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IFS

# RETAIL PRODUCTIVITY

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THE INSTITUTE FOR FISCAL STUDIES  
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# Retail Productivity

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## Introduction

Recent attention has focused on the UK's productivity gap in the retail sector. Figure 1 shows an estimate of labour productivity in retail across countries, using output per hour worked. The UK lies well behind the US, France and Germany.

[Figure 1 here]

Reynolds et al (2005) contribute to this debate by providing a discussion of the literature, along side interviews with several UK and US retail firms. The conclusions of their paper are that, while there are many measurement issues, most of the evidence points to the fact that, on average, productivity in this sector in the UK is low and has grown slowly over recent years when compared to the US. They rightly point out that a more thorough understanding of what drives productivity in the retail sector requires a better understanding of the "complex mix of urban characteristics, consumer preferences and competitive rivalries".

In this article we discuss some of the main issues involved in the measurement of productivity in retail, how these problems can be tackled, and we consider the interpretation of these statistics. We then discuss new work using microdata on the UK supermarket industry and conclude with a short discussion of where future research needs to look to answer the important policy questions around why the UK's productivity performance remains low in this important sector.

## Issues in measuring productivity

Reynolds et al (2005) are right to point out that there are a number of concerns about measurement error in commonly reported measures. The main issues are the measurement of the quality and volume of inputs and output.<sup>2</sup> In the data that is most commonly used in the approaches discussed by Reynolds et al, productivity is measured by sales or value-added per worker or per hour worked. In some cases other inputs, such as land and capital usage, are also considered. Sales is quantity sold times the price at which it was sold. Value-added is output minus the cost of the goods sold and other 'intermediate inputs' like electricity.

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<sup>1</sup> The analysis contained in this paper was funded by the Advanced Institute of Management Research (AIM) All errors and omissions remain the responsibility of the authors. For correspondence: rgriffith@ifs.org.uk; h.harmgart@ucl.ac.uk; IFS, 7 Ridgmount Street, London, WC1E 7AE, UK.

<sup>2</sup> Griliches (1994) has a nice and comprehensive discussion of these issues and how they will affect the measurement of productivity.

Price is important here, because it gives us a way to compare units of different goods. It can provide information about the quality and value of the good sold, and of the retail services provided. Without information on price it would be very difficult to compare productivity across different industries or different types of retail establishment. Because of the key role played by price in measuring productivity, the main measurement issues comes down to the measurement of price, and what information we believe prices reflect.

In markets that function well we generally think of price as accurately reflecting the quality and cost of producing a good. In perfectly competitive markets prices should do this very well. Where markets are imperfect, for example, because firms have market power (the ability to price above marginal cost) then prices may not provide an accurate reflection of either quality or costs. Instead they will reflect the degree of market power that a firm has, or in cross-country comparisons they may reflect differences in the degree of competition in each market. For example, say we are comparing productivity in two different towns. In the first town there is only one store retailing milk. Planning regulation, say, has restricted the entry of new grocery stores. In the second town there are three stores selling milk, say because planning regulations are more lax in the second town. The store in the first town will be able to charge a higher price for milk than will any of the stores in the second town. This will increase the value of their sales, and thus will increase measured productivity, but will not necessarily reflect a “real” difference in productivity.

A similar set of issues arises with the measurement of inputs. Is one worker, or one hour worked, the same as another? Is one square foot of land the same as another? Clearly they are not. Again, the price of labour and the price of land can help us. They can be used to reflect the contribution that input makes to generating sales and the quality of the input. If labour markets are functioning well, then the wage paid to workers should accurately reflect their marginal revenue product, that is their contribution to each additional pound of sales. This will be affected by the quality of the worker, along with the contribution and quality of other inputs. Similarly, if property markets are functioning well, then the rental value of a piece of land should reflect its marginal revenue product, which again will be heavily influenced by the quality and location of the land. Again, however, where these markets are not working well, due for example to restrictive planning regulation, prices will provide a less good picture.

