Working Paper

The U.S. Advantage in Retail and Wholesale Trade Performance: How Can Europe Catch up?

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Perspectives on a Global Economy: The U.S. Advantage in Retail and Wholesale Trade Performance, How Can Europe Catch-up?

This issue of *Perspectives on a Global Economy* focuses on the trade sector. The report is an outgrowth of a number of The Conference Board research projects on the trade sector and the impacts of information and communications technology (ICT) undertaken over the past few years on economic growth and business performance. (See bibliography at end.) Aside from written reports discussions at various conferences, forums, and workshops supported the work. In particular, a Conference Board Workshop held in London in late spring 2002 ("Workshop on Benchmarking Reforms in a Renovating Economy") and a conference in Amsterdam in June 2004 ("Productivity, Innovation, and Value Creation: Exploiting Opportunities for New Growth") helped us focus on business opportunities in retail trade and the limits to achieving them.

We want to thank participants in these forums for their insightful comments and guidance, without attributing any of our conclusions to them. We extend special thanks to David Weil, Associate Professor of the Boston University School of Management and the Uniform Code Council for generously sharing Universal Product Code adoption data with us.

About this report

The question we pose is why has efficiency in U.S. distributive trades grown so much faster than in many European countries in recent years? We focus on trade because over the last decade it has been the key sector contributing to the gap in productivity performance between the United States and the European Union. The evidence is particularly strong for retail trade, but wholesale trade is an important contributor as well. Both sectors are major sources of employment, and their importance is growing. The report dissects and identifies the root causes of the EU-U.S. productivity growth gap in trade.

We take a unique approach to the problem, blending economic theory with business case analysis. Our economics approach begins with a standard growth accounting framework, which we apply to derive internationally comparable measures of productivity in trade. From the business standpoint, we use business cases and commercially available data to benchmark U.S. firms against their European counterparts. We also leverage the experiences and anecdotes of member companies of The Conference Board. This combined approach yields a very rich picture of the differences that drive the performance gap.

Our core finding is that the marriage of technology and organizational change is at the heart of the U.S. trade sector's productivity acceleration away from Europe's post-1995 performance. Europe has not changed as rapidly, and its regulatory environment,

particularly as it relates to land-use, is a big factor. However, change is underway and Europe has strong potential to catch-up to the United States.

1. Executive Summary

The U.S. trade sector experienced a significant acceleration in productivity growth around 1995, almost doubling the trend growth rate of the previous twenty years. Retail trade jumped from 2.5% labor productivity growth between 1979 and 1995 to 7.9% between 1995 and 2002 Wholesale trade moved from 2.7% to 7.1% over the same period.[1] The U.S. has remained on this higher productivity growth track through both the recession and subsequent recovery. [2] European performance, on the other hand, stalled with very slow post-1995 wholesale and retail productivity growth in France, Germany, Spain, Belgium, the Netherlands, and Portugal.

These differences are at the heart of strong economic growth in the U.S. and corresponding sluggishness in Europe in recent years – the reason being that trade's share of all developed economies is very large (approximately 15% of employment and 10% of GDP on average). Both retail and wholesale have been major drivers of the United States' productivity growth advantage over the European Union since 1995. In fact, over 50% of the economy-wide productivity growth lead for the U.S. post-1995 is accounted for by wholesale and retail trade.[3]

Moreover, our data indicate that the U.S. advantage in labor productivity growth is not simply the result of faster capital accumulation. The source of the difference is total factor productivity (TFP) growth – a measure of the overall efficiency of the production process. The bottom line is that beginning in the mid-1990s, U.S. retailers and wholesalers have been able to boost their overall operational effectiveness in a way that firms in many European countries have not.

The marriage of technology and organizational change is at the core of the U.S. trade sector's productivity acceleration away from Europe post-1995. Over the last thirty years, retailing was transformed from a low-technology sector to one of the most intense users of information and communications technologies. Barcodes, scanners, and electronic replenishment capabilities, along with complementary organizational adjustments, have led a structural transformation of the sector, increased competitiveness, and strong productivity growth. The most important improvements are:

- **Better information about customers –** Retailers, wholesalers, and manufacturers can now use detailed real-time information about customer purchases to make business decisions.

[1] All industry labor productivity data are derived from the Groningen Growth and Development Centre, 60-Industry Database, http://www.ggdc.net.

[2] 2001 was a recession year in the U.S., but the acceleration is robust to changes in the endpoint in large part because the recession was focused in manufacturing and information technology production, not distribution.

[3] Bart van Ark, Robert Inklaar, and Robert H. McGuckin, "Changing Gear: Productivity in ICT and Service Industries, Europe and the United States," chapter in Jens Frosev Chistensen and Peter Maskell (eds.), *The Industrial Dynamics of the New Digital Economy* (Cheltenham, UK: Edward Elgar, 2003).

- **Faster information flow** – Information gathering and reporting is highly automated and flows almost instantaneously between business units and companies.
- **Smaller and more accurate inventories** – At all stages of the value chain participants boost efficiency by keeping lower inventories on hand.
- **Sharp declines in operating margins and real consumer prices** – These are the ultimate rewards of the investment, and many of the gains are passed on to the consumer.
- **Increased firm and store size** – The technology rewards scale and scope, enabling large centralized chains and "big box" stores to expand rapidly.

These achievements are substantial, but they have not been realized quickly or easily. Rather, they are the product of decades of heavy investment, meaningful organizational change, and effective managerial leadership. Indeed, the transformation is far from complete.

The story begins in the early 1970s, when large grocers and manufacturers like Kroger and Heinz joined efforts to create a universal product labeling standard. Their goal was to drive efficiencies in checkout speed and price labeling. The result was the creation of the Universal Product Code (U.P.C.), or barcode. The linkage of U.P.C. codes to computer inventory databases became feasible in the 1980s, pioneered by large general merchandisers like Wal-Mart. It was not until 1994, however, that U.P.C. became ubiquitous -- the saturation point on the classic "S" shaped technology adoption curve was reached.[4] It was at this point that large productivity gains began to be realized. Many of these gains are still in the process of being realized today. There are several key reasons behind the more measured pace:

- **Network effects** – Benefits could only be realized once a large number of manufacturers and stores were using the technology.
- **Learning effects** – Companies had to reorganize their entire operations around the new technology to realize its benefits.
- **Complementary changes** – Deregulation of the trucking industry in the 1980s was a major enabler of the gains, and this adjustment took time.
- **Industry diffusion** – There were substantial delays as the technology moved from the food sector, to general merchandise, and then outward to other retail sectors like apparel and electronics.
- **High investment barriers** – Inventory control systems have very high fixed costs, and the investment barrier is high, especially for smaller firms. This has been mediated over time as computer prices have fallen.

While the U.S. transformation process was slow, once the obstacles were overcome the rewards were tremendous. Rapid, broad-based productivity growth in trade has powered

[4] Data on U.P.C. registrations was kindly provided to us by David Weil, who conducted research on U.P.C. adoption while at the Harvard Center for Textile and Apparel Research. For more detail on this work see: Abernathy, Frederick, John T. Dunlop, Janice H. Hammond, David Weil. *A Stitch in Time: Lean Retailing and the Transformation of Manufacturing: Lessons from the Apparel and Textile Industries.* New York: Oxford University Press, 1999.

the U.S. economy for the last decade, and companies like Wal-Mart have expanded rapidly and generated tremendous profits.

It is clear that Europe's trade productivity growth has not accelerated like that of the United States. While change is underway in Europe, the pace of organizational and technological adoption has been much slower. Specifically, we identify five factors that explain this lag in the transformation process:

- **Head-start** – While retailers on both sides of the Atlantic have followed suit in adopting Wal-Mart's innovations, U.S. retailers had a substantial head-start over European firms in making the changes required to successfully exploit these technologies.
- **Regulatory obstacles** – Europe's regulatory environment has slowed trade productivity growth through two channels: regulation within individual countries restricts competition and *differences* in regulation inhibit smooth cross-border operations in trade and the associated gains from scale.
- **Scale** – Since ICT in the trade sector is a technology of centralized management, information processing and analysis, reduced opportunity for cross-border scale has lowered the incentive for investment in Europe relative to the United States.
- **Slower complementary change** – Europe's trucking was deregulated only in the mid-1990s, meaning many of the shipping adjustments being made in the U.S. are less far along
- **Culture and taste** – Differences in language and culture make it more difficult to streamline operations across borders in Europe. This factor has traditionally been a barrier to building cross-border scale, but as Europe integrates this may become less of a factor.

In considering these factors it is crucial to recognize that "Europe" is not one harmonized regulatory environment. Different European countries have very different regulatory policies, and these must all be considered individually. In fact, lack of a harmonized regulation system is a major difficulty in building cross-border operations across Europe. This lack makes it harder to capture all the enterprise-wide advantages of scale and standardization.

There is evidence that many European firms understand and can apply the new technologies efficiently. For example firms like Carrefour and Tesco are rapidly growing international operations in newly ascended European Union members like Hungary, Poland, and Slovakia. While cross-border activity is on the rise in Western Europe as well, the pace has been substantially slower

In spite of its slower start, Europe has strong potential to catch-up. Operational regulations have been eased in many countries, and competitive incentives for change are increasing. As a result, technology investment has increased dramatically. In fact, since 1990 European retailers and wholesalers have been investing in ICT capital at similar rates to U.S. firms, but their investment intensity levels have remained considerably lower than in the United States. As they build out their IT infrastructures they will be better positioned to exploit the efficiencies of the new business models.

Moreover, Europe's transformation has the potential to move at a very fast pace, as companies have learned from the U.S. experience and will likely make fewer mistakes and missteps. All indications are that Europe has the strong ability to catch-up to the United States, and the growing markets of the new EU members will play an important role in driving this process.
<END EXECUTIVE SUMMARY>

2. The Distributive Trade Sector is a Major Contributor to Europe's Stalled Productivity Convergence

Prior to the mid 1990s, Europe had been on a long-term productivity catch-up track with the United States. Following World War II, the European Union was operating at just below 50% of the labor productivity of the United States. This gap gradually narrowed over the next fifty years with Europe closing to within 4-percentage points of the U.S. in terms of output per hour by the mid 1990s. However, at this point there was a clear break in trend -- U.S. productivity growth began to accelerate while Europe experienced declines. Our most current economy-wide numbers show 1.9% labor productivity growth for the U.S. vs. 1.3% for the original 15 European Union members between 1995 and 2003.[5] This contrasts strongly with the 2.5% growth seen in Europe and 1.0% in the U.S. over the period 1990-1995.

Although the U.S. outpaced the EU in labor productivity growth in just over half the 56 major industries, earlier studies have shown that the EU-U.S. growth differential was focused in a few key sectors of the economy. The differences were most dramatic in service industries that relied most heavily on information and communications technology. These industries, securities trade, retail and wholesale trade, banking, R&D, professional services, renting of machinery, and insurance are collectively known as the *ICT-using services sector*. They account for the lion's share of the difference between U.S. and EU productivity growth post-1995.

While the US outperformed the EU in all of these industries except for banking and insurance post-1995, three standout as the dominant contributors to the gap – securities trade, retail trade, and wholesale trade. Together they account for a 0.9 percent gap in annual average productivity growth between the U.S. and Europe, which is 80 percent of the economy-wide differential of 1.1 percent. Retail and wholesale trade alone account for just over 50% of the gap in growth.[6]
Insert Exhibit 1: Trade Sector dominates the U.S.-EU Productivity Growth Gap

[5] For detailed comparisons of economy-wide productivity see Robert H. McGuckin and Bart van Ark, Performance 2004: Productivity, Employment, and Income in the World's Economies, Research Report 1351, The Conference Board, 2004. The original fifteen EU members (EU-15) include those countries that were part of the European Union prior to May 1, 2004.
[6] Bart van Ark, Robert Inklaar, and Robert H. McGuckin (2003).

Trade's importance to the economy-wide productivity gap is directly related to its large size. The trade sector is a titan in both the U.S. and European economies – accounting for roughly 10 percent of GDP and 15 percent of employment. Retail trade is the number one employer in the U.S. and is a close second in Europe.

The significance of trade in the economy has grown enormously over time. In 1950 the U.S. had 2.3 employees working in the production for goods for every 1 in their distribution. Today that number is just under 1, indicating that more workers are involved in distribution services associated with the sale of goods than in manufacturing.

This change is reflective of dramatic improvements in manufacturing productivity – manufacturers can produce more using less labor than they did previously. The trend also reflects greater specialization, as now many more firms focus exclusively on distributing goods to consumers, making products available at a wide variety of times and places. Additionally, there are some indications of manufacturing activities moving into the retail sector. For example, today supermarkets often provide in-house bakeries, butchers, and sandwich shops. These activities are more properly classified as manufacturing, but now take place in the retail sector.

