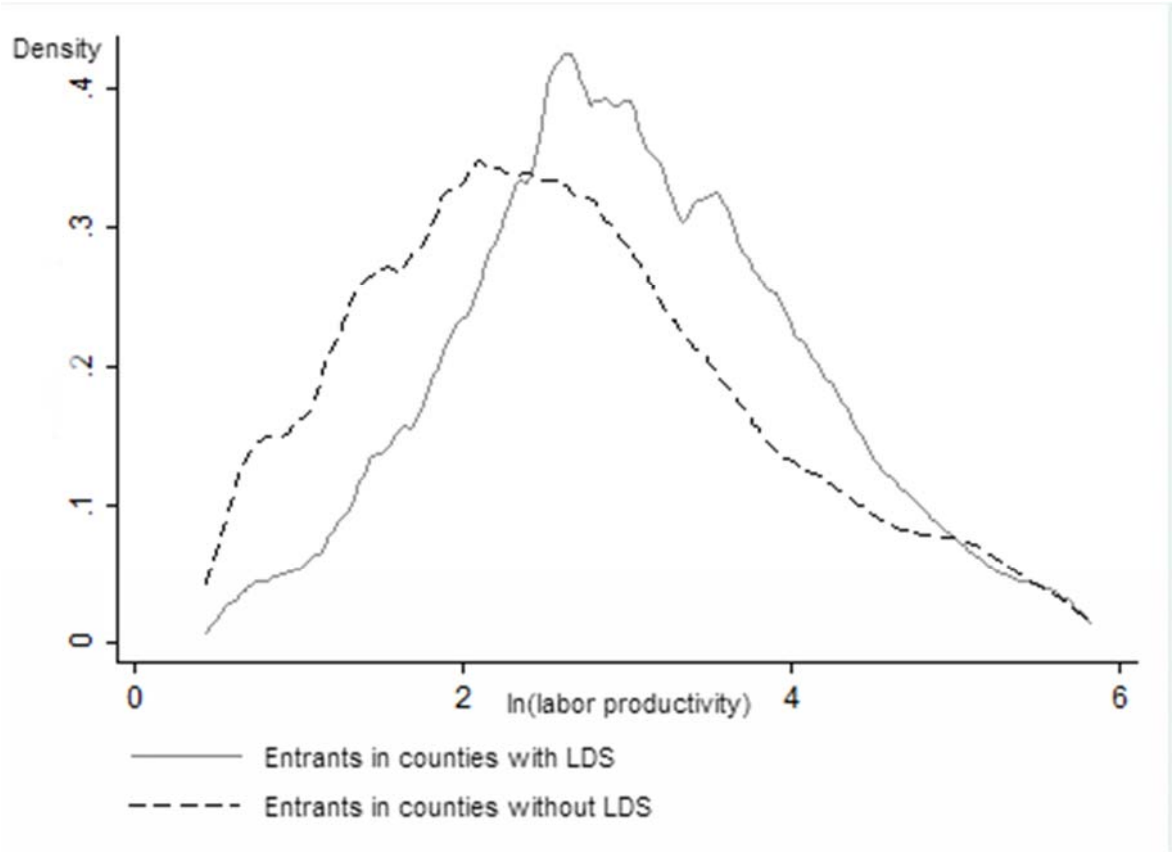
Figure 1. Productivity Distribution of Entrants in Counties with and without Large Modern Retailers



Notes: Two distributions show kernel density estimates of logarithm of labor productivity of entrants in counties where a large modern retailer entered before 2005 (in grey line) and in counties where no large modern retailer entered as of 2005 (in dotted line), respectively.

