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# **Retail Market Structure and Dynamics: A Three Country Comparison of Japan, the U.K. and the U.S.**

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## **Abstract**

We use internationally comparable microdata to document features of the retail sectors in Japan, the United Kingdom and the United States. Our main findings are (a) small stores and large chains are common features of retail markets in Japan and the US respectively, with the UK in between; (b) the US shows higher churn and mobility in a number of different dimensions (c) there has been a rise in median store size in US non-specialized store chains but a fall in the UK (d) econometric work suggests a positive and statistically significant association between chain productivity and median within-chain store size, so that (c) and (d) could be part of the explanation of the different UK/US recent retailing productivity performance.

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## 1 Introduction

Recent years have seen a revival in studying the economics of retailing. The emergence of large chains and allegations of possible market dominance have spurred interest on the IO side. The treatment of workers has been the subject of interest for labor economists. The stellar productivity performance of US retailing, and disappointing EU and Japanese performance have been studied by productivity economists.

On the productivity side, there are at least two broad hypotheses of interest. First, to the extent that productivity is affected by technology, there is renewed interest in economies of scale and scope in retailing. For example, it is suggested that smaller stores might be below minimum efficient scale. Or perhaps larger retailers can experiment with methods of selling, supply and HR practices and then transfer this knowledge across stores, a potential economy of scope. In the UK, a major recent development has been the opening of many small stores by large chain retailers, which might lose economies of scale at each small store and scope (if knowledge of operating large and small stores is not substitutable).

Second, recent work suggests that productivity growth is a function not only of technology and other shocks, but how firms and markets respond to these shocks. For example, a recent literature stresses the role of firm and establishment turnover in reallocating resources from less to more efficient producers – Foster, Haltiwanger and Krizan (2003), Haskel and Sadun (2005) and Matsuura and Motohashi (2005). This suggests investigating the dynamics of competition and sorting, which might be affected by regulation: restrictions on opening hours in Germany, on out of town building in the UK, on zoning in the US.

To study better these questions one needs, we believe, two types of data. First, industry-level data are likely not informative about within-industry dynamics and how sizes of chains and individual stores affect productivity. Thus one needs micro data on stores and chains. Second, cross-country data is of interest since institutions vary across countries. All this suggests we need to use cross-country micro data.

Therefore, we assemble comparable data on market structure and dynamics to see how they might help explain differences in the productivity performance of the retail

sectors in Japan, the United Kingdom and the United States. To do this, we use a common research protocol applied to confidential micro data on retail firms and establishments for all three countries. The source of the data is that collected by national statistical offices in compiling the national accounts and other official statistics. The operational problem is that the data we use can not leave the national statistical offices where they are collected and processed. This prevents us from pooling the micro data together. Rather we perform our analysis on comparable and disclosable aggregations of the micro records, or in similar empirical exercises conducted at the firm or establishment level within each country for the 1997 to 2002 period. To the best of our knowledge, whilst there are micro studies on individual countries, this is the first paper to attempt a cross-country study for retailing using comparable micro data.

Our work is preliminary, but our main findings so far are as follows. First, regarding statics, the major picture is that Japan has a relatively large number (per head of the population) of small stores (10 per head), with the US many fewer (4) and the UK in between (5). Regarding these stores however, the US has bigger stores all round (average sizes are 13 in the US, 9 in the UK and 6 in Japan). So, small single unit shops are small in all countries, but the biggest single unit shops are largest in the US and chains, or multi-unit stores, are bigger in the US at all points in the size distribution of stores within the chain.

We also have some interesting findings regarding within-chain store sizes. Between the mid-1990s and early-2000s, the median store size in a US non-specialized store chain rose from about 140 to 155 employees. In the UK, it fell from about 80 to 40 (we have no comparable results for Japan yet).

Second, we find interesting differences in dynamics. Japan is dominated by continuing stores and chains with little churn. In the US there has been a long run fall in shares of mom-and-pop stores, which is not so marked in the UK. We also look at changes of market shares over 5 years for chains (we can only do this for the US and UK). The major difference is that there is very substantial churn in the US around entrants and initially small chains. In the US, such firms either gain market share or exit. In the UK, they are much more likely to stick where they are, typically in the bottom of the market share distribution and not exit.

Finally, to understand the possible implications for productivity, we look econometrically at whether chain productivity is lowered by having more small stores within the chain, for given overall chain employment. The same regression in both the US and the UK reveals a consistent answer, namely a positive and statistically significant association between chain productivity and median within-chain store size. To the extent this is causal, this suggests that the UK trend to smaller stores within chains would have lowered UK retailing productivity and the US trend to larger will have raised it.

The rest of the paper proceeds as follows. The next section sets out some overall productivity data to help motivate what we do. Section three sets out our data, section four our findings on statics and dynamics. Section five looks at chain productivity and within chain store size and section six concludes.