Similar trends have been underway in Europe, but the transformation has been much slower. One way to look at these changes is to examine the ratio of workers involved in producing goods versus those that are producing services. A high ratio indicates a relatively smaller trade sector, while a lower ratio indicates a larger and more developed one. The ratio for Germany is 2.6, still higher than the U.S. ratio in 1950 (2.3). For France it is 1.6, with the U.K. slightly further along with ratios just above unity. The ratios for value-added follow a similar pattern. Another way of examining these numbers is to compare the trade sector's share of employment and GDP across countries. The U.S. share is several percentage-points larger than Europe's using both metrics, lending further support to the argument that the U.S. retail and wholesale sectors are more specialized and developed.[7]

Insert Exhibit 2: Trade is a big industry in the U.S. and Europe…

Insert Exhibit 3: ...but the shares are larger in the U.S.

Box 1: Measuring the output of a distribution firm

Economists identify retail and wholesale trade as one of the "hard to measure" sectors of the economy. Measurement of output is difficult in many service sectors in general, because outputs are not always tangible. This is in sharp contrast to the manufacturing sector, where output can easily be quantified as number of units produced. The output of a retailer is the composite bundle of services surrounding product delivery -

[7] These arguments were originally developed by Walter Oi in a classic paper on the trade sector. See: Oi, Walter, 1993. "Productivity in the Distributive Trades," in Zvi Griliches (ed.) Output Meaurement in the Service Sectors (Chicago: University of Chicago Press).

- things like customer service, location, product assortment, and product information. Unlike tons of steel the number of units of "retail" a given store produced over a period of time is not easily measured.

Three approaches are widely used to measure output in the trade sector:

B1.1 Real Sales

Real sales is the simplest way to measure the output of a distribution firm. This definition has two significant advantages – it is easily measured and its definition is clear. The retailer who sells a higher total value of goods is providing a higher level of services. The implication of using real sales is that both the product mix and the quantity of goods a store sells impact output. The quantity argument is straightforward – the more products sold the more retail services were rendered. On the product mix side, it is usually the case that more expensive items require a higher level of service (meaning the stores that sell higher-end products produce more output). For example, selling a flat-screen television will require hiring more knowledgeable sales-people, more sophisticated merchandise handlers, and better warehousing, than selling a box of pencils.

The measure, however, is not without several important flaws. Most importantly, sales productivity takes no account of differing margins. A retailer purchases products and resells them at a higher price. The gap between the purchase price and the resale price is the gross margin. All of the retailer's services must be paid for by this margin. Therefore, retailers with smaller margins will usually provide fewer services. For example, a discount store will provide fewer associated services on its products than a luxury store, and therefore see a slimmer margin (fewer value-added services) on similarly priced items. Looking at sales alone gives no sense of these differences, and will overstate output for retailers that operate on a thin margin.

Moreover, productivity growth can be dramatically overstated in industries where the prices of goods being sold decline rapidly because of major technological changes of the products themselves, such as electronics and computers.[8] This issue is very important, so it is broken out in a separate section at the end of this box.

B1.2 Gross Margin

The gross margin approach measures distribution output by sales minus cost of goods sold. The idea behind this measure is to focus more closely on the services provided by the store, rather than just the price of the goods passing through. Customers who pay higher gross margins are presumably doing so for a higher level of service from the retailer. Thus, a higher gross margin should generally reflect more value-added services.

Still, the measure is not without problems. There are several major issues with using gross margin as a measure of retail output. First, it implicitly assumes that the cost of goods sold is distinct and separable from other costs faced by a firm. In reality, a firm's gross margin reflects what services are included with the product as purchased

[8] This issue is discussed extensively by Jack Triplett in "Hedonic Price Indexes and Productivity: International Comparability Issues," Statistical Society of Canada, Hamilton, Ontario, May 2002.

form the supplier vs. what services are done in-house by the retailed. A good example of this is a bicycle store that purchases assembled bicycles and then switches to purchasing bicycle parts and having store employees assemble them.[9] The gross margin may increase, but no real gains in efficiency have been made. This may result in substantial mis-measurement if the degree to which firms are outsourcing to the manufacturer changes over time. However, if the retailers choose to "outsource" some of the services to the customer (e.g., the shift to do-it-yourself shops) there can be genuine gains.

Secondly, gross margins are heavily affected by volume discounts, as larger firms are able to negotiate a lower price with the supplier. Firms that have monopolistic pricing power may also artificially inflate their gross margin.[10] This issue may be of particular concern in some European markets where significant regulatory barriers exist.

Most importantly, gross margin is difficult to measure because data on cost of goods cost is not always reported to statistical agencies. For example, in the U.S. the Bureau of Economic Analysis often estimates gross margin as a constant proportion of sales for retailers. Thus, in practice the margin growth rates reported by BEA are identical to those reported by the Bureau of Labor Statistics, which uses real sales. Most European countries face similar issues. Programs are underway in many national statistical systems to better capture gross margin data from retailers and wholesalers, which will allow for substantial improvements in the statistics.

Finally, because of the constant gross-margin assumption, the gross margin measure faces the same issue related to rapidly declining prices as real sales. Industries with rapidly falling prices will see a rise in both real sales and real gross margin when hedonic adjustments are used.

B1.3 Value-Added

The value-added concept in trade takes gross ouput (the gross margin) and differences out all the intermediate inputs, such as electricity, rent, and other operating costs. The remainder is the firm's cost of labor and capital – the value added by the firm to the production process. All the numbers in this report use a value-added measure of productivity unless otherwise specified. [11]

The advantage of using value-added is that it is possible to examine the "top line" (gross margin) and the "bottom line" (intermediate inputs) separately. In other words, a retailer may increase its value-added output either by selling more or by reducing the cost of the intermediate inputs required to provide those sales services. Our calculations show that both of these factors played an equal role in the post-1995 U.S. productivity acceleration. The growth in output accelerated by 2 percent and the growth in intermediate inputs fell by about 2 percent. Consequently, the productivity acceleration measured by value-added is 2 percentage points higher than by gross margin. This is an indication that stores were selling more, but also selling more efficiently.

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[9] For more detail on this example and other issues related to gross margin measurement see: Triplett, Jack E. and Bosworth, Barry P. *Productivity in the Services Sector: New Sources of Economic Growth*, The Brookings Institution: Washington D.C., 2004.

[10] Oi, Walter, "Retailing in a Dynamic Economy," paper presented at the Output and Productivity Measurement in the Service Sector Workshop, The Brookings Institution, Sept. 18, 1998.

[11] Our industry categorization is based the Groningen Growth and Development Centre 60-Industry Database (http://www.ggdc.net), which is based on the ISIC classification scheme.

Of course, since value-added is derived from the gross margin, most of the measurement issues involved in measuring gross margin impact value-added. Hedonic price adjustment, in-house vs. outsourced production, monopoly pricing power, and data availability issues all can distort the measure. In value-added specifically, there is an additional issue related to outsourcing. If a firm outsources any of its non-product related costs (e.g. renting space vs. owning it) these costs will be counted as intermediate inputs and will thus will reduce value-added. However, if the firm internalizes the costs they will not be subtracted as intermediate inputs. This means that if firms are increasingly turning to outsourcing their value-added may be underestimated, but their labor and capital inputs to produce the intermediate inputs will of course decline as well, making the effect on productivity uncertain.

B1.4 The Impact of Rapidly Declining Technology Prices

The impact of rapidly declining technology prices is a major stumbling block to accurate productivity measurement in trade. Computer and IT prices tumbled throughout the 1990s as production methods improved and technology became easier to produce. This meant that vastly superior computers could be found in stores each year, without a corresponding increase in price. When the price of something is falling rapidly, government statistical agencies use hedonic measures to adjust the output for quality. This issue comes up most frequently in regard to computers – a 1996 33Mz computer is not equivalent to a 2004 2.0 GHz computer even if they are both sold at the same price. Hedonic measures will ensure that the 2.0 GHz computer is measured as more output.

In the context of retail, however, this may not be the most desirable result. A retail store selling the enhanced computer 8 years later is not really producing significantly more output. In some sense, the store is in the business of selling boxes, not what is inside them. For example, assume a major computer store sells fifty top-of-the-line computers in 1996 and then in 2004 sells fifty top-of-the-line computers again. The 2004 computers are of significantly higher quality, and government statistical agencies will show their real value to be much higher. Thus productivity will appear to increase vastly (U.S. BLS numbers for electronics and appliance retailers show a 14% annual growth rate between 1987 and 2003). But the computer store essentially moved the same number of boxes, so it is not operating more efficiently in 2004 than in 1996 in any real sense.

However, in the U.S. it appears that this issue does not play a large role in retailing. IT goods are only a small fraction of U.S. retail – just 6.4% percent in 2004. IT prices feel by about 7% annually in the U.S. throughout the 1990s. However, since the share of IT goods in the total retail product mix is so small, the price changes do not have a large impact. In fact, if prices on IT goods are held constant the U.S. acceleration in real-value added post-1995 shrinks just from 6.7 percent to 6.0 percent, a very small change.

In wholesaling the story is substantially different. Since the U.S. is a big exporter of IT goods, IT represents a large share (upwards of 15 percent) of the wholesale product mix. Without the decline in IT prices wholesale productivity growth jumps from 3.9 percent to 4.4 percent, as opposed to 6.6 percent with the declines. This suggests that

much of the U.S. wholesale acceleration may be related to these measurement problems. This area requires careful and more detailed study.[12]

2.1 A Boost in Performance: U.S. Trade Sector Moves Onto High Growth Track

In 1995 the U.S. broke a long term trend of roughly 3% average annual labor productivity growth in trade and accelerated onto a very fast-growth track. In retail trade it moved from 2.5% annual labor productivity growth between 1979-1995 to 7.9% growth between 1995 and 2002.[13] In wholesale it jumped from 2.7% to 7.1% over the same periods. Europe did not see these same accelerations; in fact it saw slowdowns in the second half of the decade. Retail trade fell from 1.7% growth to 1.6% and wholesale from 2.4% to 1.6% after 1995. The acceleration in the U.S. coupled with the slowdown in Europe combine to split the regions by about 6-percentage points annually in terms of trade productivity growth – a tremendous margin. Since the mid 1990s these trends have continued, with rapid productivity growth in the U.S. and more sluggish performance in Europe.

Insert Exhibit 4: Trade sector post-1995: U.S. labor productivity growth accelerates, but Europe stalls

Most western European countries did not see accelerations in wholesale or retail trade productivity growth. Ireland is a notable exception. Consistent with its "Celtic Tiger" macro-performance, Ireland's trade sector saw very strong accelerations in labor productivity (9.7 and 6.0 percentage-points for wholesale and retail respectively) – even greater magnitudes than the U.S. The Netherlands and Finland saw strong accelerations in wholesale, while Norway saw one in retail.

Outside of these few exceptions, however, Europe performance was generally lackluster. Germany, France, Italy, Spain, and Belgium all experienced major *decelerations* in trade productivity growth. German performance took the biggest fall, with slowdowns of over 2 percentage points in both wholesale and retail trade. Most countries saw productivity growth of less than 2 percent (any many close to 1 percent) post-1995. The decelerations were sharper in wholesale trade, but anemic productivity growth plagued both sectors throughout much of Europe.

[12] See Marcel Timmer, Robert Inklaar and Bart van Ark, "Productivity Differentials in U.S. and EU Retailing: Statistical Myth or Reality", Groningen Growth and Development Centre, mimeographed.
[13] These estimates use the latest available data in the Groningen Growth and Development Centre 60 Industry Database. The 2002 data are estimated, but the results are not sensitive to the particular endpoints chosen. The exhibits in this report show our official data through 2001.

Outside of Europe, Australia and Canada both saw large productivity accelerations in the trade sector. In contrast Japan saw very sharp decelerations in wholesale and retail labor productivity (-7.3 and -5.0 percentage points respectively).

Insert Exhibit 5: Labor productivity growth by country

2.2 Total Factor Productivity -- Efficiency Drives the Difference

The empirical evidence strongly suggests that these differences in labor productivity growth performance have less to do with capital and more to do with greater overall U.S. efficiency. Labor productivity growth can be expressed as the sum of two components: the change in the capital to labor ratio and the change in the overall level of economic efficiency. The managerial implication is simple – for a business to employ its workers more productively it must either put more capital behind them or reorganize the business to use all resources more efficiently. The first strategy is straightforward – by giving workers better tools a business increases the potential output of its worker. It is the second method, however, that is of central importance to long-term economic growth. Deploying resources more efficiently enables a business to get more output without increasing inputs . Economists refer to this concept as *total factor productivity* (TFP), the measure of how efficiently all factors of production are deployed.[14]

Box 2 on TFP

Total Factor Productivity (TFP) is used by economists to understand how efficiently businesses are using their factors of production (labor and capital). TFP is measured as a residual – the difference between the growth in output and the growth in measured inputs. In some sense, a boost in TFP is an "unexplained" growth residual that cannot be accounted for by anything physically changed at a particular firm. Consequently, TFP is associated with broad-based technical change and business process reorganization. These types of changes can increase output without requiring more capital or labor.

Gains in TFP are not the result of any physical investment – but instead are derived from technology and human knowledge. TFP gains are critical to long-term business performance, because capital is subject to the law of diminishing returns – as a business adds more capital it eventually has sufficient capital for each worker and sees lower returns on each additional amount of investment. For example, an office can install one copy machine on each floor. Tremendous efficiency gains may be achieved, but adding additional machines beyond that is unlikely to further boost productivity. On the other hand, a new system to better schedule use of the machines might further boost productivity. This would be a TFP improvement.