The point here is that prices can be very useful in allowing us to meaningfully aggregate the quantity sold and quantity of inputs used. They are the most useful when markets are working reasonably well. So, to the extent that we believe that retail markets are reasonably competitive, then these measurement problems should be fairly minor. However, all is not lost if they are not competitive. If we take the view that prices are not set competitively in these markets, then, with some knowledge of how prices are set, we can say something about the way in which the measurement of productivity will be affected, and the direction of bias they measurement error will induce.<sup>3</sup> When markets are not competitive, this generally means that the price will be higher than in a competitive market. This means that the value of output or of the inputs will be over stated - price will reflect not only the value of the output or input, but also the extent of market power. If this occurs in the output market this will lead to an overstatement of productivity, if prices are set non-competitively in input markets this will generally lead to an understatement of productivity.

For example, if there is one dominant firm in an industry which is able to price higher than all other firms, not because of a difference in quality, but due, for example, to an inadvertent effect of regulation which conferred some market power on that firm. The value-added of this firm will then be greater than the other firms. If all firms use the same amount of inputs then the firm with market power will look like they are more productive, when in fact this

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<sup>3</sup> See Klette and Griliches (1996), Hall (1988) and large subsequent literature on this.

represents a difference in their market power. At the country level, if competition in one country is fiercer than in another, then firms in the country with less competitive markets will be able to charge a higher price, all else being equal. This will mean that they will look *more* productive than firms in the more competitive country.

Looking at the numbers in Figure 1, where we see that US labour productivity is substantially higher than UK labour productivity, if we were to explain these differences by this type of measurement error in prices, we would have to believe that UK retail markets were substantially more competitive than US markets. This is not the general impression one gets, for example, when reading the Competition Commission's recent report on supermarkets. We are therefore left to look for other explanations for this gap in productivity.

One further comment is worth making. First, Reynolds et al raise the issue of comparing productivity across retail propositions. There should be no problem doing this, if we measure productivity correctly. There are two main issues that arise, both of which are not specific to retail. The first is the issue to do with prices, as discussed above. The second is related to the technology used. When firms are offering differentiated products (in this case different retail propositions - for example, superstore versus convenience store) then they may use quite different inputs in making this offering. For example, convenience stores may be more labour intensive, while superstores may use more automation. Thus, if we compare labour productivity between the two types of stores the smaller convenience stores may look much less productive. Yet if we fully account for all inputs they may be more comparable. For example, McKinsey (1998) find that, while the UK had lower labour productivity in retail in 1995 in comparison to the US and France,<sup>4</sup> its capital productivity was in fact significantly higher in that year.<sup>5</sup>

## The drivers of retail productivity

Recent research has emphasised the importance of entry in driving productivity growth in retailing, as well as in other sectors. For example, Foster, Haltiwanger, and Krizan (2002) find that productivity growth in retailing in the US largely occurs in new stores, rather than productivity growth in incumbent stores. They also show that the majority of productivity growth in the US has happened within firms rather than across firms - it is companies closing unproductive stores and open up productive ones rather than the entry of new firms.<sup>6</sup> The cumulative entry rates is 38.2% over the period 1987-1997, or about 3.3% on average per year.

Haskel and Khawaja (2003) use similar data to Foster et. al., but for the UK. They find that, although annual entry rates in the UK are in fact much higher than in the US, between 8.7 % and 10.2% across all retail sectors between 1998-2000, albeit over a different time period, the contribution of new stores to aggregate productivity growth is much lower in the UK than in the US. They show that larger retailers have higher labour productivity, but that growth in labour productivity is fastest amongst the smallest retailers.

These are interesting findings and certainly deserve further investigation. However, two important questions arise with respect to these findings. The first is, what is actually meant by

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<sup>4</sup> 25% lower than France and 12% lower than the US

<sup>5</sup> 50% higher than France and 67% higher than the US

<sup>6</sup> FHK's analysis is at the establishment level and they follow the entrants from 1987-1992 to 1992-1997 and measure their respective productivity. Within their sample most establishments exit within that period. The exit is concentrated in the group of lowest productivity establishments (of the twenty percent of establishments with lowest productivity around 70%, or 14% of the whole sample, did not survive till the ten years).

entry in these papers. The second is that these papers do not directly look at what are the mechanisms driving growth. They carry out an accounting decomposition of where growth occurred, which is useful, but they do not explain what are the mechanisms or the causal relationships driving growth.