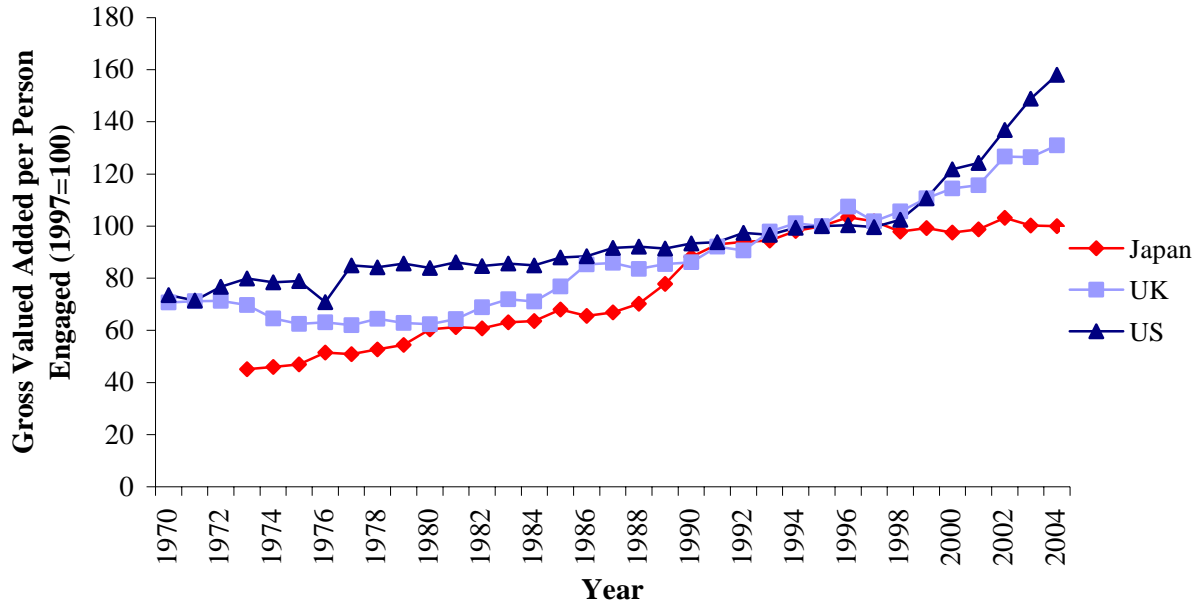
## 2 Motivation: international productivity differences

To help motivate our investigation, we review retail sector productivity differences across the countries in both levels and growth rates. In table 1, we show results from Timmer and Ypma (2006) on labor productivity for the three countries over the period from 1980 to 2002. First, note that both British and Japanese retailers are less productive than US retailers and that the differential is growing over time. Second, while the U.S. and U.K. both exhibit the post 1995 surge in productivity growth rates that is often associated with IT usage (see Motohashi, 2002; Stiroh, 2003; and Doms, Jarmin and Klimek, 2004), the Japanese retail sector experienced negative productivity growth.

**Table 1: Retail Sector Gross Value Added per person engaged**

	US	UK	JAPAN
<b>Levels</b>			
1980	100	63	62
1995	100	61	70
2002	100	56	46
<b>Growth rates</b>			
1980-95	2.2	2.0	3.0
1995-2002	5.4	4.3	-0.7

**Figure 1: Retail Sector Gross Value Added per person engaged.**



Source: EUKLEMS, March 2007

As a comparison, we can also use data from the most recent release of the EUKLEMS project (see Timmer, O’Mahony and van Ark, 2007). In figure 1 we see that while the Japanese retail sector showed relatively strong productivity growth throughout the 1970’s and 80’s, productivity has remained flat since the mid 1990’s. In contrast U.S. and U.K. retail productivity growth accelerates sharply in the mid 1990’s.

A variety of factors may underlie the differences in productivity levels and growth rates across the three countries. Differences in the regulatory and business environment (McKinsey, 1998) may restrict retailers, especially in Japan, from building stores and/or distribution networks that allow them to benefit from the same scale and scope economies as U.S. retailers enjoy. Haskel and Sadun (2006) examine the role of changes in land use regulations in the 1990’s on the size of new retail stores and find that retail chains respond by building smaller stores and that this was associated with a slowdown in retail TFP growth.

Foster, Haltiwanger and Krizan (2006) focus on the role of entry, exit and reallocation in driving industry level retail productivity growth in the U.S. In particular,

they stress the role of large national retail chains that open new stores that replace smaller less efficient non-chain stores. Jarmin, Klimek and Miranda (2005) demonstrate the restructuring of retail markets – increasing dominance of larger national retail chains at the expense of small mom-and-pop shops – has been occurring for many decades and clearly predates the use of IT.

### **3 Data**

Given the prevalence in retailing of multi-unit shops under common ownership it is useful to start with some nomenclature. We define a retailing entity at a single geographical address as a “store”. A group of retail stores under single ownership is a “chain”. A “firm” may be a single store, or a chain, depending on context, see below. Some country-specific issues are set out below.

#### **3.1 Japan**

Data on the Japanese retail sector comes from the Retail and Wholesale Census (RWC) conducted by the Research and Statistics Department, Minister’s Secretariat, Ministry of Economy, Trade and Industry (METI). This census survey covers all establishments in wholesale and retail trade. This survey started in 1952, and has been conducted every 3 or 5 years. The latest data available are from 2002. At this point, we do not yet have firm identifiers for Japan so in what follows we can carry out store-level analysis but not chain-level. .