[14] In practice Total Factor Productivity is measured as a residual – the increase in output after all inputs have been accounted. See "Box on TFP" for a description of how TFP is calculated.

END BOX

The economic evidence suggests that the labor productivity growth differences between the U.S. and EU are not primarily the result of varying patterns of capital spending, but are instead largely attributable to TFP growth. The U.S. saw strong TFP accelerations post-1995 in both wholesale and retail (3.0 and 4.4 percentage-points respectively), while Europe experienced zero acceleration in retail and a 0.9 percentage-point decline in wholesale.[15] There are some exceptions to this general trend -- wholesale in the Netherlands and retail in the U.K. both showed reasonably strong accelerations post-1995. Germany stands out as the worst performer with productivity growth rates in both wholesale and retail slipping by about 2 percentage points to below 1-percent growth. France's experience was also lacklustre -- it actually showed negative growth in wholesale productivity post-1995.

In all of these countries the TFP differences explain a large portion of the labor productivity differences. This reinforces the idea that capital investment is not the driving force here – the story is one of intangibles: knowledge, business organization, and technological change and scale.

Insert Exhibit 6: Total Factor Productivity Growth Drives the Gap

2.3 Organizational capital: The hidden complementary investment to technology

Managers have long been aware that technology alone does not necessarily increase productivity or efficiency. Using information and communications technology (ICT) to make a business run better is not just about installing more servers or networking cables. Instead, new technology almost always requires complementary investment in organizational structure, training and expertise.[16] For example, if a company shifts from flying its executives around the world to using video conferencing, in the long run there will be a productivity increase. However, in the short-run productivity might go *down*, as the company adjusts to the change. Staff will have to be retrained, new technology purchased, new personnel hired, and policies and procedures changed.

At the economy-wide level, many economists have suggested that the explosion in U.S. total factor productivity growth is the result of the delayed impact of organizational changes that accompany ICT spending. Companies made substantial adjustments to new technology in the early 1990s, when U.S. productivity growth was

[15] TFP is more difficult to measure, and thus we only have aggregate results at the country level for four European countries (Germany, France, U.K. and the Netherlands). Our "Europe" number is a weighted average of these four.

[16] Technology usage is associated with higher productivity, but increases in technology investment do not account for productivity gains. See: McGuckin, Robert H., Streitweiser, Mary L. and Mark Doms, "The Effect of Technology Use on Productivity Growth," *Economics of Innovation and New Technology*, 1998, Vol. 7, pp. 1-26.

slow. Productivity growth then exploded once the adjustments had been made and the changes were in place.

In the context of retail these changes include shifting older, smaller stores to new ones, changing delivery and sales procedures, and adjusting distribution networks, among thousands of other adjustments that have to be made to fully utilize the new technology. The changes can take place within an existing firm, but more often occur when a new firm displaces an older one. Numerous studies in the U.S. have shown that new technology and business practices tend to be embodied in new capital. This seems to be particularly true in the retail sector. A recent study found that virtually 100% of U.S. retail labor productivity growth can be attributed to new stores displacing old ones.[17] This suggests that new stores operate much more efficiently than the older stores they replace. Moreover, the majority of these gains were from new stores of existing firms displacing older stores. In the U.S., these were largely – but as argued in more detail in Section 6 – new "big box" stores that took full advantage of ICT and the benefits that it brought. This suggests that firms operating networks of stores (chains) are more productive than individual stores. ICT is what enables headquarters to effectively manage large chains of stores.

In Europe TFP growth stalled at precisely the same time it accelerated in the United States. This may be suggestive of a restructuring in Europe's retail sector during the late 1990s. TFP growth dropped dramatically in European retailing. We also know that cross-border merger activity accelerated dramatically during this time. It is quite possible that Europe's restructuring occurred later than that of the United States, and that the depressed TFP rates are reflective of this. This theory would suggest that Europe is poised for rapid TFP growth, but that it will depend on how rapidly European retailers proceed with restructuring, reorganization, and investment.

3. *Information is the key ingredient to distribution services*

Trade is about much more than simply buying and reselling goods. It involves a whole range of services. In a classic paper on the trade sector, Walter Oi argued that the output of a retail firm is essentially the bundle of services that accompany the product when sold. The service provided to customers, merchandise assortment, location, opening hours, ambiance, and other services are all part of the value-added to the customer's experience.[18] Roger Betancourt and David Gautschi classified these services into five broad categories: location convenience, product assortment, assurance of delivery at a specified time and place, supplemental information, and shopping ambiance.[19] Stores that provide more of these services or provide them at a higher quality are producing greater output. This is a very convincing conceptual approach to

[17] Lucia Foster, John Haltiwanger, C.J. Krizan, 1998. "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," NBER Working Papers 6803, National Bureau of Economic Research.
[18] Oi, Walter. 1992. "Productivity in the Distributive Trades," in Zvi Griliches (ed) Output Meaurement in the Service Sectors (Chicago: University of Chicago Press)
[19] See: Betancourt, Roger R & Gautschi, David A, 1993. "The Outputs of Retail Activities: Concepts, Measurement and Evidence from U.S. Census Data," The Review of Economics and Statistics, MIT Press, vol. 75(2), pages 294-301, May.

what a trade firm offers its customers – and indeed is reflective of the strategic initiatives used by retailers to boost business.

Fundamentally, trade is a business of information. Trade involves the matching goods and services to customer demand. This matching process is highly information-intensive. At all stages of the value chain storing, processing and enhancing information are key aspects of the activities of the firm.

All of the retail services identified by Betancourt and Gautschi completely revolve around the management and transmission of information:

Product Assortment: The distributor needs to maintain a product assortment that matches customer demand. Consumer buying patterns change dramatically and the retailer strives to carry merchandise that the consumer wants for each sales day. Successful retailers are able to share real-time information about what the consumer is buying with their suppliers, so that inventory closely matches customer demand.

Product Delivery: Product delivery is the service of providing merchandise for consumer purchase at a consistent location and at a consistent time (during the store's operating hours). The consumer expects products to be available for purchase, and may stop shopping at the store if items are out-of-stock. Like product assortment, preventing out-of-stock situations also requires information coordination with suppliers. Shipping from various suppliers must be coordinated to maximize efficiency of trucking fleets.

Product Information: Retail stores provide information to consumers about the products they sell. Stores need a framework for organizing product information updates and making them available to consumers. Retailers that do this effectively provided a higher level of service to the consumer.

Accessible Location: Providing goods at an accessible location is one of the most important services of a retailer. ICT in trucking and logistics enables large stores to assemble a wide variety of goods at a convenient location, reducing the amount of time the consumer spends shopping. Another ICT application to accessibility is electronic commerce. The Internet enables purchasers to access the store's merchandise from virtually any location, with close to zero transportation cost. The purchase point becomes determined by the user, rather than the operators of the store.

Ambiance: Ambiance is closely related to the issue of taste and culture. Stores in Germany look and operate very differently from stores in Japan, based on the taste and culture of local consumers. ICT can help manage these differences by facilitating better merchandise selection, and standardizing back-end operations even when store layouts and appearances may differ. In the e-commerce context, ICT can also enable customers to set their own ambiance, by choosing the location from which they will shop.

Box 3: Distinction Between Retail and Wholesale Trade

An important distinction within distribution is between retail and wholesale trade. Wholesale firm sell goods that they do not manufacture themselves to retailers and other large-scale buyers. Traditionally, the core business of wholesalers involves the storage and distribution of goods to other firms that deal directly with the consumer. Recently there are indications of structural change in the industry with some firms specializing in physical storage and distribution (in close connection with transportation and logistics), while others focus on the brokerage aspects of the business. In this latter role, wholesalers add value by connecting buyers for retail stores with producers and providing market information to both groups. There has also been substantial vertical integration of the wholesale function by retailers, who now often deal directly with their manufacturers.

Retail firms sell goods manufactured elsewhere (historically purchased through wholesalers) to businesses and consumers, adding a markup to cover the services they provide plus profit. Retail encompasses a wide variety of businesses, ranging from small specialized bakery shops and 7-Elevens to large grocery chains like Ahold and general merchandisers like Wal-Mart. Aside from brick-and-mortar operations, distribution includes catalog operations like Land's End, as well as Internet stores such as Amazon. Food retail is generally the largest sub-sector of distribution in developed countries, but specialty apparel, furniture and appliances, and general merchandise are also important components. E-commerce is a rapidly growing area, but still accounts for a small share of total sales (just under 2 percent in the United States).

END OF BOX

4. Information Technology Innovation in U.S. Trade Sector

4.1 Distribution historically a low-technology business

The U.S. distribution sector has undergone substantial transformation over the past 25 years.[20] Traditionally, retail was a very low-technology business. Firms primarily relied on employee-purchasers, who negotiated for and procured products from manufacturers and wholesalers well in advance of the selling season. The buyers used qualitative information and intuition to predict customer demand in the stores. Orders were both large and infrequent, and retail inventory was maintained at an offsite warehouse or in the store itself. Measuring inventory was a time-consuming, labor-intensive process that required the hand counting of each item in the store. These counts were then manually cross-referenced with sales receipts to reveal which products actual sold. This procedure was so involved that stores could usually only take the measurement once or twice a year. Since the store could not adjust orders based on what

[20] For an excellent review of technological change in the trade sector see Brown, Stephen A. *Revolution at the Checkout Counter: The Explosion of the Bar Code*. Cambridge, Massachusetts: Harvard University Press, 1997. and Haberman, Alan L. (ed.) *Twenty-Five Years Behind Bars.* Cambridge, Massachusetts: Harvard University Press, 2001. The historical information and statistics presented in this section are from these two sources.

was selling, the chief concern of the retailer was the considerable demand risk it faced if the buyer's forecasts did not match actual consumer buying patterns. If too much of a product was ordered it faced excess inventory, while the opposite situation caused an "out-of-stock" situation. Both outcomes significantly eroded the productivity and profitability of stores and neither could be corrected very quickly.

4.2 In 1949 the barcode is born…

In 1949 Bernard Silver, a graduate student at Drexel University, overheard a food industry executive asking a dean to research ways to automatically capture product information at checkout. Shortly thereafter, Silver and his partner Normand Woodland patented a device to "provide automatic apparatus for classifying things according to photo-response lines and/or colors." [21] This was the first time anyone had formally proposed a symbolic way of identifying products that could be read by machine – the concept behind the modern barcode.

4.3 …But it is not until the early 1970s that the U.S. grocery industry begins drive to automate

It was not until the early 1970s that industry began to look at this idea as an actionable business initiative. At this time the U.S. grocery industry was facing very rapid inflation, thinning margins, and declining profits. Industry executives became aware that profitability and efficiency could be improved by the automation of food retailing functions (most importantly price labeling and customer checkout).

In response to these concerns, an inter-industry committee of CEOs from grocery and food manufacturing companies was formed in 1970 to explore the use of product code technology to cut costs and enhance efficiency. Heinz, General Mills, and Kroger were some of the larger companies represented, but smaller players were also involved. The business case for investing in this cost-reducing technology was divided into two parts -- "hard" and "soft" savings. Hard savings were the benefits that could be realized immediately and without question. They focused on two key labor-saving areas:

- Reducing checkout time, and therefore labor costs at the cashier stand
- Eliminating the need to manually price tag items

Soft savings, on the other hand were likely to improve productivity, but could not be immediately realized and were more difficult to quantify. These benefits included:

- Better matching of inventory to customer demand
- More responsive pricing changes
- More efficient use of shelf space
- Reduced inventory and fewer out-of-stock situations
- The potential to evaluate and optimize advertising campaigns
- More efficient use of trucking and shipping

[21] See United States Patent and Trademark Office, Patent Number 02612994 for the original description of the coding system.

4.4 Hard savings drove adoption

Business was initially swayed chiefly by the hard, quantifiable savings. Reduced labor costs in price-tagging and checkout were easy to understand and offered a clear impact to the bottom line. While the savings were not tremendously large -- the initial business case estimated hard savings in the U.S., net of implementation costs, to be 120 million dollars industry-wide – there was a high probability of realization. The principal risk was that benefits hinged on manufacturers and distributors using the same set of codes and technologies. If a large portion of the industry could not be convinced, there would be minimal labor-savings. Initial estimates suggested that stores could only justify investment in scanners if 75 percent of their products were coded. Additionally, a substantial number of stores had to adopt the technology for the industry as a whole to breakeven from a hard-savings perspective.

4.5 The realization of soft-savings took significantly more time

Hard labor savings were only one part of the story. The soft-savings related to better management of inventory were recognized from the start, but were generally underestimated because they were hard to quantify. The original business plan estimated their value to be just 0.15% of sales. Progress was very slow and between 1974 and 1980 even this level of savings was generally not achieved. The first retail product to be scanned with a barcode was a ten-pack package of Wrigley's gum in an Ohio store in 1974.[22] By mid-1976, 75 percent of the items in the average supermarket in the U.S. had U.P.C. markings, but few stores were actually scanning and none were using the sales information.[23] By 1980 the scanner had become both small enough and cheap enough to be picked up by a large number of stores. Still, at this point no one was using it for anything but speeding up price-tagging and checkout.