Figure 2. Entry Rates in Counties with and without Large Modern Retailers

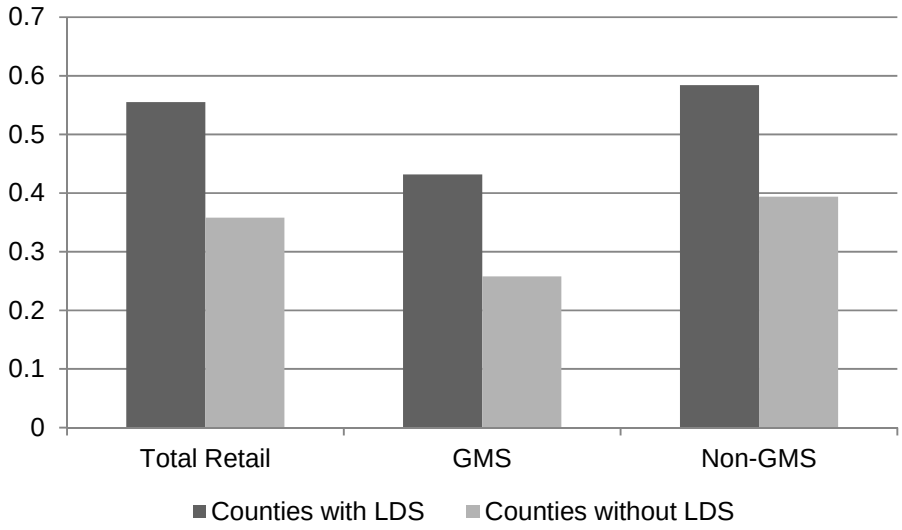


Table 1. Decomposition of Labor Productivity Growth, 2005–2010

	(1) Total Retail	(2) Large GMS	(3) Other Retail
Weight	1.000	0.066	0.934
Within	4.33	6.03	4.22
Between	1.41	12.14	0.66
Cross	-4.44	-29.86	-2.65
Net entry	7.92	-0.97	8.55
Entry	6.67	-12.11	7.99
Exit	1.25	11.14	0.55
Labor Productivity Growth	9.23	-12.67	10.77

Notes: Weights for each 4-digit industry is average total hours between 2005 and 2010. Labor productivity growth is the log difference of labor productivity in 2005 and 2010.

Table 2. Transition Matrix of Relative Productivity in 2005 and 2010

	Quintile 1 (2010)	Quintile 2 (2010)	Quintile 3 (2010)	Quintile 4 (2010)	Quintile 5 (2010)	Exits	Row total
Quintile 1 (2005)	22.7	12.1	5.9	3.8	1.6	53.9	
	24.7	*12.7*	*6.9*	*4.2*	*1.8*		*10.2*
Quintile 2 (2005)	14.9	13.4	8.6	6.7	3.5	52.9	
	13.5	*11.8*	*8.5*	*6.2*	*3.2*		*8.7*
Quintile 3 (2005)	9.8	12.0	10.3	9.5	5.8	52.6	
	9.9	*11.7*	*11.3*	*9.7*	*6.0*		*9.7*
Quintile 4 (2005)	6.2	9.5	10.9	13.0	9.6	50.8	
	5.9	*8.8*	*11.1*	*12.5*	*9.3*		*9.5*
Quintile 5 (2005)	2.9	5.5	7.4	12.8	22.1	49.3	
	2.8	*5.2*	*7.8*	*12.7*	*22.2*		*10.1*
Entrants	*43.2*	*49.7*	*54.4*	*54.7*	*57.4*		*51.8*
Column total	11.5	10.5	8.6	9.1	8.4	51.9	100.0

Notes: Quintile 1 is the lowest productivity within the 4-digit industry-level, and quintile 5 is similarly defined for the highest. The top number in each cell shows the percentage of establishments in a given quintile in 2005 ended up in 2010 (row percentage). The bottom number in each cell (in italics) shows the percentage of establishments in a given quintile in 2010 came from (column percentage). Figures are weighted by labor hours. The sample includes all establishments in the retail trade sector except for those in the large GMS sector.

Table 3. Summary Statistics

Establishment type	Labor productivity	Employment	Sales
Continuers in 2005 (237,112)	30.44	2.05	192.76
	(37.41)	(2.43)	(735.75)
Continuers in 2010 (237,112)	31.61	1.96	204.85
	(45.12)	(2.27)	(742.04)
Entrants (264,409)	35.36	2.15	211.29
	(46.12)	(3.17)	(915.31)
Exiters (266,600)	28.45	1.96	153.39
	(34.14)	(3.14)	(701.70)
Total (1,005,233)	31.48	2.03	190.05
	(41.06)	(2.81)	(780.42)

Notes: The table provides summary statistics for the regression sample. For the column of establishment type, numbers in parentheses are the number of observations. Continuing establishments are observed in both 2005 and 2010, whereas exiting (entering) establishments are observed only in 2005 (2010). The table reports averages of labor productivity, employment, and sales. Employment is the number of workers. Labor productivity is in thousand 2005 KRW per hour and sales is in million 2005 KRW (1 USD = 1,024 KRW in 2005). Numbers in parentheses are standard deviations.