#### **3.2 The UK**

The UK business data come from multiple sources. The main source is the business register, called the Interdepartmental Business Register (the IDBR). This business register is compiled using a combination of tax records (on value added and payroll tax), information lodged at Companies House, Dun and Bradstreet data and data from other surveys. The IDBR tries to capture two broad measures. First, it tries to measure the structure of ownership of businesses using three aggregation categories: local units (LUs), enterprises and enterprise groups. A local unit is a single mailing address, which in the retailing context is a store. An enterprise is a chain of local units/stores

under common ownership (e.g. a chain of supermarkets). An enterprise group is a group of enterprises under common ownership (e.g. a chain of supermarkets who also own a chain of garden centers). The second part of data that the IDBR holds is turnover and employment data. This is based mostly on tax data (plus old records from previous inquiries). Output information on the IDBR comes from Value Added Tax (VAT) records if the original source of business information was VAT data. Employment information comes from payroll tax data (called Pay As You Earn, PAYE) if that is the source of the original inclusion. Thus if a single-local unit enterprise is large enough to pay VAT (the threshold was £52,000 in 2000/01) it would have turnover information at the enterprise and local unit level. On the other hand, if it does not operate a PAYE scheme, it will have no employment information. However, employment data is required to construct sampling frames and hence is interpolated from turnover data. For the multi-local unit enterprise, no turnover information will be available for local units, since most multi-local unit enterprises do not pay VAT at the local unit level. If the PAYE scheme is operated at the local unit level, it would have independent employment data.

There are two other ways in which more employment and output data are gathered. The first is if the business is included Annual Register Inquiry and the second if it is included in the Annual Business Inquiry (ABI). The Annual Register Inquiry (ARI) is designed to maintain the business structure information on the IDBR (Jones, 2000, p.51). It began operation in July 1999 and is sent to large enterprises (over 100 employees) every year, to enterprises with 20-99 employees every four years and to smaller enterprises on an *ad hoc* basis. The ARI currently covers around 68,000 enterprises, consisting of about 400,000 local units. It asks each enterprise for employment, industry activity and the structure of the enterprise. Most importantly for our work, it asks for employment of an enterprise's stores (local units). The ABI is the official ONS business survey, based on the IDBR, to ask for inputs and outputs and so generate value added for the national accounts (the Annual Respondents Database, ARD, consists of the panel micro-level information obtained from successive cross-sections of the ABI). The ABI is not a Census of all local units. This is in two regards: aggregation and partial sampling. Regarding aggregation, enterprises normally report on all their local

units jointly. This is called a “reporting unit” (RU) but is typically an enterprise; for convenience we shall call it a firm.

Retail firms are required to provide details on turnover (total and broken down in retail and non-retail components, and by commodity sold), expenditures (employment costs, total materials and taxes), work in progress, and capital expenditures (separately for acquisitions and disposals). Also, in the long format, firms answer on questions such as the total number of sites and the amount of squared meters they consist of. Other reported data at the RU level are total employment, wages and input costs and investment. The investment data are used to build up a capital stock database using the perpetual inventory method.

To summarize, the UK productivity data consists of ABI data at the firm level, which is typically the RU, which in the retailing case will be the chain. However, we do know employment and location information for the stores within the chain. Thus we can examine how the productivity of the chain relates to chain inputs, such as bought in materials, capital etc. but also to the characteristics of its stores. The reporting unit/local unit issue raises a number of measurement issues (econometric issues are discussed below).

Finally, usable UK retailing microdata is available for all year 1997-2003. Before 1997, the data are simply not available in electronic form. Since 1997 was the first year available, the data are quite noisy and so we will typically either begin our UK analysis in 1998 or average the 1997 and 1998 data.

### **3.3 *The U.S.***

Data for U.S. retailers come from four sources. First, basic establishment (retail store or local unit) and firm (enterprise group in the UK context) demographic information is taken from the Longitudinal Business Database (LBD) maintained by the Census Bureau’s Center for Economic Studies (Jarmin and Miranda [2002]). The LBD contains information for the entire universe of private business establishments with paid employees and is sourced from the Census Bureau’s Business Register and is available annually from 1975 to the present. The LBD does not contain sufficient information to



permit computation of productivity. Establishment data on retail sales are available from the quinquennial Census of Retail Trade conducted for reference years ending in 2 and 7. Given the availability of data from the other two countries, our focus here will be on 1997 and 2002. Unfortunately, the Census of Retail Trade does not inquire about gross margins, nor does it collect information about intermediate inputs, capital stocks or investment. The Business Expenditures Survey (BES) is conducted as part of the quinquennial Economic Censuses and collects information on purchases of intermediate inputs and services for the retail sector. However, the survey utilizes a hybrid reporting unit that roughly corresponds to a line of business within a firm. Linking micro records from the BES to the LBD or Census of Retail trade is feasible but subject to error as discussed in Doms, Jarmin and Klimek (2004). Finally firm level information on book values of capital stocks and capital expenditures is available at the firm level from the Annual Capital Expenditures Survey.

### ***3.4 Further data issues***

In retailing in particular, there are a number of definitional issues that arise. First, on the definition of a chain, note that some firms change chain status between the base and final year. We use the final year to assign chain status. Second, in both the UK and the U.S data, a vertically integrated firm's stores are assigned to the industry they operate in (e.g. if local unit A is a supermarket and local unit B is a distribution centre, they have different industry codes). Thus we define the local unit according to the industry it is in and the firm according to the industry that the majority of local units are in. Third, there is a slight complication since a firm might have a number of stores in, say retailing, making it a chain in retailing, but only one local unit in say, wholesaling, making it a non-chain in wholesaling. We defined the firm as a chain if it was a chain in any of its industries.<sup>2</sup> Fourth, in the UK and US data, a small number of stores have an employment of zero. We dropped these stores. Finally, we classify the data to ISIC industry definitions.