The critical step for realizing the soft-savings was linking barcodes to information and communications technology (ICT). In 1982, following a study by the consulting firm Arthur D. Little, the Uniform Communications Standard (UCS) became a published standard. Shortly thereafter Electronic Data-Interchange (EDI), a software system that implemented UCS was created. EDI made it possible to transmit all product ordering and billing information electronically.

Despite its potential benefits, the adoption rate of EDI was extremely slow. Implementation costs were high and the changes required were substantial. Large general merchandisers like Wal-Mart and Kmart were the first to adopt this technology, despite the early lead of the grocery industry in barcodes and scanners. Other areas of retail were much later to the game. As late as 1988 only 24 percent of U.S. apparel retail firms were using EDI, but this number jumped to 64 percent by 1992 and nearly all became heavy users by around 1994.[24]

Even by 1992, few firms outside of the large general merchandisers were using EDI to more efficiently replenish inventory, measure promotions, or achieve any other of the soft-savings benefits. Instead they used it as a means of transmitting invoices and

[22] Uniform Code Council (http://www.uc-council.org/upc_background.html).
[23] Brown, Stephen A. *Revolution at the Checkout Counter: The Explosion of the Bar Code*. Cambridge, Massachusetts: Harvard University Press, 1997.
[24] Abernathy et al., 1999.

payments electronically. The Efficient Consumer Response (ECR) initiative was launched by an industry consortium in 1992 to enable retailers to realize these soft-savings (and compete better with the general merchandisers). Nonetheless, a benchmarking study in 1997 found that just one-third of ECR practices were being utilized by the average retailer. It is only in the last few years that significant numbers of stores outside of general merchandise have began to realize the ICT-enabled gains from better managing their supply chains. Recent estimates suggest that as much as $15 billion in net savings . Many of these implementations are still in progress today.

4.6 Lean Retailing – A Transformed Sector

The result of the technological transformation in distribution is commonly referred to as "lean retailing." Frederick Abernathy, John Dunlop, Janice Hammond, and David Weil of the Harvard Center for Textile and Apparel Research popularized this term as it applied to garment manufacturing.[25] The core argument of the researchers was that process changes in distribution networks were central to the transformation of the retail sector. Companies moved from a warehouse model, where goods sat statically waiting for orders, to a distribution center model, where goods moved swiftly from in-bound to out-bound trucks. None of these changes were possible until barcodes, scanners, lasers, and computers permitted processes to be systematized and automated. This process is not instantaneous, and although much of the U.S. retail sector is still not operating in a "lean" way; vast efficiency improvements in the way goods are handled have been achieved. This transformation has changed the way business operates and fundamentally reorganized the trade sector.

Insert Exhibit 7X – How Lean Retailing Works

4.7 Retailers are Vertically Integrating the Wholesale Function

A result of these changes has been an acceleration of the trend toward vertical integration of function in distribution. Even before ICT, many large retailers bypassed the wholesaler function and ordered directly from manufacturers. The advent of product data at the point of scanner has greatly accelerated this trend. The retailer is now in control of the most timely and accurate information about consumer demand. Large centralized operations are able to aggregate the sales information from many stores and act as their own wholesalers, purchasing large orders directly from the manufacturer.

The retailers are able to use barcode/scanner data to build large orders for exactly what their customers demand, thus bypassing the need for the wholesaler function. For example, Wal-Mart gathers sales data on Proctor and Gamble products directly from its stores and transmits this information to P&G once a day. Proctor and Gamble feeds this information directly into both its manufacturing and order replenishment process. The result is tri-part: 1) the retailer usurps the role of the wholesaler, 2) manufacturing and shipment schedules can incorporate real-time information about consumer demand, and 3) both the retailer and manufacturer increase productivity and pass price declines on to the consumer.

[25] See the organization's website at (http://www.hctar.org) for more information on the Harvard Center for Textile and Apparel Research.

4.8 Reducing demand risk is a key gain

The critical feature of ICT in trade is that is has enabled retailers to significantly reduce demand risk and rationalize the use of resources. This is the core benefit of EDI and its related technologies. Lean retailing is about the ability to rapidly gather sales information at the point of sale and use this to make real-time forecasts about future demand. The practice enables firms to instantly transmit sales information to suppliers and request rapid replenishment of inventory. The firm aggregates scanner information from stores all over the world and uses it to assemble large, precisely targeted orders from suppliers. The order is based on the most accurate and timely measurement of consumer preferences – and current store sales information. The net result is that stores dramatically reduce their risk of over- or under-stocking certain goods, thus making better use of their labor (sales representatives) and capital (floor space, merchandise) resources. "Slack" in the production of retail services is vastly reduced, leading to higher productivity. These gains can clearly be seen in inventory to sales ratios, which have dropped dramatically in the U.S, and in the strong cuts in the use of intermediate input costs. This indicates that manufacturers, wholesalers, and retailers can carry less inventory, since they have only what the consumer wants and can rapidly replenish things that are out-of-stock. Consumers reap substantial gains, as stores carry the products they want and are able to offer lower prices.

Insert Exhibit 8: U.S. inventory to sales ratios have declined dramatically

5. The innovation process has been much slower in Europe

The U.S. barcode/scanner adoption process was led by the grocery stores, and then accelerated by large general merchandisers like Wal-Mart. Indications are that the diffusion process was much slower in Europe, particularly in the early years (prior to 1985). The European barcode adoption process was spearheaded by Albert Heijn of Royal Ahold, who wanted to apply what happened in the U.S. to Europe. In 1976, the European Article Numbering (EAN) association was formed with its own symbolic code system. The time lag was substantial – the original U.S. grocery code had been created 6 years earlier and the first product had already been scanned in the U.S. two years prior to the creation of EAN. This initial delay proved to be persistent – Europe was much slower to invest in the new technology during the early years.

An illustrative comparison can be made between the U.S. and the U.K.[26] U.K. retailers have been the leaders in adopting this technology in Europe (U.K. distribution networks are among Europe's most centralized), but still lag measurably behind the U.S.. The first U.S. product to be scanned – a package of Wrigley's gum – was scanned in an Ohio supermarket in 1974. In the U.K. it was not until 1978 that Melrose tea bags became the first product to receive barcodes. From the first bar-coded product it took the U.S. 2 years to reach the milestone of having 75% of its supermarket goods bearing

[26] The historical information on the U.K. in the following section is from e.centre, a business association that promotes EAN.UCC usage in the United Kingdom (See: http://www.e-centre.org.uk/txt_temp.asp?fid=184 for more detail.)

codes. In comparison, it took the U.K. four years (until 1982). By 1981 10 percent of the approximately 2 million retail stores in the U.S. were scanning products – a total of 200,000 stores. In contrast, the U.K. had just 10 individual scanning stores in 1981.

The head-start for the U.S. was magnified as stores began to link barcodes to their inventory systems via EDI. The U.K fell further behind as stores like Wal-Mart made heavy investments in information and communications technology. In 1982 the U.S. EDI standard was created, but an EDI association was not launched in the U.K. until 1987. While the U.K. has made substantial progress, the head-start still gives U.S. firms an edge, as is evidenced by their early lead in wireless RFID standards (See Box New Developments: The Move to RFID).

Exhibit 9: Barcode timeline U.S. vs. U.K.

Exhibit 10: U.S. takes early lead in ICT investment

Data on ICT investment suggest that these differences are not just limited to the U.K.; they reveal strong U.S. investment leads over Europe in the early 1980s for both wholesale and retail trade, with an incomplete European catch-up in the late 1980s.[27] U.S. ICT capital service flows in retail trade grew by an incredible 46% annual average between 1980 and 1985. The growth rate in Europe was comparatively much slower, just 19% annually.[28] This was the period when the U.S. began to build out its barcode infrastructure, while Europe was still coming to grips with the technology.

While there was some variation within European countries (the Netherlands and the U.K. generally invested more heavily than Germany and France), none of them surpassed the U.S. rate of investment. This suggests that the lag times were probably even longer in these countries than in the U.K.[29]

The pattern was similar, though slightly less pronounced in wholesale. In the late 1980s Europe experienced a slight catch-up period, exceeding U.S. investment growth rates by several percentage points. This trend was more noticeable in wholesale than in retail.

Throughout the 1990s growth rates of ICT investment were relatively similar for the U.S. and Europe. The U.K. and the Netherlands continued to outperform Germany and France, but the average rate of growth was quite comparable to the U.S. Europe was not catching up, but it was also not falling further behind. Thus the U.S. head-start remained relatively constant – in the neighborhood of 5 years throughout the 1990s.

Box 4: ICT in the Trucking Industry Leads to "Big Box" Stores

One part of the retail supply chain that has been particularly impacted by ICT has been the trucking industry. As emphasized in this report, barcodes and scanners have

[27] These data are for capital services growth. Capital services represent the capital "input" to production, i.e. the amount of capital used by the production process in a given time period. A rise in capital services growth reflects increased investment.

[28] The European number is a composite of Germany, France, the Netherlands, and the U.K. Data on other countries are not available.

[29] See for an example of ICT investment in retail and wholesale trade in the Netherlands between 1988 and 1994, L. Broersma, R.H. McGuckin and M.P. Timmer, "The Impact of Computers on Productivity in the Trade Sector: Explorations with Dutch Microdata", *De Economist*, vol. 151, no. 1., 2003

enabled stores to take more frequent and more accurate inventory. This means that when retailers place orders they can rely on substantially more current information about demand than in the past. In a recent paper, Thomas Holmes argues that these changes have led to relative cost advantages for larger stores – i.e. the trend toward "big box" retailing.[30] The reason for this is twofold – better information about inventory leads to more frequent delivery, which in turn creates incentives for larger stores.

In traditional retailing inventories were taken very infrequently, sometimes at semi-annual or even annual frequencies. Consequently, delivery frequency was not very relevant to performance because stores could not feed more accurate information about demand into their orders. As scanners and barcodes enabled more frequent inventory measurement, stores could use this information to rapidly construct orders that matched what was being sold. As a result, stores with more frequent deliveries had merchandise that more closely matched customer demand.

As delivery frequency increased (to the daily model used in many retailers today), the incentive for larger stores closely followed. Given a fixed-size truck, increasing the rate of deliveries will rapidly lead to inefficiencies in merchandise hauling. This is because a small store does not have sufficient sales to fill up a large truck's inventory each day. A large store can more effectively utilize the truck's space, thus substantially reducing delivery costs. This fact provides a strong cost advantages for bigger stores such as Wal-Mart, Home Depot, and Best Buy, allowing them to delivery goods to consumers at lower prices.

Holmes, however, makes the point that going forward groups of smaller stores may be able to capture the same efficiencies that the larger stores have by forming partnerships. The idea is that a collection of small stores could effectively use the space on a truck just as well as one "big box" store. This may be an important development going forward since in many cases consumers may prefer the environment of the smaller store (but with the efficiency of the larger ones).

The trucking industry itself has also been substantially impacted by ICT. The use of on-board computers (OBCs) and electronic location tracking has resulted in tremendous capacity utilization improvements. Thomas Hubbard finds a 13% increase in capacity utilization among trucks using OBCs between 1992 and 1997 in the United States.[31] Recent work suggests that the U.S. leads some European countries in OBC adoption, but that European adoption is increasing. Trucking in Europe was not deregulated until 1997, and this may account for some of the lag.

6. What was the source of the U.S. advantage?

6.1 Wal-Mart changes the competitive landscape

Investment in new technology is driven by incentives – in theory a project will only be undertaken by a firm if the net present value of the endeavor is positive. In practice, it is difficult to estimate potential returns from new technologies and business

[30] Holmes, Thomas. "Bar Codes Lead to Frequent Deliveries and Superstores," *Rand Journal of Economics* Vol. 32, No. 4, Winter 2001, pp 708-725.

[31] Hubbard, Thomas N. "Information, Decisions, and Productivity: On-Board Computers and Capacity Utilization in Trucking." *American Economic Review*, 2003, *93*(4), pp. 1328-53.

models. Being first to invest requires great vision and leadership. One firm -- Wal-Mart -- has been the clear leader in the United States, always substantially ahead of its competitors in effectively using IT.

Wal-Mart has relentlessly focused on using technology to optimize supply chain efficiency, which has frequently allowed it to offer lower prices than other retailers. The driving force is efficiently linking the front end merchandizing and marketing with the back end distribution and purchasing. The company invests billions annually in its IT systems, which suppliers use to automatically track sales of their goods in Wal-Mart stores and coordinate replenishment. In turn, all stores are connected electronically to headquarters in Bentonville, Arkansas, where sales performance is centrally monitored. This allows for an extraordinary detailed level of control over merchandise. For example, Linda Dillman, the CIO, recently introduced the FISH (First In Still Here) report which identifies merchandise that has not been selling.[32] Once these items are identified Wal-Mart can cut their prices to regain the shelf space, but more importantly it can immediate reduce orders for replenishment of these products. The goal is to use every available piece of information to optimize what the store carries.

While Wal-Mart accounts for about 9 percent of total U.S. retail sales, its impact on the economy goes far beyond its own share. Its operations created competitive pressure through two channels to increase efficiency sector-wide:

- Within food and general merchandise sector competing stores quickly had to adopt Wal-Mart's practices to remain competitive.
- Outside of food and general merchandise, as firms rapidly implemented Wal-Mart's innovations in their lines of business.