Table 4. Labor Productivity Growth Regressions: Entrants in Counties with and without LMR

	(1) Retail	(2) Retail	(3) GMS	(4) Non-GMS
Entrants	0.171***	0.221***	0.337***	0.196***
	(0.008)	(0.014)	(0.020)	(0.017)
in counties with LMR		0.188***	0.279***	0.172***
		(0.017)	(0.040)	(0.018)
Exiters	-0.023**	-0.048***	-0.228***	-0.008
	(0.009)	(0.013)	(0.021)	(0.013)
in counties with LMR		0.257***	0.424***	0.205***
		(0.024)	(0.049)	(0.024)
Continuers in counties with LMR		0.240***	0.339***	0.206***
		(0.015)	(0.039)	(0.016)
in year 2010		0.034*	0.003	0.044**
		(0.017)	(0.020)	(0.021)
Year 2010	-0.156***	-0.182***	-0.112***	-0.203***
	(0.007)	(0.016)	(0.016)	(0.020)
Urban	0.070***	0.060***	0.146***	0.037***
	(0.012)	(0.011)	(0.032)	(0.012)
R-squared	0.153	0.163	0.048	0.193
Sample size	1,005,233	1,005,233	187,885	817,348

Notes: Dependent variable is the log labor productivity of establishments. Dummy of counties with LMR takes the value 1 if counties in which an establishment locates are entered by a LMR before 2005, otherwise zero. The coefficients represent productivity differences between each type of establishment and continuing establishments in 2005. In columns (2)-(4), the coefficients of entrants, exiters, and continuers in 2010 in counties with LMR represent productivity difference with those in all counties. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 5. Labor Productivity Growth of Entrants

	(1) Retail	(2) Retail	(3) GMS	(4) Non-GMS
Entrants with 5-9 employees	0.724***	0.893***	0.894***	0.928***
	(0.015)	(0.038)	(0.075)	(0.044)
with 10 or more employees	1.092***	1.200***	1.754***	0.822***
	(0.026)	(0.067)	(0.068)	(0.082)
Entrants in counties with LMR: with 1-4 employees		0.181***	0.295***	0.162***
		(0.016)	(0.039)	(0.017)
with 5-9 employees		-0.021	-0.057	0.001
		(0.038)	(0.062)	(0.045)
with 10 or more employees		0.049	-0.003	0.109
		(0.072)	(0.066)	(0.087)
Urban	0.012	0.013	0.093***	0.000
	(0.013)	(0.013)	(0.024)	(0.014)
R-squared	0.162	0.166	0.120	0.174
Sample size	264,409	264,409	37,482	226,927

Notes: Dependent variable is the log productivity of entrants. Dummy of counties with LMR takes the value 1 if counties in which an establishment locates are entered by a large modern retailer before 2005, otherwise zero. Baseline productivity level is entrants with 1-4 employees for all columns. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 6. Robustness: Endogeneity

	Specification 1			Specification 2		
	(1) Retail	(2) GMS	(3) Non-GMS	(4) Retail	(5) GMS	(6) Non-GMS
Entrants	0.206***	0.348***	0.173***	0.219***	0.378***	0.177***
	(0.010)	(0.023)	(0.011)	(0.011)	(0.023)	(0.012)
in counties with LMR	0.091***	0.151***	0.089***	0.192***	0.311***	0.174***
	(0.019)	(0.046)	(0.020)	(0.017)	(0.039)	(0.017)
Exiters	-0.044***	-0.198***	-0.011	-0.076***	-0.230***	-0.040***
	(0.009)	(0.014)	(0.009)	(0.009)	(0.016)	(0.009)
in counties with LMR	0.168***	0.261***	0.137***	0.333***	0.521***	0.272***
	(0.024)	(0.057)	(0.025)	(0.021)	(0.045)	(0.022)
Continuers in counties with LMR	0.138***	0.187***	0.119***	0.273***	0.409***	0.228***
	(0.019)	(0.052)	(0.018)	(0.015)	(0.039)	(0.016)
in year 2010	0.011	0.026	0.009	0.005	0.027	0.000
	(0.012)	(0.018)	(0.014)	(0.012)	(0.018)	(0.014)
Year 2010	-0.163***	-0.125***	-0.175***	-0.159***	-0.127***	-0.170***
	(0.007)	(0.011)	(0.009)	(0.008)	(0.012)	(0.009)
Urban	-0.027	0.037	-0.041**	-0.086***	-0.076**	-0.087***
	(0.017)	(0.045)	(0.017)	(0.013)	(0.032)	(0.014)
R-squared	0.155	0.031	0.187	0.163	0.052	0.192
Sample size	1,005,233	187,885	817,348	1,005,233	187,885	817,348