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<sup>2</sup> We did this first of all by the country specific industry code (e.g., SIC in the UK and SIC or NAICS in the US) and then assigned each firm and its local units/stores into the corresponding ISIC using a concordance. This gives a very slightly different definition of a chain relative to first assigning to ISIC and then defining a chain on the basis of multiple stores in any ISIC.

## 4 Basic Facts on Retail Market Structure and Dynamics

### 4.1 Market structure and size distribution

Table 1 shows the basic structure of the retail trade sector for each country as of 2002. A number of features are worth noting. First, Japan has many more retail stores per person than does the U.K or the U.S. Second, U.S. establishments and firms are on average the largest and Japanese establishments are the smallest. Third, the U.S. also has the highest proportion of retail stores owned by multi location retail chains.

**Table 1: Structure of the Retail Trade Sector, year=2002**

	<b>Japan</b>	<b>U.S.</b>	<b>U.K</b>
Number of Establishments	1,273,904	1,114,637	334,627
Establishments per 1000 pop	10.03	3.94	5.64
Number of Firms	n.a.	717,553	241,634
Single Unit Establishments	839,993	685,044	228,189
Multi Unit Establishments	326,167	429,593	106,438
Employment	7,146,228	14,647,675	2,984,376
Average Establishment Employment	6.13	13.14	8.92
Average Firm Employment	n.a.	20.41	12.35

Table 2 shows data on median store sizes within chains, which is of interest for the reasons set out in the introduction. The table shows data on chains for all retailing. In both countries a rise is apparent in the larger sizes; single stores are still the same size. Note too that the median size is smaller in the UK across the board.

**Table 2. Size distribution of stores within chains, all retailing, US and UK**

		1990/1	1998/9	2002/3
<b>US</b>	<b>single</b>	4.5	5.0	5.0
	<b>local</b>	8.3	11.0	11.8
	<b>regional</b>	10.1	11.9	13.0
	<b>national</b>	10.6	13.0	13.6
		1990/1	1998/9	2002/3
<b>UK</b>	<b>single</b>	n/a	2.0	2.0
	<b>regional</b>	n/a	4.5	4.5
	<b>national</b>	n/a	9.2	10.1

Notes: data are averages for years indicated. Data for UK not available 1990/1.

Table 3 focuses on non-specialized stores (ISIC 521). These data are of interest since they include large supermarkets and general merchandise stores, which have been the focus of much interest and in practice account for a large share of total retailing employment. The data here are employment-weighted, that is they are computed by (a) computing the average store size within all chains and (b) computing the median of that average, weighted by overall chain employment. This makes the data (in the UK at least) somewhat sensitive to very large chains but is more representative of what the typical retail consumer or employee would encounter. Before commenting on robustness, the data show a rise in all at all points in the distribution in the US, but a fall in the median and 10th percentile size in the UK.

How robust is this picture? First, the rise in size in the UK at the 90th percentile is due to a very large 90th percentile point in 2003. Second, if the UK data are not weighted, they show falling sizes at all points in the distribution and a less noisy pattern (due to the omission of very large weights on some high employment stores). UK results also show a decline at all points if weighted by the number of stores in the firm rather than total employment.<sup>3</sup> Regarding weighting and US numbers, the unweighted numbers trend upwards for chain stores if restricted to those firms in NAICS 445110

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<sup>3</sup> One way of thinking about the differences would be as follows. The unweighted numbers tell you if you walked randomly into a store in the US what would the median store size be. The chain number weighted numbers tell you if you walked randomly into a chain in the US what the median store size within that would chain be. Finally, the employment-weighted numbers tell you what size store an average employee of a chain works in.

(Supermarkets) that were classified as “national” chains in both 1997 and 2002. However, if one takes the medians for those national in 1997 and separately for those national in 2002, median store size falls. This is due to the fact that newly “national” chains are smaller, thus reducing the median by a compositional effect.

**Table 3. Size distribution of stores within Non-specialized Store (ISIC 521) Chains for US and UK**

		<b>1998/9</b>	<b>2002/3</b>
<b>US</b>	90th	233	282
	Median	142	152
	10th	79	82
		<b>1998/9</b>	<b>2002/3</b>
<b>UK</b>	90th	343	374
	Median	61	43
	10th	22	18

Note: columns are averages of 1998/9 and 2002/3 data. UK 1997 data is noisy. Data are calculated by (a) computing the average store size within all chain and (b) computing the median of that average, weighted by overall chain employment. The UK data omit the top two chains which have very large employment.

## 4.2 Dynamics

Having looked at the size distribution we turn now to dynamics. We look at a number of different dynamic measures: entry, exit, employment growth and transitions. Our main interest is to see if transitions look different across countries.

### 4.2.1 Births and deaths

We show establishment birth and death rates for the retail sector as a whole for each country in Table 4. We report both establishment and employment weighted results and use the birth and death rate measure as in Davis, Haltiwanger and Schuh (1996). Some interesting results emerge. In the U.S. and the U.K case we see the expected result that establishment weighted birth and death rates are higher than employment weighted rates. This reflects that fact that larger establishments are less likely to have birth and death events, so market churn is largely concentrated among smaller units. In Japan, this holds for death rates, but not for birth rates indicating relatively high entry for larger

establishments and exit rates for smaller retail stores that are comparable to those in the U.S. and U.K.