The process began in the early 1980s, when Wal-Mart led the drive to get products outside the grocery segment bar-coded. It was a key leader in the push for EDI and other electronic standards. Retailers were quickly forced to adopt similar improvements. While it is true that Wal-Mart has usually remained step ahead of its competitors productivity-wise, these same competitors boosted their efficiencies tremendous just by trying to keep pace with Wal-Mart.

This is the heart of the competitive process – one leader can drive the efficiencies of a whole segment forward. Outside general merchandise, Wal-Mart's competitive pressure sparked initiatives like the Efficient Consumer Response (ECR) in 1992 (see previous discussion). ECR sought replicate Wal-Mart's system for other retail segments, and has been very successful at boosting efficiency and productivity in the broader sector. In this way Wal-Mart's competitive pushes boosted the competitiveness of the retail sector, and the whole U.S. economy as a whole.

Insert Exhibit 11: Wal-Mart Maintains Productivity Edge, But Competitors Also Advance

Wal-Mart has been fantastically rewarded for its leadership in innovation and efficiency. It is the largest retailer in the world terms of sales, far outpacing its nearest competitor with nearly 250 billion dollars in receipts annually. Wal-Mart's growth has

[32] See "The IT Marksman at Wal-Mart" in the May 14, 2003 edition of *Business Week* for a description of Fishman's initiatives.

been so fast that it is now the biggest employer in both the U.S. and Mexico. Earnings in 2003 were about 9 billion dollars.[33] This enormous growth has provided very real incentives to its employees and investors to continue doing what they are doing. The company remains on the cutting edge and is now the first to require its suppliers to adopt radio frequency identification (RFID) standards, a technology that will further boost efficiency.

The Wal-Mart experience is reflective of the overall competitive intensity of the U.S. economy and the opportunities for large rewards to innovation. While Wal-Mart was the innovator, the more important story is that the competitive pressure pulled the rest of the sector along. Other retailers had to adopt the same innovations to compete, and this is what pushed aggregate productivity forward.

6.2 The Rest of the Industry Follows: Drugstores as an Example

While the dramatic changes in the retail industry are evident to most consumers in the U.S., they are difficult to measure precisely over time because of changing statistical standards. The U.S. has conducted major overhauls of its statistical system 3 times since the early 1980s, and each time the trade sector has been substantially redefined. However, in some sectors the definitional changes are not very significant. Drug and pharmaceutical stores stand out as having relatively static classifications over time, which makes for a straightforward analysis.

Data from the Census of Retail Trade show that dramatic changes were afoot in the industry between 1982 and 1997.[34] In 1977 there were 34,436 pharmacy and drugstore firms in the United States and just 32 of these had more than 50 establishments. Those 32 firms accounted for 42 percent of all sales. By 1997 the total number of establishments had dropped by one-third and firms with over 50 establishments had expanded their sales share to over 60 percent. Massive consolidation occurred over the period, even among the large firms, whose number shrank from 32 to 23. These results are not sensitive to the way size is measured – similar results are achieved if we use sales or number of employees.

The changes are indicative of large chain stores like Rite Aid and CVS replacing local mom and pop drug stores. The disappearance of one-third of all firms in any industry is very significant, and is indicative of major structural shifts.

Insert Exhibit 12: Massive consolidation reduces the number of small firms dramatically

Insert Exhibit 12a: Large firms rapidly grow their share of sales

7. Why the Slower Transformation in Europe?

Much commentary has focused on regulatory differences as an explanation for the slower transformation and poor European productivity growth performance. The basic

[33] See "Top 100 Retailers" at *Stores Magainze* (www.stores.org).

[34] The latest U.S. Economic Census available at the time of publication is for 1997. Data for the 2002 Economic Census will be made available in 2005.

argument is that regulation restricts competition to a much higher degree in Europe than in the United States. [35] Quantifying these differences is difficult, but a wide variety evidence suggests that regulation does indeed matter.

One simple assessment of competition is to examine the margins retailers are able to make on sales. High margins are suggestive of a less competitive environment, because retailers are able to extract monopolistic rents. As competition increases retailers will no longer be able to maintain very high margins – competitors will forcefully drive them down. Gross margins are generally lower in the United States than in any European country, with only Germany approaching U.S. levels. Greece has gross margins that are 5 times U.S. levels, a strong indication that its retail sector is not under substantial competitive pressure.[36] Nonetheless, margins are far from a perfect measure of competition and may indicate differences in capital costs, labor costs, as well as other factors.

Insert Exhibit 12X: Lower U.S. gross margins indicate greater competitiveness

However, explaining sluggish productivity growth in Europe by broadly casting it as overregulated and uncompetitive is not very useful analytically. It is essential to understand if and how regulation constrains productivity. In fact, there are some situations where regulation can increase productivity in retailing at least in terms of measured levels. Our strategy is to identify the causes of lowered productivity as they relate to each specific regulation. This approach allows us to determine whether and how Europe can improve productivity by changing its regulatory structure.

A second critical point is that we want to avoid treating "Europe" as one harmonized regulatory environment. Different European countries have very different regulatory policies, and these must all be considered individually. In fact, lack of a harmonized regulation system in itself is often cited as a major difficulty in building cross-border operations within Europe. We focus on three major categories of regulation that can be logically associated with stunted productivity growth in Europe – store opening hours, land usage restrictions (especially on large stores), and labor laws. Other regulations such as price controls and restrictions on promotional activities play some role, but they are not likely to be as significant.

7.1 Opening Hours for Large Stores

Store opening hour regulation has become more critically important as lifestyles and working patterns have changed over the past 25 years. Throughout much of Europe and most of the United States the two-earner family is now the norm. With both parents at work during the daylight hours, available shopping time is often restricted to the evenings and weekends. Traditionally, regulations on store opening hours prohibited operations during these times largely to protect the employees from having to work long or "anti-social" hours.

[35] For an excellent overview of trends in European retail regulation see Olivier Boylaud, 2000. "Regulatory reform in road freight and retail distribution," OECD Economics Department Working Papers 255, OECD Economics Department.

[36] Gross margin data are taken from Boylaud, 2000.

The U.S. has few limits on store opening hours at the national level (although local communities may and do pass regulations). Europe, on the other hand, still has heavy national regulation at this level for large stores. Most European countries have some type of regulation on large stores operating on Sundays (the United Kingdom being a major exception.) Germany has some of the tightest regulations in all of Europe, defined by the Ladenschlussgesetz (Shop Closing Hours Act), which currently only allow stores to open 6AM to 8PM Monday to Saturday. Before a liberalization in 1996 the permitted hours of operation were even fewer – 7AM to 6PM (with operation until 8PM allowed only on Thursdays). The U.K. and France, on the other hand, generally have no limits on opening hours during the week. The Netherlands has some restrictions on opening hours, although they are not nearly as restrictive as in Germany. The trend has definitely been towards liberalization, and both local and national regulations are moving in the direction of greater flexibility for opening hours.

Insert Exhibit 13: Large Store Opening Hours More Restricted in Europe

For the time being, however, the restricted opening hours are a big factor in operational performance. The major question is exactly how restrictions on opening hours can reduce retail productivity. We identify three channels through which store hour restrictions can reduce the incentive to introduce new innovative retail formats, and thus reduce value-added, as well as productivity:

- **Decreased shopping time** – Without long opening hours some items are simply not purchased by consumers because they do not have the time to buy them. Modern large formats provide a vastly increased assortment of products, but consumers simply may not have the time to sift through all these choices if hours are constrained. These products might otherwise be bought in an unrestricted marketplace, and thus value-added is lost. German consumer groups have raised this issue in their effort to relax opening hours regulation.
- **Reduced convenience –** When opening hours are reduced many of the benefits of large stores vanish. Consumers value the time savings of doing all their shopping in the same place, and are willing to tradeoff longer travel times for the convenience of one-stop shopping. However, these extended shopping trips require a greater amount of time and thus can usually only be done on the evening or weekend. If the consumer must "squeeze" shopping time in before and after work they are more likely to patronize local stores to pick up just a few items each day. The aggregate shopping and travel time here may be greater than one trip to the big box, but that trip is not possible if the store is not open when the consumer can go.
- **Less scheduling flexibility –** Customers must make a substantial commitment to travel to a more distant, large store. The shopper does not have perfect control over his schedule and may be influenced by unpredictable delays (e.g. traffic). Knowing that the large format store is open for many hours (or even 24 hours) allows him or her to more flexibly plan time usage. If closing hours are early the consumer will not see it as possible to reap the advantages of the large format store, as the risk of "arriving late" is too high to justify the extra trip.

It is important to note that in some cases decreased opening hours may actually increase measured productivity levels in some cases. Retail throughput is forced into a shorter time period and productivity can be elevated. Some countries with very restricted opening hours show high productivity levels. [37] However, productivity growth should not ordinarily be accelerated by short opening hours.

Germany Impacted Most

All of these factors make it less attractive for consumers to use new modern retail formats, and therefore cut the incentive to build them. The trend is most evident in Germany where the response to restricted hours has been the proliferation of small discounters like Aldi and Lidl. The prices in these stores are highly competitive, and the margins low, but the stores are very small and more local. The selection of merchandise is vastly smaller than a U.S. hypermarket like Wal-Mart. This is not to say that German retailing is not competitive, as it is well-known that margins are razor thin. However, consumers would stand to gain from access to large-format stores which are not feasible due to constraints on operating hours.

7.2 Land Use Policies and Store Sizes

The adage "location, location, location" highlights the importance of geography to retailers. A retailer's survival is dependent on getting a convenient visible location. Consequently, land use policy is central to the performance of the retail sector. The policies of European countries differ dramatically with those in the United States. In Europe, land use regulations have been most frequently implicated as an impediment to new and modern retail formats. The U.S. has taken a largely decentralized, disorganized, market-driven approach to retail development. New stores and shopping centers frequently open and old ones go out of business. While far from uniform, Europe is generally more restrictive of new retail establishments.

Insert Exhibit 14: Summary of European Land Use Policies

Strictest policies in the U.K.

Most land-use laws tend to focus on regulating large establishments, which are the new modern formats that can displace local shops in city centers. By far the strictest regulation occurs in the U.K. where local planning authorities have an absolute say in whether new retail outlets are constructed. These boards have authority over all store sizes, and are very active in rejecting large stores. Development sites are highly restricted, and the result is that retail property costs are significantly higher in the U.K. than in continental Europe or the United States. U.S. rental costs are usually below $500

[37] McKinsey & Company found that since capacity and opening hours are constrained, French stores generally sell more goods per unit of space and time than their U.S. counterparts. For more detail see: McKinsey Global Institute, "Reaching Higher Productivity Growth in France and Germany," October 2002.

per square meter; the ceiling in continental Europe is around $1500 per square meter, but U.K. retailers usually pay upwards of $2500 per square meter.

The fact that the U.K. is an island nation with a strongly concentrated population in some key areas, notably the Southeast, also contributes these high land costs. Property taxes in the U.K. are also roughly 20% higher than in the U.S. or France. The net result of these factors is that the U.K. does not have many hypermarkets. There are just 7 square meters of hyper-market per thousand people, as compared to 40 in the U.S. and 71 in France. [38]

Insert Exhibit 15: U.K. lags behind U.S. and continental Europe in hypermarkets

France complex to navigate for foreign firms

France is somewhat of an unusual situation, as it actually has more hypermarkets per person than the U.S., but on paper its laws seem very strict. The French policy from the 1970s to the mid 1990s was dominated by the *Loi Royer* which set up commissions departmentales d'urbanisme comercial (CDSUs) – local planning boards that have absolute power to authorize or prohibit any store above 400 square meters. In effect, the local boards had monopoly rights over the land. The law was strongly supported by small shopkeepers and local municipalities, both of which are threatened by the introduction of hypermarkets. The municipalities feared a declining tax base, and local stores did not want the competition.[39]

However, the result of the *Loi Royer* has been somewhat different than its original intent. Hypermarkets are more abundant in France than in most countries. There is evidence to suggest that heavy budget shortfalls in local governments during the 1980s persuaded politicians to give up their rights to the land in exchange for tax revenues. The process was not always evenhanded -- French firms often received strong preference over foreign firms.[40] As a result, few foreign hypermarkets have moved into France, yet native firms like Carrefour are ubiquitous.

The net impact of the Royer law has been to artificially raise the value of existing French firms. Since it is difficult to open new stores, existing stores are assigned a large premium in the marketplace based on the value of their properly zoned land. This situation has worsened in recent years with a stricter *Loi Raffarin*, passed in 1996, reducing the regulatory threshold to 300 square meters. The new law also instituted a mandatory public inquiry process for stores over 6000 square meters. The number of new hypermarkets has dropped dramatically. As a result the further modernization of French distribution has been slowed.[41] Additionally it has made it difficult for foreign hypermarkets to move into the French market and compete with local firms.