Notes: Dependent variable is the log productivity of establishments. To estimate the probability of a county entered by LMR, the first stage probit regression includes a distance measure (in kilometer) from each county to the closest county with LMR and an urban dummy for columns (1)-(3) (i.e., Specification 1). For columns (4)-(6), the first stage regression also includes the area of county in square kilometers (i.e., Specification 2). Among 249 counties, a dummy of counties with LMR takes the value 1 for 119 counties (set equal to the actual number of counties entered by LMR before 2005) with the highest predicted probability of LMR entry; zero for 130 counties. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 7. Robustness: Test for Difference in Store Size

A. Continuers in 2010 vs. Entrants

Labor productivity quintile	(1) Continuing	(2) Entrants	(1) – (2) Difference
Quintile 1	24.09	24.14	-0.051
	(16.33)	(16.95)	[0.114]
Quintile 2	27.35	27.00	0.354***
	(17.59)	(17.80)	[0.121]
Quintile 3	29.70	28.48	1.225***
	(18.59)	(18.58)	[0.127]
Quintile 4	32.32	29.86	2.467***
	(19.68)	(19.55)	[0.135]
Quintile 5	33.68	32.14	1.531***
	(20.71)	(20.81)	[0.150]
Total	28.94	28.55	0.381***
	(18.76)	(19.07)	[0.058]

B. Entrants in counties without LMR vs. entrants in counties with LMR

Labor productivity quintile	(1) Counties without LMR	(2) Counties with LMR	(1) – (2) Difference
Quintile 1	24.64	24.00	0.642***
	(17.55)	(16.78)	[0.213]
Quintile 2	26.40	27.12	-0.718***
	(18.26)	(17.7)	[0.228]
Quintile 3	27.66	28.62	-0.955***
	(18.81)	(18.53)	[0.232]
Quintile 4	29.12	29.97	-0.856***
	(19.86)	(19.5)	[0.255]
Quintile 5	32.61	32.07	0.539*
	(21.46)	(20.72)	[0.279]
Total	27.88	28.68	-0.799***
	(19.32)	(19.02)	[0.109]

[Table 7 Continued]

C. Small entrants (with 1-4 employees) in counties without LMR vs. small entrants in counties with LMR

Labor productivity quintile	(1) Counties without LMR	(2) Counties with LMR	(1) – (2) Difference
Quintile 1	24.70	24.09	0.615***
	(17.55)	(16.79)	[0.214]
Quintile 2	26.42	27.24	-0.815***
	(18.21)	(17.71)	[0.230]
Quintile 3	27.88	28.87	-0.996***
	(18.83)	(18.54)	[0.236]
Quintile 4	29.47	30.45	-0.977***
	(19.89)	(19.55)	[0.261]
Quintile 5	33.14	32.53	0.604**
	(21.26)	(20.62)	[0.300]
Total	27.98	28.87	-0.891***
	(19.23)	(18.97)	[0.111]

Notes: Figures of the table are store size measured by square meters per worker. Numbers in parentheses are standard deviation, and numbers in brackets are standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 8. Robustness: Excluding Chain Stores

	(1) Retail	(2) Retail	(3) GMS	(4) Non-GMS
Entrants	0.185***	0.221***	0.320***	0.195***
	(0.008)	(0.014)	(0.022)	(0.016)
in counties with LMR		0.193***	0.370***	0.170***
		(0.016)	(0.043)	(0.016)
Exiters	-0.005	-0.027**	-0.142***	-0.003
	(0.010)	(0.013)	(0.018)	(0.014)
in counties with LMR		0.242***	0.398***	0.196***
		(0.025)	(0.044)	(0.026)
Continuers in counties with LMR		0.231***	0.360***	0.192***
		(0.016)	(0.038)	(0.016)
in year 2010		0.032*	0.015	0.038*
		(0.018)	(0.021)	(0.022)
Year 2010	-0.187***	-0.211***	-0.174***	-0.221***
	(0.007)	(0.016)	(0.017)	(0.020)
Urban	0.079***	0.068***	0.173***	0.044***
	(0.012)	(0.011)	(0.031)	(0.012)
R-squared	0.167	0.177	0.062	0.197
Sample size	889,662	889,662	141,278	748,384