**Table 4: Basic Results on Dynamics**

**DHS Establishment birth and death rates**

	<u>Japan</u>	<u>US</u>	<u>UK</u>
<i>% of Establishments</i>			
Death Rate	34.89%	40.85%	37.53%
Birth Rate	17.14%	40.14%	35.68%
<i>Employment weighted</i>			
Death Rate	28.30%	26.19%	31.57%
Birth Rate	25.24%	27.99%	32.78%

More information on the average size of establishment births and deaths is given in table 5. The first and last rows of the table provide the average number of employees at retail stores in the beginning and end of the 1997 to 2002 period for which we have comparable data at the micro level. The average size of retail establishments is increasing in all three countries. But we see a much larger role for new establishments in increasing the average retail store size in Japan, where new establishments are even larger than surviving establishments. In the U.S., new retail stores are slightly larger than exiting stores but are much smaller than continuing retail stores. In addition, continuing retail establishments exhibit substantial growth in the U.S. (nearly 47%), much more moderate growth in the U.K. (6%) and negligible growth in Japan (3%)

**Table 5 Beginning and End Year Average Employment Size for Establishment Births, Deaths and Continuers  
Year1=1997 (1998 for UK), Year2=2002**

	Average Employment Size		
	Japan	US	UK
avg. employment of all establishments in year 1	5.02	12.51	7.97
avg. emp of estabs in both years (continuers) year1	5.47	15.59	8.74
avg. emp of estabs in both years (continuers) year2	5.63	22.90	9.32
avg. emp of estabs in year 1 but not year 2 (deaths)	4.55	8.22	6.71
avg. emp of estabs in year 2 but not in year1 (births)	8.26	8.94	8.19
avg. employment of all establishments in year 2	6.32	13.14	8.92

Table 5 suggests that the entry and exit of retail stores play a different role in changing the structure of retail markets across the three countries. In the U.S. market churn is characterized by many small units entering. Exits are also small, and there is substantial growth for continuers. We have very good establishment and firm age data for the U.S. from the LBD and plan, in subsequent drafts, to provide a more detailed description of the pattern of growth broken out by firm size and age. In Japan and the U.K, we see that entrants are large relative to the average store size for the sector as a whole. More work is needed to confirm, but these patterns are suggestive that churning in the U.S. is consistent with market experimentation and selection, whereas churning in Japan and the U.K. is simply to replace less efficient mom-and-pops with large chain stores based on models first tested in the U.S. or elsewhere.

To compare retail sector churn across the three countries more systematically, we employ cell based regressions of the cross sectional dispersion of establishment and firm growth rates. To do this we proceed as follows. First, in the micro data we follow Davis, Haltiwanger, Jarmin and Miranda (2006) and for each store or chain, we compute employment growth as

$$\gamma_{it} = \frac{(x_{it} - x_{it-s})}{((x_{it} + x_{it-s})/2)} \quad (1)$$

where  $x$  is employment. This has the advantage of using data on birth and death in the computation of employment growth rates. However, since we cannot use micro data we then aggregate these data into cells, defined by country, 3-digit ISIC, size class (8 size band classes) and single/multi-unit status groupings. We then calculate the average  $\gamma$  for each cell and the standard deviation of  $\gamma$  for all observations within the cell. Our objective is to then compare formally how much cross-country difference there is. To do this, we then run the following regression, where the left hand side is the standard deviation of employment growth rates for cell  $i$ , country  $j$  in time  $t$

$$sd(\gamma)_{ijt} = \beta_{JA} + \beta_{UK} + \sum_{k=1} \theta^k SIZEBAND^k_{ijt} + \mu MULTI + \lambda_I + \lambda_T + \varepsilon_{it}$$

and the right hand side consists of our main variables of interest, namely country dummies for Japan and the UK (the omitted country is the US). We also include other controls (8 size band dummies, a single/multi-unit status, 3 digit ISIC dummies and time dummies). Results from establishment and firm level regressions using both the full and continuers only samples are shown in table 6.

The first column shows the establishment results when growth rates are computed for births and deaths as well as continuers. Our main interest is on the country dummies. Here we see that the Japanese retail sector exhibits dramatically less churn at the establishment level than either the U.S. or the U.K. Perhaps unexpectedly, the cross sectional dispersion of establishment growth rates is higher in the U.K. than in the U.S. Interestingly, however this is reversed when we consider only continuing establishments, where the standard deviation of employment growth is less than in the US, but more than Japan. One possibility is that there are some data error problems with large UK retail chains that have undergone mergers and acquisitions which can generate spurious entry and exit. This would be particularly noticeable at the establishment level, since the chains operate many stores.

Column 2 and 4 show regressions where the micro unit of observation is the firm, defined as all retail stores operating under common ownership and control within a 3-digit ISIC code, and so the cells are the standard deviation of firm growth. We can only compare the U.K. and the U.S. since we currently do not have longitudinally linked firm level data for Japan. It's interesting to note that difference in dispersion is much larger when looking only at continuing firms where the standard deviation of growth rates for the U.S. retail sector is 7.8% greater than in the U.K. This is relative to a mean standard deviation of continuing firm growth rates of 60.4%. This compares to a 6.1% differential that is relative to a mean standard deviation of growth rates for all firms of 145.2%. Again, this may be partly due to errors in the U.K. data that we are currently addressing.