[38] The land use data on U.K. productivity are from: "Assessing the Productivity of the U.K. Retail Sector." Oxford Institute of Retail Management, Templeton College, University of Oxford, April 2004.
[39] For an extensive discussion of French retail regulation see: Messerlin, Patrick A. "The French Distribution System and the Openness of the French Economy," OECD, 1993. This paper is the source of much of the discussion in this section.
[40] Messerlin, Patrick A. (1993).
[41] McKinsey Global Institute (2002).

Germany and the Netherlands more liberal

Land usage for retailing is somewhat less regulated in Germany and is very liberal in the Netherlands. Germany does have a complex zoning law, but the main difference with France is that the regulatory threshold is 1200 square meters (as opposed to 300). This permits a competitive environment for a much larger number of store formats (though not hypermarkets). This law combined with the operating hour restrictions encouraged the development of the small, highly productive discounters like Aldi and Lidl. The Netherlands is generally more liberal than Germany or the U.K., but regulations differ from locality to locality.

There are 2 major channels by which land usage impacts productivity:

- **Limitation of entry and exit** -- Restrictions on retail land usage cut back on both the creation of new stores and the elimination of old ones. The rules make it very costly to build new stores (fewer entrants) and artificially inflate the value of old stores based on the land they sit occupy. This means old stores are less likely to go out of business even if they are not operating productivity. In the U.S. studies have shown nearly all of retail productivity growth is from new stores replacing older ones. This selection process is clearly not as rapid in countries like the U.K. or France.
- **Inability to exploit economies of scale** -- Land use regulations usually focus on large store sizes. In many situations a large store size is required for the most efficient use of labor and capital. Deliveries can be scheduled more optimally (See box on trucking) and labor scheduling becomes easier. Large stores also bring savings to the consumer by reducing the number of trips required to make their purchases. Restrictions on store sizes can reduce productivity in all of these areas.

It is clear that these land usage policies have had a significant impact in the United Kingdom.[42] One study showed that in the U.K. just 43 percent of the productivity growth in retail is from new firms displacing old ones.[43] In the U.S. this number is much higher – 60 percent. (In the U.S. the number jumps to 100 percent for individual stores, but such a measure is not available for the U.K.). U.K. productivity levels remain far below the U.S., France, Germany, and the Netherlands.

Insert Exhibit 15X: Dominant Source of U.S. Retail Productivity Growth: New Establishments of Existing Chains Displacing Exiting Firms

[42] For a discussion of productivity in the United Kingdom see Chapter 4 of Baily, Martin Neil and Kirkegaard, Jacob Funk. Transforming the European Economy, 2004. It is available at: http://bookstore.iie.com/merchant.mvc?Screen=PROD&Product_Code=353.

[43] Griffith, R., et al., The U.K. Productivity Gap and the Importance of the Service Sectors. 2003, AIM.

7.3 Labor Flexibility and Wages

Even with substantial technological advances, retailing is a very labor intensive business.
The efficient and flexible use of labor is as critical for success as strategic management of space and land. There are two major ways in which restrictions on labor flexibility can reduce productivity in retailing:

- **High minimum wages reduce services –** France and Germany generally have much higher minimum wages than the U.K. or U.S. A McKinsey study showed that in the case of France this can reduce the number of services provided in the retail environment. It found that 8 percent of U.S. grocery baggers earn below the French minimum wage, and therefore these additional services are usually not provided in France. Again, this may paradoxically *increase* measured productivity (but is not a real efficiency gain as work is simply transferred to the customer.
- **Higher per employee costs**– European labor is generally more expensive than in the United States. The tax burdens are higher and it is generally more difficult to discharge employees. However, these factors may play less of a role in retailing because it is heavily dependent on part-time staff. Many European countries have dual labor markets where part-timers are not subject to the same rigidities as the full time staff. The Netherlands and the U.K. make particularly strong use of part-time labor in retail.

The minimum wage effect clearly shows up in the French data. French retail labor productivity has historically been very high, and up until 1995 was greater than the U.S. McKinsey similarly finds a 19% productivity advantage in French grocery productivity as a result of fewer services. Outside of minimum wage, the impact of labor flexibility is relatively difficult to measure. In spite of relatively flexible policies in the UK, the average number of employees per store is very high (12) even with relatively small store sizes.

Exhibit 16: Retail average working hours and restrictions

Exhibit 17: Retail employees per outlet

Exhibit 18: EU retailers are concentrated in their own countries, but lack of cross border trade makes U.S. retailing more concentrated economywide

Box 5 -- Radio Frequency Identification (RFID): The next leap forward

The next major innovation in retail supply-chain technology is Radio Frequency Identification (RFID) tag technology. RFID tags can be affixed to cases, pallets or even individual products, and radio waves then transmit product identification information at a

distance. This information may include price, date of expiration and other useful product attributes. Active RFID tags can transmit to further distances, while the cheaper, passive RFID tags transmit over shorter ranges. The big advantage of this technology over barcodes is that pallets and products do not have to be individually scanned with a scanning gun. Indeed, the barcode could be completely replaced -- a customer could conceivably "check-out" of a supermarket just by pushing their cart across a line.

The technology itself has existed for more than five years. However, it wasn't until June 10th 2003, that RFID development received a big boost when Wal-Mart, the largest retailer in the United States, announced that its top 100 suppliers would be required to adopt RFID on their cases and pallets by January 2005. Soon after, the U.S. Department of Defense, with over 43,000 suppliers, followed Wal-Mart's example and released its own RFID supplier mandate.

B5.1 U.S. leads RFID development, but Europe following suit

Retailers in the U.S. and Europe have followed the example of Wal-Mart and introduced their own RFID intiatives. In the United States, Target announced an initiative in November of 2003. In Europe, Metro AG and Tesco in the U.K. launched similar efforts. Other retailers will likely follow as the technology becomes more affordable.

Indications are that Europe is trailing behind the U.S. in initial adoption. A recent Accenture survey shows that fewer European retailers are examining RFID than their American counterparts. In the survey, the United States had 86% of respondents currently examining the technology, while Europe trailed behind with only 40% doing so.

B5.2 Business case emerging, but not yet clear

Just as with the barcode in the early 1970s, the business case for RFID is not yet clear. The technology offers tremendous operational cost savings, but the investment hurdles are very high. The tags are costly and the changes required to back-end software systems are even costlier. The technology is young, new and expensive. Only the largest players can afford to invest. They will lead the competitive change, and as the cost of the technology goes down, smaller retailers will join. The net effect will be increased productivity throughout the sector.

8. Cross-Border Operations: Can European Firms Achieve the Required Scale to Benefit?

Country-specific regulation makes Europe a challenging business environment for transnational retailers. Rules differ dramatically between countries, and operating smoothly across European borders presents a formidable challenge. Even in a harmonized regulatory environment, synchronized trucking, centralized purchasing, and coordinated restocking are not things that are easy to get right. When regulations and standards differ substantially from country to country, it can become nearly impossible to reap any scale benefits.

Information and communications technology (ICT) is changing things rapidly. Whereas retail used to be a local business, now it is a regional, national, and global one. Centralized IT-enabled management can coordinate firm operations over a large geographic area. Efficiencies in logistics, purchasing, and marketing can now be achieved that were not formerly possible.

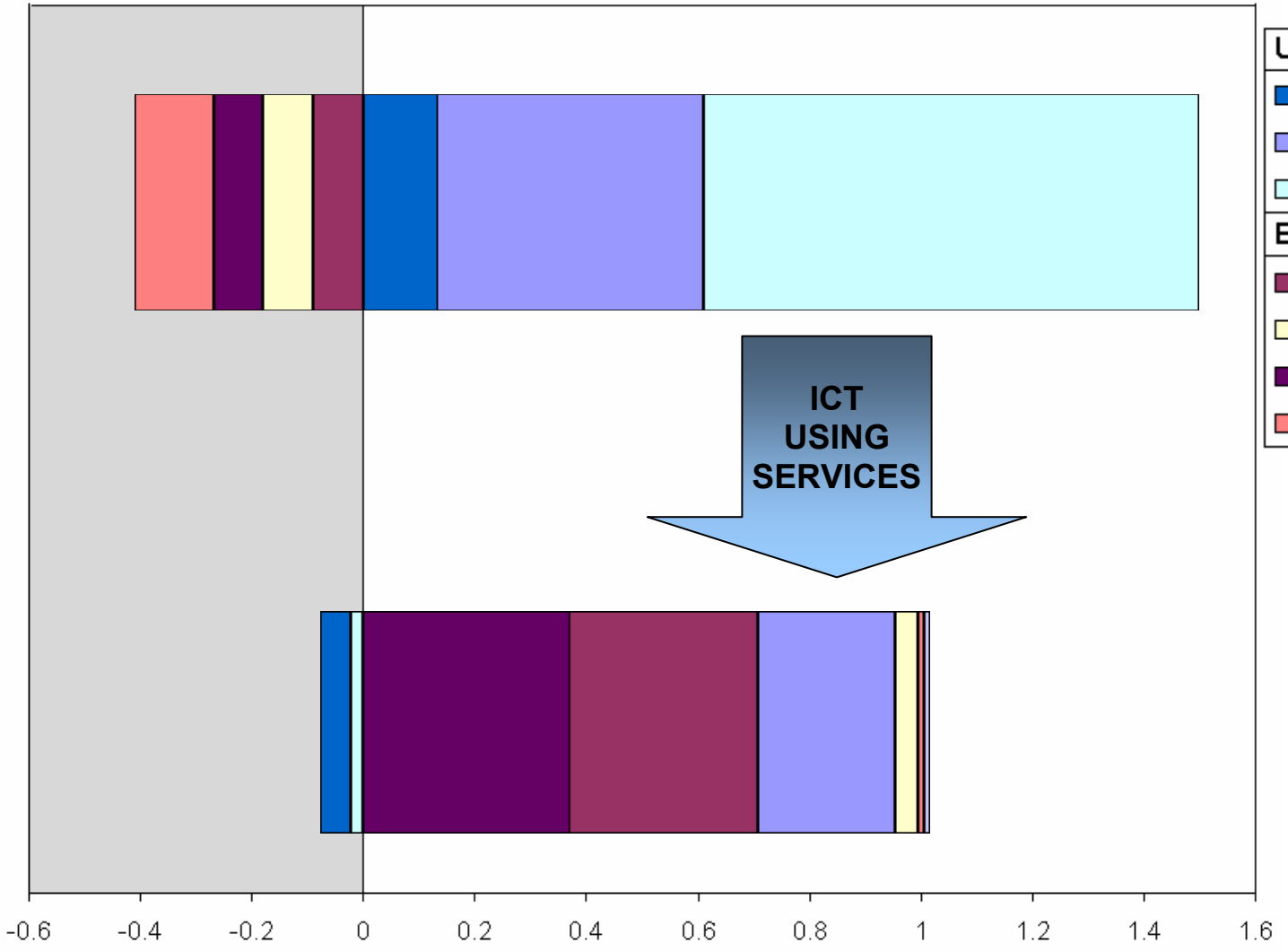
The scaling process has been much faster in the United States, where a relatively unified regulatory environment allows firms to quickly spread throughout the country. In Mexico and to a lesser extent in Canada a similar pattern has emerged. In Europe the process has been much slower, with local retailers maintaining strong positions and chain stores remaining closer to their home countries. Country-by-country differences in taxes, trucking pallet sizes, customs regulations, and operating restrictions have made it harder to administer things in a centralized way.

Europe, however, is changing. Trucking was deregulated in 1997 and pallet sizes became standard. Cross-border taxes are now much simpler than they were in the past. Operational restrictions like opening hours and land usage have been eased in many countries (although there are exceptions.) The changes have made retailing both more competitive and more efficient. The results are clear – retailers have started to more aggressively expanding across Europe. Cross-border mergers and acquisitions soared in the late 1990s as firms began moving out of their home countries. Furthermore, Western European companies have aggressively pushed into the new Eastern European markets of the 10 new European Union members.

The shopping behavior of consumers also plays a big role – the U.S. is a very different society than Europe. Families generally have two cars, whereas in Europe they usually have only one. Americans are accustomed to driving 10 minutes to visit a store, whereas in Europe this is not the norm. With new incentives, consumer behavior often changes, but the European "lean-retailing" model may ultimately turn out to be somewhat different from that used in the United States. Even in the U.S. there has been a strong movement to revive downtown business districts.

The challenge for Europe will be to continue to harmonize and standardize, to allow firms to capture the scale efficiencies that ICT promises. At the same time, the tastes and preferences of consumers will play a strong role in the changing retail landscape. The key takeaway is that ICT will make firm-level scale a critical factor for success. While retail is still a local business at its core, technology systems have made it a regional and global one as well.