As Haskel and Khawaja (2003) are careful to point out, an important limitation of the data used is that they are not collected at shop level. Thus entry and exit do not consist of shops opening and closing, which is ideally what we would like to study. Instead the data are held at the enterprise level, which roughly corresponds to a firm in a particular chain (for example if a supermarket chain owns supermarkets and DIY stores, these are two separate enterprises). The US data is also measured primarily at the establishment level, but in most cases in the US this is a single store, and in only a few cases comprises multi-unit establishments.<sup>7</sup>

In order to really understand the impact that entry is having on growth it is important first of all to have an idea of what is driving entry, and secondly to have good measures of entry, in order to relate them to productivity performance.

To illustrate these ideas we look at one part of the retail industry - supermarkets - where more detailed and disaggregated data on entry is available. Supermarkets make up a substantial part of the retail trade in the UK, and the two largest UK retailers - Tesco and Sainsbury - are supermarkets (see Reynolds et al Table 6 from M+M Planet Retail).

We use data from the Institute of Grocery Distribution (IGD), which includes information on all individual stores of the large grocery chains, all Co-ops and around 80% of independent grocery retailer. In total it lists around twelve and a half thousand stores in the UK. The advantage of this data is that we can observe entry, exit and refitting at the store level for almost all stores in the UK. Looking at this disaggregated data in more detail shows very interesting patterns of entry and exit in the period between 1980-2004.

[Figures 2 and 3 here]

Looking at the type of stores that the four large chains (Tesco, Sainsbury, Asda and Safeway/Wm Morrison) opened over the 1990s we see an increase in the number of smaller store formats, such as convenience stores, relative to supermarkets and other large store formats. Figure 2 show the striking increase in number of convenience stores opened by the big four. Figure 3 shows that increasingly more stores are being opening in high street and neighbourhood locations, rather than at edge-of-town or out-of-town sights.

The firm that exemplifies this development most clearly is Tesco Stores. Figure 4 shows the number of stores opened each year by Tesco, by format. The opening of Tesco Express stores, their small centre-of-town format, has increased dramatically over the latter part of the 1990s and early 2000s. Although in terms of sales area Tesco Express still represent a small proportion of Tesco's overall sales area, both with respect to the stock of existing stores and of entrants. This is because the average size of a Tesco Express is around 2,000 square feet, compared to a Tesco supermarket of around 27,000 or Tesco Extra hypermarket of 69,000.

[Figures 4 and 5 here]

The picture for Sainsbury looks similar, see Figure 5, with the biggest increase in number of store openings in their small neighbourhood/highstreet format - "Sainsbury Local". The picture for Asda looks different, following more the Walmart strategy of opening one-type-

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<sup>7</sup> Most of their data comes from a survey conducted every five years by the Census of Retail Trade (CRT).

fits-all large supermarket format. And due to the recent takeover of Safeway by Morrisons the picture of their strategy more difficult to see at the moment.

These convenience store openings of course follow an earlier period where there was a large amount of closure of smaller format independent stores. But, there seems to be a clear strategy switch happening here in the at least some of the big supermarket chains. It may be that this pattern shows a UK retail strategy that is adapting to the particular preferences of UK consumers. In densely populated cities, where consumers like to buy fresh food, generally walk home from work and shop more than once a week, the optimal strategy may to be have a large number of small conveniently located stores.

But has this change in strategy affected productivity? The literature discussed above seems to suggest that this is what is holding UK retail productivity back, the focus on the small store format. Yet Tesco has been one of the most successful UK firms, with recent growth in value-added per worker and strong financial performance.