**Table 6: Cell Based Regressions of the Cross Sectional Dispersion of Establishment and Firm Growth Rates**

Cross Sectional Dispersion Regression (Dependent Variable: std dev of employment growth)				
Model				
	<u>All</u> <u>Establishments</u>	<u>All</u> <u>Firms</u>	<u>Continuing</u> <u>Establishments</u>	<u>Continuing</u> <u>firms</u>
Intercept	1.257 <i>0.063</i>	1.452 <i>0.046</i>	0.488 <i>0.032</i>	0.604 <i>0.033</i>
Multi-Unit	0.023 <i>0.015</i>	-0.179 <i>0.019</i>	-0.03 <i>0.007</i>	0.049 <i>0.014</i>
avgemp<2	0.38 <i>0.039</i>	0.217 <i>0.046</i>	0.007 <i>0.024</i>	-0.122 <i>0.042</i>
2<=avgemp<5	0.203 <i>0.026</i>	0.122 <i>0.027</i>	0.02 <i>0.014</i>	0.006 <i>0.022</i>
5<=avgemp<10	0.196 <i>0.024</i>	0.049 <i>0.025</i>	0.051 <i>0.012</i>	-0.025 <i>0.019</i>
Size Class				
10<=avgemp<25	0.174 <i>0.022</i>	0.037 <i>0.022</i>	0.07 <i>0.011</i>	-0.056 <i>0.016</i>
25<=avgemp<50	0.133 <i>0.024</i>	0.039 <i>0.023</i>	0.067 <i>0.012</i>	-0.047 <i>0.017</i>
50<=avgemp<75	0.082 <i>0.027</i>	-0.0002 <i>0.028</i>	0.048 <i>0.013</i>	-0.073 <i>0.02</i>
75<=avgemp<100	0.08 <i>0.03</i>	-0.002 <i>0.033</i>	0.034 <i>0.015</i>	-0.075 <i>0.024</i>
100<=avgemp				
Japan	-0.927 <i>0.016</i>	NA <i>NA</i>	-0.246 <i>0.008</i>	NA <i>NA</i>
UK	0.044 <i>0.018</i>	-0.061 <i>0.012</i>	-0.047 <i>0.011</i>	-0.078 <i>0.009</i>
US				
Observations	351	279	333	260
3 Digit ISIC Controls	<i>Yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>



#### 4.2.2 Dynamics using transition matrices

We now study dynamics using transition matrices. Our method is as follows. We take firm employment for 1998 and 2003 in the UK and 1997 and 2002 in the US (so far we can only do this for the US and UK). There are  $n_0$  and  $n_1$  firms in the beginning and final cross sections, respectively, for which we compute employment based market shares within 3-digit ISIC industries. Thus, in the initial year we have  $n_0$  market shares, and in the final year we have  $n_1$ . We then rank all the firms in each year and allocate each firm to a market share quintile (we tried deciles but cell sizes were too small). We deal with entry and exit as follows: if any firm was not present in the initial year but was in the final year, i.e. an entrant, we allocate them to a “birth” group in the initial year and they migrate to whichever group they’re observed in for the final year. Likewise for exitors, in the final year they’re classified as a death with the initial year classification being what they were last observed in. Thus every firm in the data set, including entrants and exitors, will have two markers from 1 to 6 in both the base and final year. We then tabulate the base against the final year, which gives us the numbers in each cell. We can then express this as a fraction of the total number of firms over the period, i.e. the sum of continuers, entrants and exitors.

The results for the transition matrix of market shares are set out in Table 7. Each cell is the fraction of the total number of firms. The top row shows the final year market share quintiles where of the firms who entered after the initial year. The first column shows the initial year market share quintiles of the firms who exited before the final year. Moving to the rows and columns 1 to 5 which refer to the stayers, the diagonal elements show the fractions of the total remaining in the same quintile over the years. The upper off diagonal elements show the fraction of the total moving upwards and the lower-off diagonal the fraction of the total moving downwards. The sums of these three groups are shown as well.

The matrices suggest that in comparing the US and the UK, there is (a) overall more “fluidity” in the US and that (b) this is concentrated in the small market share US firms being able to become large market share firms. First, the sum of the diagonal elements in the UK (27%) exceeds that of the US (21%), suggesting that UK firms are more likely to stick in their market shares. Second, looking at the elements themselves, it

is apparent that the high market share firms in the US and UK are both equally likely to keep their market position. The reason that UK diagonal sum is higher is because the low market share firms are more likely to remain low market share in the UK. Third, the proportion of firms moving up the distribution in the UK and US is about the same, whereas the proportion moving down is less in the UK (38% of US firms move up, 36% of UK, 41% of US firms move down, 37% of UK). Thus market selection of poorly performing firms seems less pronounced in the UK (market selection in the sense of firms moving down the distribution but still remaining in business). Fourth, the top row suggests that entrants in the US are more likely to progress into the top quintile of market share whereas in the UK they are more likely to remain in lower quartiles.<sup>4</sup>