ICT Using Services Dominate US-EU Productivity Growth Gap (1995-2000)



US Advantage

- Non-ICT other industries (13%)
- ICT producing manufacturing (48%)
- ICT using services (89%)

EU Advantage

- ICT producing services (-9%)
- ICT using manufacturing (-9%)
- Non-ICT manufacturing (-9%)
- Non-ICT services (-14%)

US Advantage

- Securities Trade (35%)
- Retail trade (32%)
- Wholesale Trade (23%)
- Banks (4%)
- Renting of machinery (1%)
- R&D (1%)

EU Advantage

- Insurance (-2%)
- Professional services (-5%)

Source: The Conference Board (TCB) / Groningen Growth and Development Centre (GGDC) database

Trade is a big industry in both the U.S. and Europe…

Figure 2

Value Added

UNITED STATES

Sector	Dollars, millions	Rank In Economy
Real estate activities	994,713	1
Public administration and defence	801,024	2
Health and social work	709,593	3
Retail trade	**635,698**	**4**
Wholesale trade	**545,617**	**5**
Financial intermediation	471,750	6
Construction	469,667	7
Education	456,066	8
Legal, technical and advertising	439,170	9
Other business activities, nec	337,292	10

EUROPEAN UNION (EU-15)

Sector	Euros, millions	Rank in Economy
Real estate activities	888,955	1
Health and social work	578,423	2
Public administration and defence	569,649	3
Construction	520,713	4
Education	453,896	5
Wholesale trade	**434,036**	**6**
Legal, technical and advertising	431,622	7
Retail trade	**408,695**	**8**
Other community, social and persona	366,661	9
Financial intermediation	343,677	10

Employment

UNITED STATES

Sector	Employees, thousands	Rank In Economy
Retail trade	**17,015**	**1**
Health and social work	15,002	2
Education	13,305	3
Public administration and defence	10,619	4
Hotels & catering	9,458	5
Other business activities, nec	7,711	6
Construction	7,038	7
Wholesale trade	**6,832**	**8**
Other community, social and persor	6,259	9
Legal, technical and advertising	4,508	10

EUROPEAN UNION (EU-15)

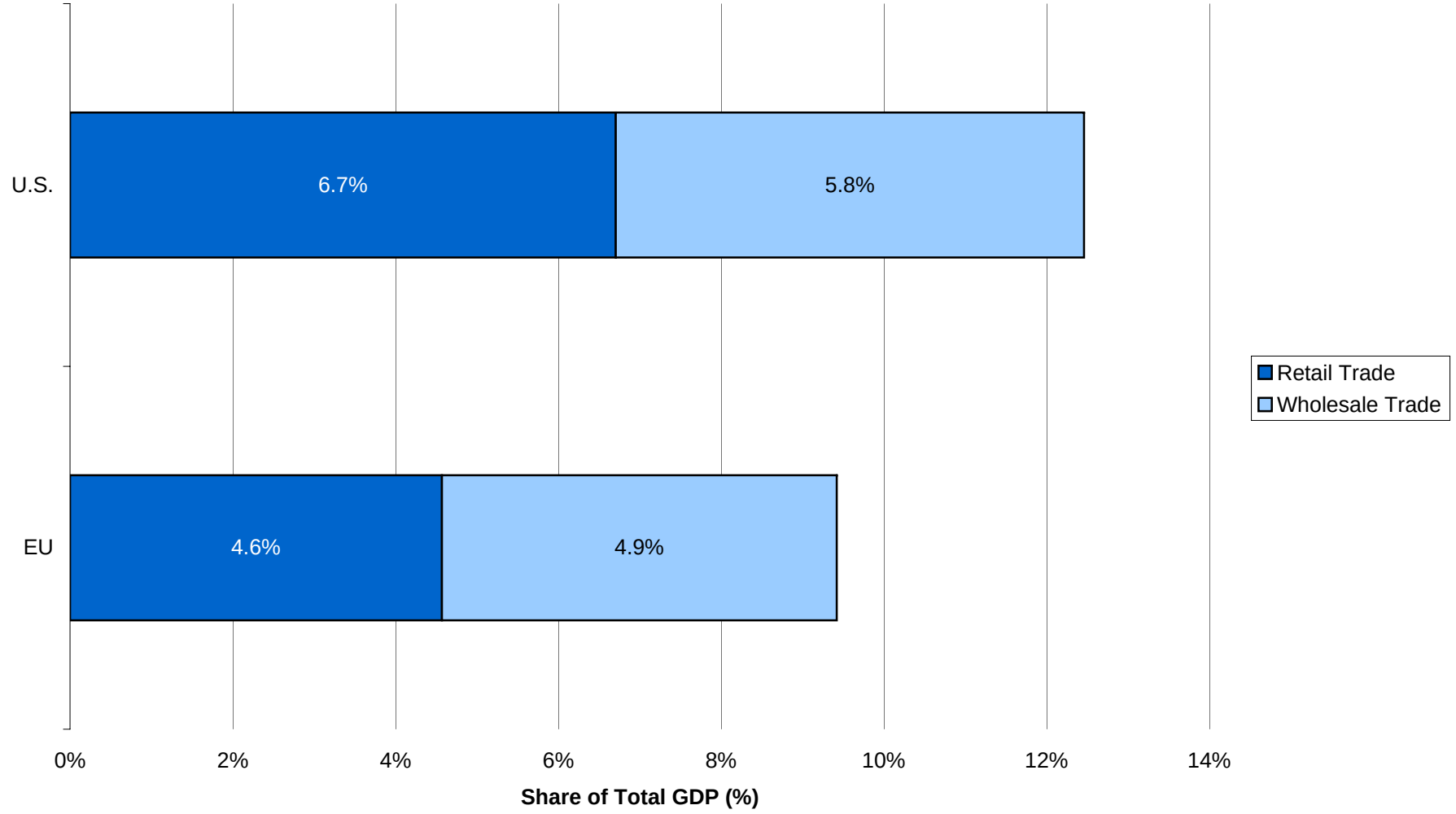
Sector	Employees, thousands	Rank in Economy
Health and social work	15,360	1
Retail trade	**15,166**	**2**
Public administration and defence	11,826	3
Construction	11,697	4
Education	10,787	5
Other community, social and persona	9,486	6
Hotels & catering	8,053	7
Other business activities, nec	7,805	8
Wholesale trade	**7,113**	**9**
Legal, technical and advertising	6,894	10

Source: O'Mahony and van Ark (2003) CD-ROM

Note: EU-15 refers to the 15 EU members prior to May 1, 2004.

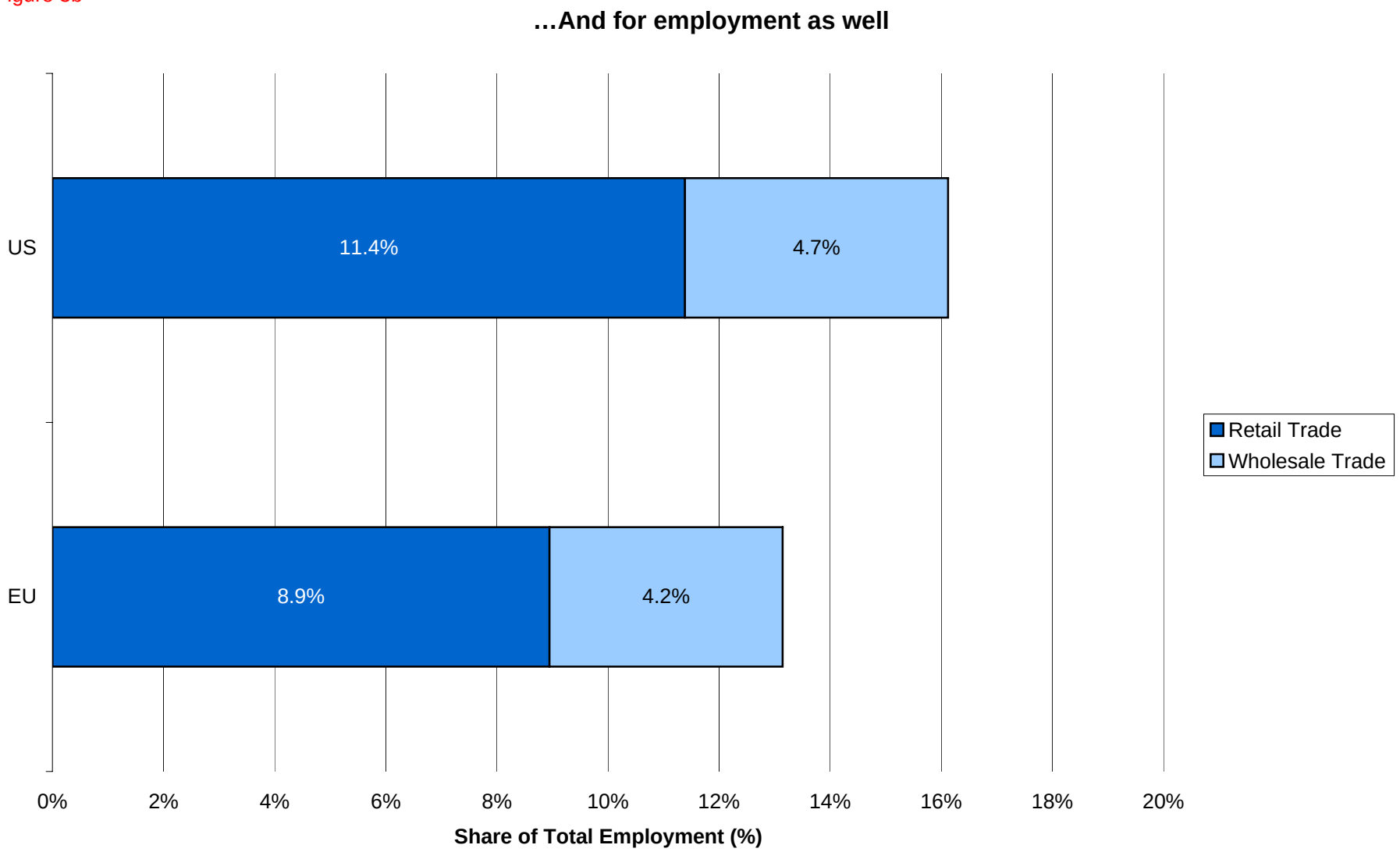
Figure 3a

Greater specialization: U.S Trade share of GDP larger than Europe



Source: O'Mahony and van Ark (2003) CD-ROM

Figure 3b



Source:O'Mahony and van Ark (2003) CD-ROM

Trade sector post-1995: U.S. labor productivity growth accelerates, but Europe stalls

Figure 4

Retail Trade	***1990-95***	***1995-2001***	**Acceleration 1995-01/1990-95**
U.S.	2.0%	6.5%	**4.5%**
EU-14	1.7%	1.3%	**-0.3%**
Wholesale Trade	***1990-95***	***1995-2001***	**Acceleration 1995-01/1990-95**
U.S.	3.5%	8.2%	**4.7%**
EU-14	3.6%	1.5%	**-2.1%**

Source: GGDC 60-Industry Database. EU-14 includes France, Germany, U.K., the Netherlands, Austria, Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Spain, and Sweden. Greece has been excluded for lack of data.

Labor Productivity Growth By Country

Retail Trade	*1980-90*	*1990-95*	*1995-2001*	Acceleration 1995-01/1990-95
U.S.	3.0	2.0	6.5	4.5
EU-14*	2.4	1.7	1.3	-0.3
Germany	3.1	2.84	0.7	-2.2
France	4.2	2.1	1.9	-0.3
U.K.	3.3	1.2	3.7	2.6
Netherlands	3.3	0.7	1.2	0.5
Austria	2.1	1.3	3.8	2.5
Belgium	-0.2	2.3	-1.5	-3.8
Canada	0.2	1.6	5.6	4.0
Denmark	2.0	2.3	2.4	0.1
Finland	4.0	4.1	1.4	-2.7
Ireland	3.4	-2.9	3.1	6.0
Italy	0.9	1.3	1.1	-0.2
Japan	3.4	4.7	-0.3	-5.0
Luxembourg	2.8	0.2	2.7	2.5
Norway	2.6	4.6	8.1	3.5
Portugal	1.1	1.6	1.2	-0.4
South Korea	7.6	3.5	5.0	1.5
Spain	2.0	0.3	0.2	-0.1
Sweden	2.4	3.7	3.8	0.1
Taiwan	5.9	6.8	7.5	0.7
Wholesale Trade	***1980-90***	***1990-95***	***1995-2001***	**Acceleration 1995-01/1990-95**
U.S.	3.0	3.5	8.2	4.7
EU-14*	0.02	3.6	1.5	-2.1
Germany	4.4	4.3	1.9	-2.4
France	5.2	3.9	1.4	-2.5
U.K.	2.9	5.7	3.6	-2.2
Netherlands	3.3	-0.2	4.0	4.2
Austria	4.2	3.2	1.1	-2.1
Belgium	-0.2	2.2	0.1	-2.1
Canada	2.5	2.8	8.2	5.4
Denmark	2.1	2.1	4.7	2.6
Finland	3.8	-2.4	2.7	5.1
Ireland	5.0	-5.5	4.2	9.7
Italy	0.9	4.6	0.1	-4.6
Japan	4.2	7.6	0.3	-7.3
Luxembourg	4.4	2.9	6.7	3.8
Norway	2.6	4.6	6.8	2.2
Portugal	1.1	1.6	3.8	2.2
South Korea	7.6	3.5	5.0	1.5
Spain	-0.6	2.0	-0.2	-2.2
Sweden	2.4	3.7	1.1	-2.6
Taiwan	6.2	7.4	10.3	2.9

Source: The Conference Board (TCB) / Groningen Growth and Development Centre (GGDC) databases.
*EU-14 includes the original EU members with the exception of Greece, which was omitted because of data availability.