More generally, how do we expect entry to affect productivity growth? There are two main mechanisms that have been emphasised in the literature - increasing competition, which drives out poorly performing stores, and the adoption of new technologies, which may be easiest when building a new store. In the UK, particular attention has focussed on the role of land use regulation and planning. It may be that this is stifling entry, or affecting the type of entry, and thus depressing competition and slowing the use and adoption of information and communication technologies (ICT). This seems plausible, but it seems important to marry up this effect with what looks like a strategic shift towards smaller format stores.

There are at least two ways in which planning may affect productivity. First, planning regulations might result in retail stores operating below minimum efficient scale, and thus lead to lower productivity levels. Second, regulation might hinder the opening of new stores and closure of old ones. To the extent that retail productivity growth is due to firms closing older, low productivity stores, and opening newer, high productivity shops to replace them, this might result in lower productivity growth.<sup>8</sup>

In an international comparison Flath (2003) finds a lower store density in the UK than in most other European countries. The store density is similar to the US,<sup>9</sup> but, since car ownership and average travel distances to stores is much higher in the US, this could still be in line with a less competitive UK environment. Entry may therefore lead to lower prices and better quality offering through an increase in competition. The general perception that grocery prices tend to be higher in the UK than in other comparable EU countries and the US has led to repeated investigations of the supermarket industry.<sup>10</sup> Smith (2004) estimates the effect of supermarket competition on equilibrium prices in the UK. His findings provide evidence of a significant impact of market power on prices. Investigating this relationship further will help us to understand the precise impact of market concentration on productivity and prices.

Recent work has also suggested that the adoption and use of ICT has been an important contributor to the US productivity acceleration of the late 1990s. It is likely that ICT usage is higher and more effective in larger and newer shops. Van Ark et al (2002) and Basu et al (2003) argue that the productivity difference between the US and the UK can be partly explained by differences in ICT investment. In both countries ICT use and industry productivity growth are highly correlated. Since retail accounts for an important part of this

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<sup>8</sup> Of course, regulation and planning are likely to have beneficial effects as well, on land use, the environment, and the quality of life, among others.

<sup>9</sup> Measured in number of stores per 1000 inhabitants.

<sup>10</sup> An initial investigation was conducted by the Office of Fair Trading (OFT) in 1998 and subsequently by the Competition Commission in 2000.

productivity differential, it is crucial to understand the role of ICT investment in retail. Interestingly, Oulton and Srinivasan (2004) document that overall retailing is one of the biggest contributors to the ICT capital deepening over the 90s in the UK.

Does this suggest that the UK is starting to catch up with the US in terms of ICT investment? The aggregate numbers shown in Figure 1 do not lend any support to this idea. Or is it that only a few leading UK firms – like Tesco – have successfully adapted their strategy, and we will be left with a long tail of poor performers? If this is the case, it might explain why the ICT capital deepening has not been picked up in more aggregated measures of productivity in retail. Maybe the heterogeneity we see on the micro level, with companies like Tesco leading in strategy adaptation and productivity growth, is only the first sign of change. For the whole sector to follow might take more time.

## Concluding remarks

So where does this leave us? International productivity comparisons can be a useful tool for governments in informing their broad policy agenda. The job of policy makers is to ensure that markets function well and enable firms and individuals to work efficiently and effectively and that firms, workers and consumers face the appropriate incentives to invest, work and consume. International comparisons can help us to learn about whether markets are working well and about what sorts of policies are in place which are and are not effective. Within a single country we rarely see sufficient variation in policies or institutions to enable us to identify which work effectively and which do not. Cross country comparisons help us do this, but they must be interpreted judiciously. There are a number of reasons why measured productivity may differ, which do not necessarily reflect underlying differences in productivity. Recent work has rightly focussed on micro level measures of productivity, which can then be used to inform the debate about macro economic performance.

Many of the measurement problems stressed in the literature can be handled by careful consideration of the likely impact they will have on measurement. Rather than throwing up our hands in despair we can systematically think through which types of measurement error are likely to be most important, and what effect they are likely to have on measures of interest (in which direction they are likely to effect the measures of interest). In addition, there is now the potential for much careful work on measuring productivity at the micro level.