**Table 7: Transition matrices of market share, by firm**

Firm Size Class Transition Matrices								
% of Firms								
U.K.								
		2002 Size (based on employment) Quintile						
		Deaths	1	2	3	4	5	1997 total
1998 Size (based on employment) Quintile	Births	<b>0.00%</b>	10.99%	4.50%	3.09%	2.94%	2.61%	24.13%
	1	10.08%	<b>8.09%</b>	1.31%	0.91%	0.74%	0.30%	21.42%
	2	6.81%	2.20%	<b>4.74%</b>	1.75%	1.28%	0.43%	17.21%
	3	3.91%	0.66%	1.09%	<b>3.19%</b>	2.60%	0.73%	12.17%
	4	3.40%	0.38%	0.63%	1.48%	<b>3.88%</b>	1.64%	11.41%
	5	3.91%	0.19%	0.21%	0.45%	1.53%	<b>7.37%</b>	13.66%
2002 Total		28.11%	22.50%	12.48%	10.87%	12.96%	13.07%	100.00%
U.S.								
		2002 Size (based on sales) Quintile						
		Deaths	1	2	3	4	5	1997 total
1997 Size (based on sales) Quintile	Births	<b>0.00%</b>	8.55%	7.16%	6.34%	5.61%	4.55%	32.21%
	1	9.45%	<b>2.48%</b>	0.99%	0.34%	0.16%	0.06%	13.49%
	2	7.36%	1.31%	<b>3.19%</b>	1.27%	0.33%	0.10%	13.56%
	3	6.30%	0.50%	1.49%	<b>3.67%</b>	1.44%	0.22%	13.62%
	4	5.54%	0.25%	0.37%	1.42%	<b>4.56%</b>	1.42%	13.56%
	5	5.01%	0.10%	0.12%	0.24%	1.17%	<b>6.94%</b>	13.57%
2002 Total		33.65%	13.19%	13.34%	13.27%	13.28%	13.28%	100.00%

<sup>4</sup> Another way of expressing this is to take all entrants in 1997 and ask what quintile do they end up in by 2002? For the UK, 46% end up in the bottom quintile but in the US 27% do. For the second, third, fourth and top quintiles the figures are all larger in the US than in the UK, for the US, 22%, 20%, 17% and 14% respectively versus for the UK 19%, 13%, 12% and 11%.

Next we looked how employment grows by the employment share quintiles. This enables us to see whether employment growth is in the firms who stay in the top quintiles, in those who are rising up the distribution etc. To do this, we took all employment in 1997 and assigned it to quintiles of the market share distribution in 1997 and 2002. Thus, for exitors we assigned, just as we did above, each exitor to its five market share quintile and calculated five total employment numbers. For firms who remained in quintile 1, we calculated the total employment in 1997 of those firms, likewise for other quintiles. We then did the same for employment in 2002: e.g. for firms who remained in quintile 1, we calculated the total employment in 2002 of those firms. We then calculated employment growth numbers for each quintile and also the employment growth rates (using the DHS formula).

An important feature of the data for each country is that employment change, positive or negative is concentrated in births and deaths. The single exception to this is the large increases in employment at firms that are in the top employment quintile in both the initial and final periods.

Comparing the US and UK we again get a picture of increased dynamism at the bottom in the US. Looking at the employment growth numbers, there are a very good deal of employment growth accounted for in both countries by entrants who get to the top and stayers who remain at the top. Looking at the employment growth rate numbers, the top stayers on the diagonal have similar growth rates. However, in the UK it is notable that the middle stayers on the diagonal have been contracting, whereas the lowest diagonal quintile has been growing. This contrasts with the US where the lowest diagonal quintile has been falling with growth in the other quintiles.

**Table 8**

Firm Size Class Transition Matrices								
Change in Employment								
U.K.								
		2002 Size (based on employment) Quintile						
		Deaths	1	2	3	4	5	1997 total
1998 Size (based on employ- ment) Quintile	Births	<b>0</b>	40,924	30,496	28,513	44,228	468,148	612,309
	1	-33,895	<b>855</b>	4,539	5,103	7,965	8,235	-7,198
	2	-46,503	-3,258	<b>-134</b>	5,725	10,686	10,166	-23,318
	3	-39,209	-3,276	-3,731	<b>-1,658</b>	9,374	16,386	-22,114
	4	-52,095	-3,713	-4,598	-6,370	<b>-983</b>	22,465	-45,294
	5	-654,502	-5,128	-5,246	-8,854	-19,688	<b>401,612</b>	-291,806
2002 Total		-826,204	26,404	21,326	22,459	51,582	927,012	222,579
U.S.								
		2002 Size (based on sales) Quintile						
		Deaths	1	2	3	4	5	1997 total
1997 Size (based on sales) Quintile	Births	<b>0</b>	99,991	183,998	263,666	407,240	1,288,299	2,243,194
	1	-151,718	<b>347</b>	12,221	10,187	8,246	6,894	-113,823
	2	-215,932	-11,144	<b>2,430</b>	18,802	14,793	14,301	-176,750
	3	-295,697	-11,678	-12,921	<b>7,777</b>	33,658	21,823	-257,038
	4	-466,117	-12,374	-12,254	-19,047	<b>19,583</b>	86,002	-404,207
	5	-2,462,301	-14,390	-17,518	-21,803	-60,297	<b>1,802,537</b>	-773,772
2002 Total		-3,591,765	50,752	155,956	259,582	423,223	3,219,856	517,604

## 5. Impact of Structure and Dynamics on Retail Productivity

Given the evidence presented on scale and on market churn for the three countries, we now want to see how this impacts the productivity differences that motivate the paper. There are at least two ways to do this. First, we might consider that store size matters for economies of scale at the store level, but also for economies of scope for chains. The former is due to the kind of fixed cost effects discussed in Oi (1992). The latter might be due to the idea that large chains use organizational capital across stores (an economy of scope). When they learn how to use bigger stores, they gain a scope economy when opening additional large stores. But if they open a small store they might not be able to use that knowledge as effectively.