Notes: Dependent variable is the log labor productivity of establishments. The sample excludes entrants and exiters with either franchise or company-owned multi-unit stores. Numbers in parentheses are county-clustered standard errors. * Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 9. Robustness: Excluding Stores Located Near LMR

	(1) Retail	(2) Retail	(3) GMS	(4) Non-GMS
Entrants	0.171***	0.220***	0.331***	0.196***
	(0.008)	(0.014)	(0.020)	(0.017)
in counties with LMR		0.149***	0.259***	0.129***
		(0.017)	(0.040)	(0.018)
Exiters	-0.033***	-0.049***	-0.229***	-0.009
	(0.010)	(0.013)	(0.021)	(0.013)
in counties with LMR		0.212***	0.387***	0.160***
		(0.024)	(0.048)	(0.025)
Continuers in counties with LMR		0.203***	0.304***	0.169***
		(0.015)	(0.038)	(0.016)
in year 2010		0.028	-0.002	0.038*
		(0.018)	(0.020)	(0.021)
Year 2010	-0.161***	-0.182***	-0.112***	-0.203***
	(0.007)	(0.016)	(0.016)	(0.020)
Urban	0.106***	0.094***	0.186***	0.069***
	(0.012)	(0.012)	(0.033)	(0.012)
R-squared	0.159	0.167	0.050	0.199
Sample size	857,065	857,065	164,022	693,043

Notes: Dependent variable is the log labor productivity of establishments. The sample excludes stores in the same town (eup-myeon-dong in Korea) where the LMR is located. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Appendix

Table A1. Transition Matrix of Relative Productivity in 2005 and 2010:
Weighted by the Number of Establishments

	Quintile 1 (2010)	Quintile 2 (2010)	Quintile 3 (2010)	Quintile 4 (2010)	Quintile 5 (2010)	Exits	Row total
Quintile 1 (2005)	22.3	12.1	5.8	3.8	1.6	54.4	
	23.9	*12.5*	*6.8*	*4.1*	*1.8*		*9.9*
Quintile 2 (2005)	14.6	13.2	8.4	6.6	3.4	53.7	
	13.3	*11.6*	*8.3*	*6.1*	*3.2*		*8.6*
Quintile 3 (2005)	9.6	11.7	10.0	9.3	5.7	53.7	
	9.7	*11.4*	*10.9*	*9.5*	*5.9*		*9.5*
Quintile 4 (2005)	6.1	9.4	10.3	12.6	9.4	52.1	
	5.8	*8.5*	*10.5*	*12.0*	*9.1*		*9.1*
Quintile 5 (2005)	2.8	5.4	7.0	12.3	21.5	51.0	
	2.7	*5.1*	*7.4*	*12.0*	*21.4*		*9.7*
Entrants	*44.6*	*50.9*	*56.2*	*56.2*	*58.7*		*53.2*
Column total	11.3	10.4	8.3	8.8	8.2	53.0	100.0

Notes: Quintile 1 is the lowest productivity within the 4-digit industry-level, and quintile 5 is similarly defined for the highest. The top number in each cell shows the percentage of establishments in a given quintile in 2005 ended up in 2010 (row percentage). The bottom number in each cell (in italics) shows the percentage of establishments in a given quintile in 2010 came from (column percentage). Figures are weighted by the number of establishments.

Table A2. T-test for Entry Rates: LMR Counties versus Non-LMR Counties

	(1) Counties with LMR	(2) Counties without LMR	(1) – (2) Difference
Total Retail	0.555	0.358	0.197***
	(0.100)	(0.089)	[0.013]
GMS	0.584	0.394	0.190***
	(0.105)	(0.100)	[0.014]
Non-GMS	0.433	0.258	0.173***
	(0.092)	(0.089)	[0.012]

Notes: Number of counties with LMR is 119 and that of counties without LMR is 96, respectively. Numbers in parentheses are standard deviation, and numbers in brackets are standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table A3. First-stage Probit Regressions of LMR Entry