Reynolds et. al. state that firm level data are worse for retailing than manufacturing, but in many ways the data in retail, at least for supermarkets, are much better. Data are available at the individual store level, we know what prices consumers pay from marketing data, and we have good measures of the quality of goods purchased, if not of other amenities and services provided. This means that we have the opportunity to actually measure prices correctly, and to consider how firm and consumer behaviour affect them. There is also a wealth of data at the firm and establishment level. Economic researchers are only just beginning to put this data together in order to gain a better understanding of the nature of competition in the industry and the way in which productivity is and has evolved in the UK. But it looks like this will be a burgeoning area of research over the coming years.

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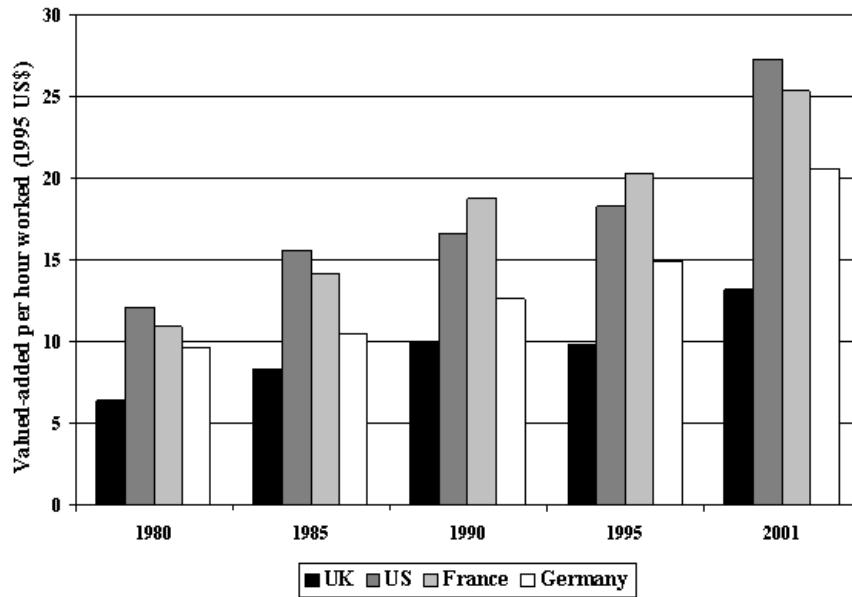
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Figure 1: Value-added per hour worked in retail



Source: Groningen Growth and Development Centre, 60-Industry Database, October 2004  
<http://www.ggdc.net>

Figure 2: Store openings by store type

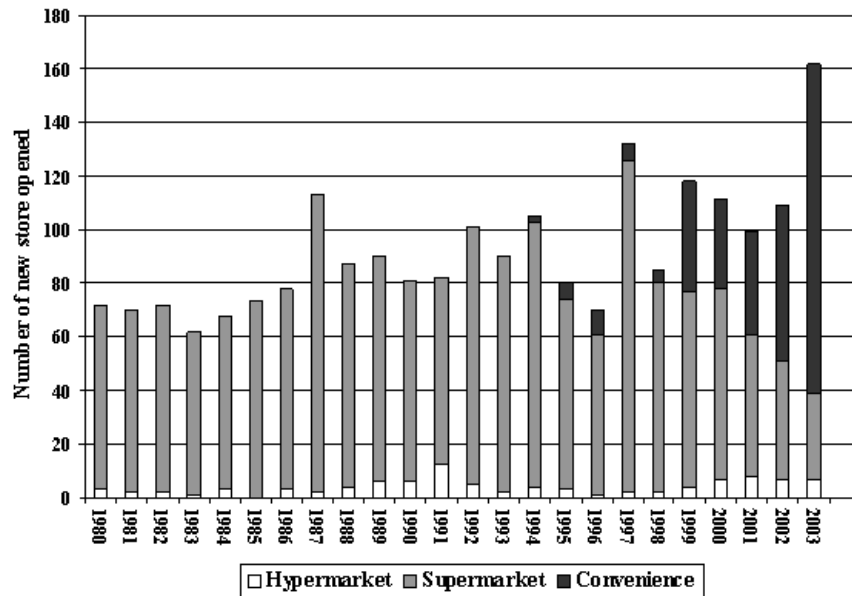


Figure 3: Store openings by Location (big four)