Second, we would like to see how differences in retail market dynamics across the countries affect productivity growth. The usual method is to try decompositions as in Foster, Haltiwanger and Krizan (2002) (FHK) and compare them across countries. The problem here is that productivity can only be computed at the firm level for the UK, as is TFP for US retailers. Receipts per worker (crude proxy for labor productivity) can be constructed for U.S. establishments. But most of the data needed for compute productivity are at the firm level. This and the short time period would reduce the effectiveness of FHK type decompositions in examining the impact of retail market dynamics on productivity.

Therefore we confine ourselves here to study scale issues. We do this following Haskel and Sadun (2006) by running the following regression for chain  $c$  in year  $t$ ,

$$\ln Q_{ct} = \gamma_1 \ln N_{ct} + \gamma_2 \ln MEDSIZE_{ct} + \gamma_3 CHAINTYPE_{ct} + \lambda_t + \lambda_c + \varepsilon_{ct}$$

where  $Q$  is sales of the chain, with total employment  $N$ ,  $CHAINTYPE$  is a dummy indicating a national or sub national chain (not essential), and the other terms are fixed effects for the industry and year. The crucial variable is  $MEDSIZE$ , some measure of the within-chain employment distribution. Our experiments suggested that log median size of the within-chain store seemed to give the most robust findings. We also looked at the fraction of within-chain stores who are small, where small is defined as the fraction of shops below the median size of the chain in the base period (1997-8). We also looked at

regressions with fixed effects and obtained similar results. The results using log median size (logMSS) are set out in Table 9 below. As the table shows, the coefficient on logMSS is positive and significant for the UK and both US data sets using long and short time periods. This positive association between store size and chain productivity is consistent with the idea that a move to smaller-sized stores within chains lowers measured productivity.

**Table 9 Gross Output Regressions - Chain Stores Only**

	Dependent Variable is Log(sales)							
	<u>Japan</u>		<u>U.K.</u>		<u>U.S.-1</u>		<u>U.S.-2</u>	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
log(N)			0.972	0.009	0.994	0.002	0.99	0.003
log(MSS)			0.081	0.014	0.009	0.002	0.017	0.003
Chain Dummies			Yes		Yes		Yes	
Year Dummies			Yes		Yes		Yes	
ISIC Dummies			Yes		Yes		Yes	
R-Squared			0.929		0.849		0.85	
Observations			7478		366667		115003	

Notes: U.S.-1 model estimated on all available Economic Census Observations for 1977, 1982, 1987, 1992, 1997 and 2002. U.S.-2 model estimated on 1997 and 2002 data only.

A number of points are worth making. First, these are of course associations in the data and should not be interpreted causally (although it might be interesting to use US logMSS in like regions as an instrument for UK logMSS and vice versa). Second, due to data availability we do not have current Japanese data or data on other inputs. Third, measured productivity in retailing might change due to changing assortment and ambience rather than changes in physical outputs per person (Betancourt 2004). Fourth, it is of interest that the coefficient varies between the UK and US, being higher in the UK. One possibility is that UK chains, whose median size is smaller, have a greater marginal effect on productivity.

## 6. Conclusion

This paper uses internationally comparable microdata to document features of the retail sectors in Japan, the United Kingdom and the United States. We study store and chain sizes, entry, exit and market share transitions. Our main findings are of the relative dominance of small single stores in Japan and large chains in the US. For example, in 2002, stores per 1000 of the population are 4 in the US, 6 in the UK and 10 in Japan. Chains account for 39% of US retail stores, 32% in the UK and 26% Japan. The US also seems to have larger churn of stores and, relative to the UK, an increased propensity of chains to show “up or out” behavior: low market share chains either gain market share or exit. Of all US chains in 1997, 21% are in the same market share ranking 5 years later and 27% in the UK, 41% in the US have moved down or exited and 37% in the UK. Of entrants, 27% of US entrants are in the bottom market share quintile 5 years later, but 46% of UK entrants.

We have also seen increases in the median size of stores in non-specialized store chains in the US, but decreases in the UK. Between 1998/9 and 2002/3, the median store size in a US food chain rose from about 140 to 155 employees. In the UK, it fell from about 80 to 40. Our econometric work suggests a positive and statistically significant association between chain productivity and median within-chain store size. To the extent this is causal, this suggests that the UK trend to smaller stores within chains would have lowered UK retailing productivity and the US trend to larger will have raised it.

There are clearly a number of areas to explore further. First, on data, we currently have somewhat incomplete Japanese data, and there are always data problems in ensuring comparability across countries. Second, it would be of interest to explore more how competition from large chains has affected single stores in different countries.

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