	(1)	(2)
Distance (in kilometers)	-0.011***	-0.008***
	(0.003)	(0.003)
Area (square kilometers)		-0.001***
		(0.000)
Urban	0.501**	0.133
	(0.205)	(0.234)
Constant	0.340*	0.716***
	(0.187)	(0.222)
Pseudo R-squared.	0.118	0.156
LR Chi2	37.44***	44.50***
Sample size	249	249

Notes: Dependent variable is a dummy variable that takes the value 1 if a county was entered by a large modern retailer before 2005, otherwise zero. Numbers in parentheses are standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table A4. Robustness: Endogeneity

	(1) Retail	(2) GMS	(3) Non-GMS	(4) Retail	(5) GMS	(6) Non-GMS
Entrants	0.200***	0.344***	0.171***	0.208***	0.364***	0.173***
	(0.010)	(0.019)	(0.011)	(0.011)	(0.019)	(0.012)
in counties with LMR	0.099***	0.159***	0.095***	0.140***	0.226***	0.130***
	(0.016)	(0.035)	(0.017)	(0.015)	(0.035)	(0.015)
Exiters	-0.035***	-0.188***	-0.005	-0.051***	-0.206***	-0.019**
	(0.008)	(0.013)	(0.008)	(0.008)	(0.014)	(0.008)
in counties with LMR	0.161***	0.279***	0.131***	0.231***	0.406***	0.185***
	(0.021)	(0.044)	(0.023)	(0.020)	(0.042)	(0.021)
Continuers in counties with LMR	0.148***	0.214***	0.126***	0.203***	0.322***	0.167***
	(0.014)	(0.040)	(0.015)	(0.013)	(0.038)	(0.014)
in year 2010	0.020	0.019	0.021	0.021	0.021	0.022
	(0.013)	(0.020)	(0.015)	(0.013)	(0.019)	(0.016)
Year 2010	-0.166***	-0.119***	-0.180***	-0.168***	-0.121***	-0.182***
	(0.009)	(0.010)	(0.011)	(0.010)	(0.011)	(0.012)
Urban	-0.013	0.048	-0.028**	-0.017	0.025	-0.028**
	(0.013)	(0.037)	(0.014)	(0.012)	(0.035)	(0.012)
R-squared	0.157	0.034	0.189	0.161	0.048	0.191
Sample size	1,005,233	187,885	817,348	1,005,233	187,885	817,348

Notes: Dependent variable is the log productivity of establishments. To estimate the probability of a county entered by LMR, the first stage probit regression includes a distance measure (in kilometer) from each county to the closest county with LMR and an urban dummy for columns (1)-(3) (i.e., Specification 1). For columns (4)-(6), the first stage regression also includes the area of county in square kilometers (i.e., Specification 2). Among 249 counties, a dummy of counties with LMR takes the value 1 for 73 (Specification 1) and 86 (Specification 2) counties out of 119 counties actually entered by LMR before 2005) with the highest predicted probability of LMR entry; zero for the other counties. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table A5. Robustness: Excluding Industries Consisting of More Than 10% of Chain Stores

	(1) Retail	(2) Retail	(3) GMS	(4) Non-GMS
Entrants	0.185***	0.218***	0.258***	0.210***
	(0.009)	(0.015)	(0.023)	(0.018)
in counties with LMR		0.200***	0.341***	0.179***
		(0.019)	(0.043)	(0.020)
Exiters	-0.011	-0.043***	-0.217***	0.001
	(0.009)	(0.014)	(0.022)	(0.014)
in counties with LMR		0.258***	0.409***	0.207***
		(0.025)	(0.047)	(0.025)
Continuers in counties with LMR		0.232***	0.317***	0.201***
		(0.016)	(0.037)	(0.017)
in year 2010		0.032*	-0.002	0.044**
		(0.018)	(0.020)	(0.022)
Year 2010	-0.170***	-0.194***	-0.125***	-0.216***
	(0.007)	(0.017)	(0.016)	(0.021)
Urban	0.067***	0.056***	0.137***	0.034***
	(0.013)	(0.012)	(0.032)	(0.012)
R-squared	0.175	0.185	0.044	0.218
Sample size	870,423	870,423	163,212	707,211

Notes: Dependent variable is the log labor productivity of establishments. The sample excludes 10 industries that consist of more than 10% of franchise and company-owned multi-unit stores. These industries include convenience stores, supermarkets, bakery, vitamin and nutrition supplements, kid and baby clothing, underwear, sportswear, furniture, cosmetics, and eyeglasses. Numbers in parentheses are county-clustered standard errors.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.