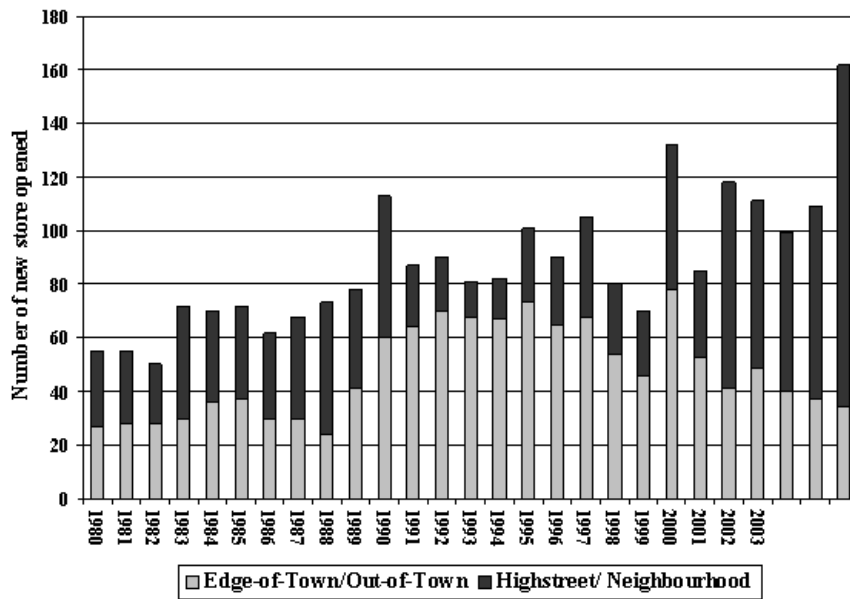


Figure 4: Store openings by Tesco Stores

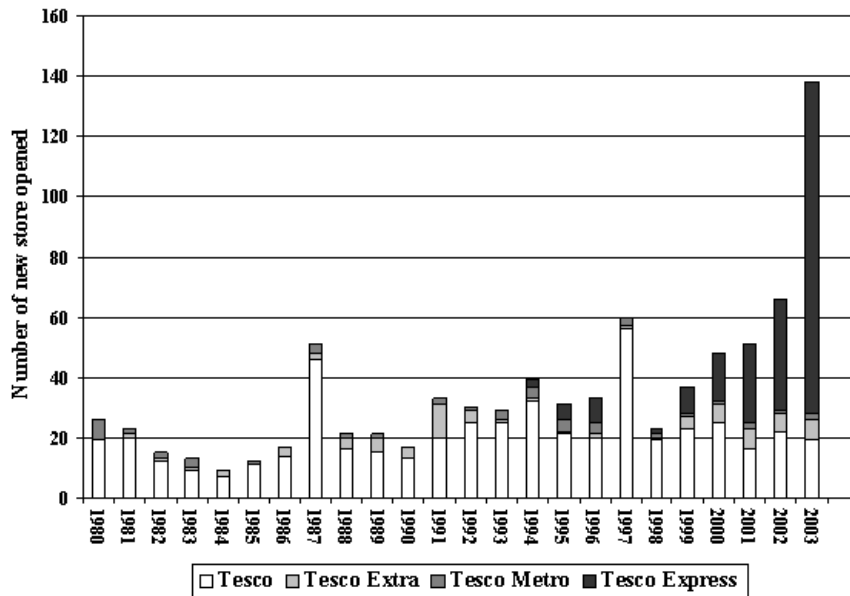


Figure 5: Store openings by Sainsbury Stores