Figure 6

Total factor productivity growth drives the gap

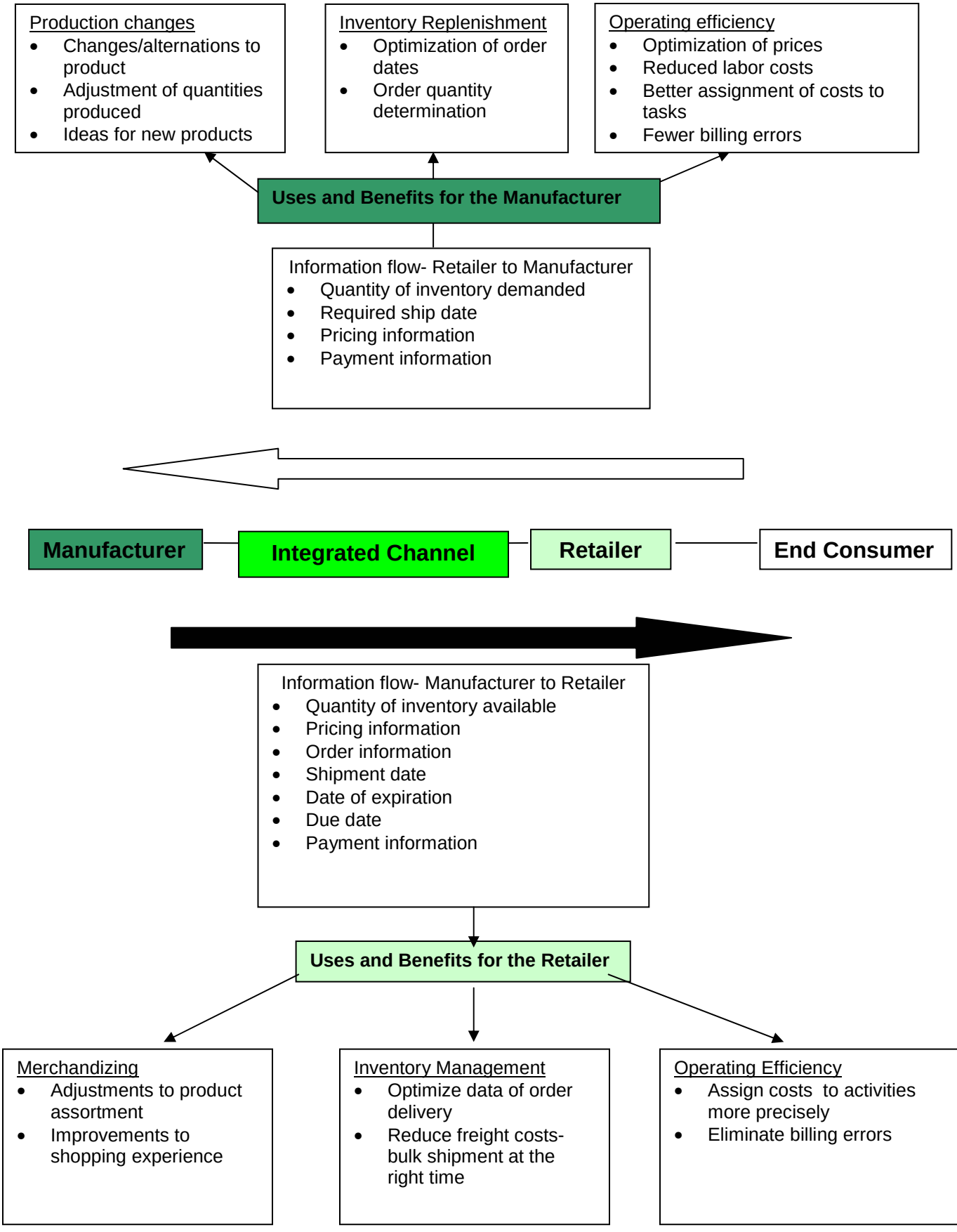
Retail Trade	**1980-90**	**1990-95**	**1995-00/1***	**Acceleration 1995-00/1* over 1990-95**
U.S.	1.9%	1.0%	5.4%	**4.4%**
EU-4	1.8%	0.8%	0.8%	**0.0%**
Germany	1.2%	2.1%	0.2%	**-1.9%**
France	3.5%	0.8%	0.9%	**0.1%**
U.K.	1.0%	-1.1%	1.2%	**2.3%**
Netherlands	2.9%	0.0%	0.5%	**0.5%**
Wholesale Trade	**1980-90**	**1990-95**	**1995-00/1***	**Acceleration 1995-00/1* over 1990-95**
U.S.	0.8%	0.5%	3.5%	**3.0%**
EU-4	2.0%	2.1%	1.2%	**-0.9%**
Germany	1.7%	2.2%	0.6%	**-1.6%**
France	3.8%	1.5%	-0.3%	**-1.8%**
U.K.	0.8%	4.2%	2.3%	**-1.9%**
Netherlands	2.3%	-0.6%	2.7%	**3.3%**

* Due to data availability issues, total factor productivity (TFP) for France, U.K. and the EU-4 is calculated for 1995-2000, while the other countries are for 1995-2001

Source: GGDC 60-Industry Database. EU-4 includes Germany, France, U.K., and the Netherlands.

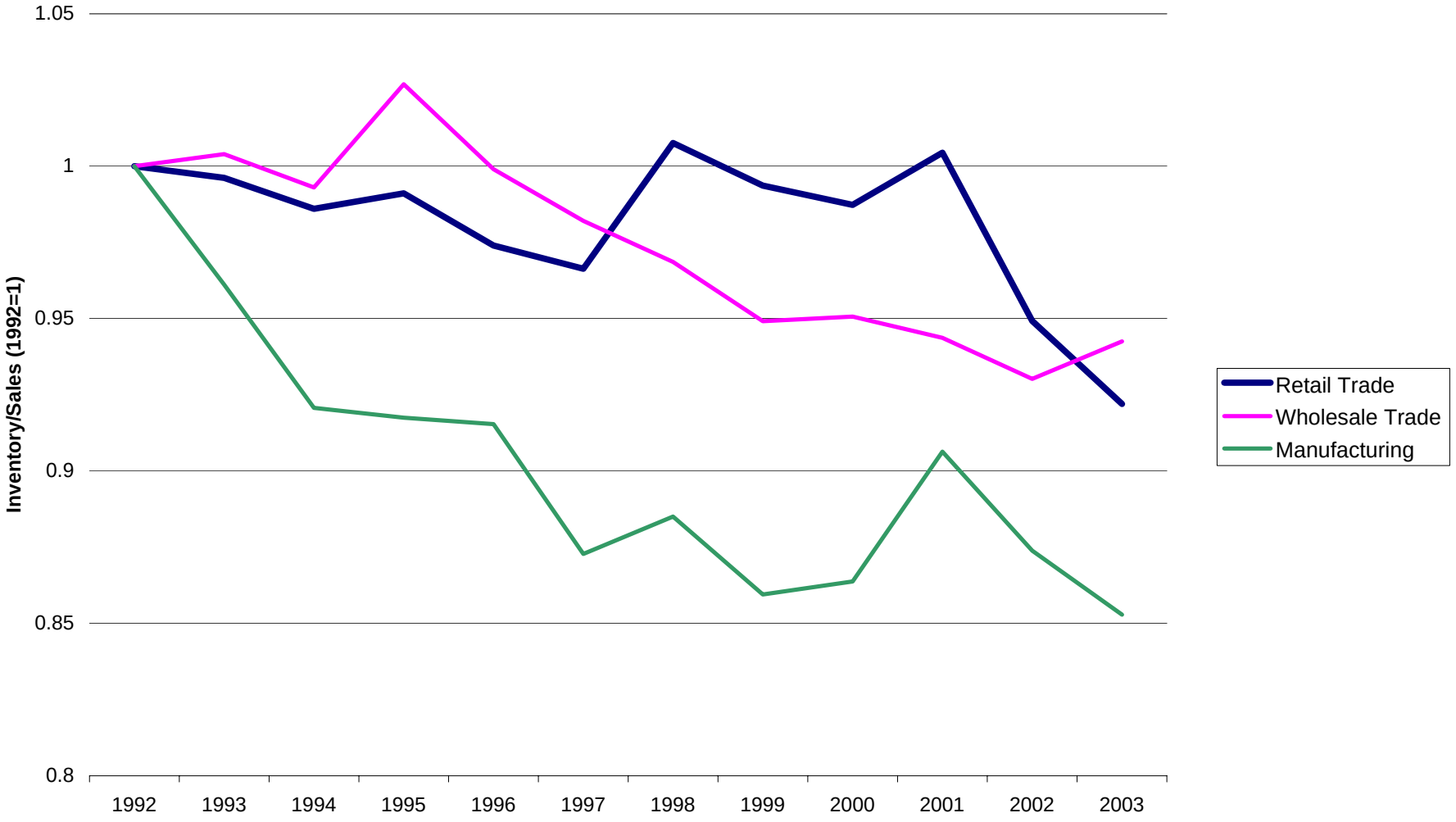
Note: Wholesale trade includes trade and repair of motor vehicles

Benefits of Lean Retailing



U.S. inventory to sales ratios have declined sharply, especially for manufacturers

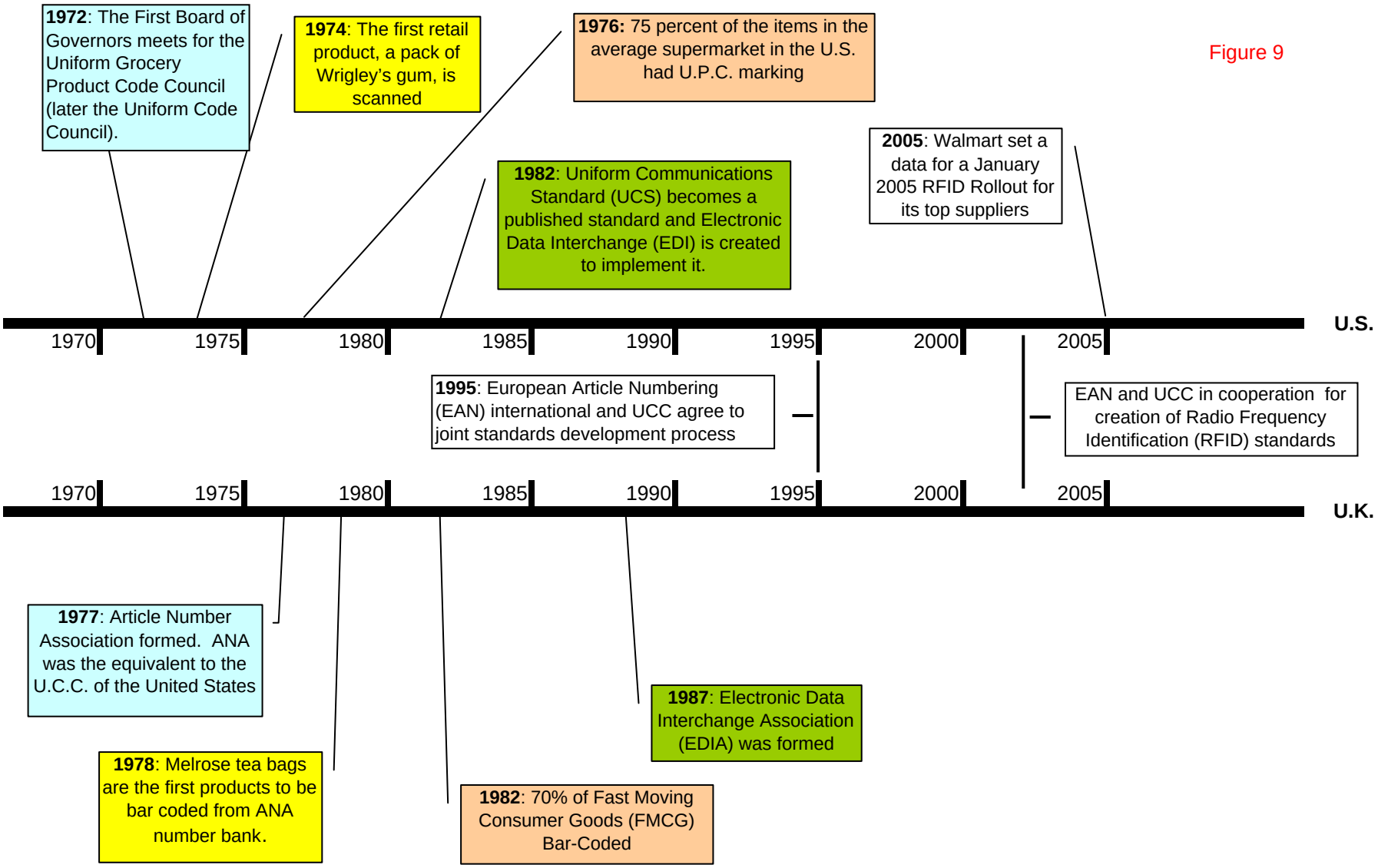
Figure 8



Source: U.S. Census Monthly Trade Inventories and Sales Program

The U.K. Bar Code Technology lagged compared to that of the U.S.

Figure 9



Notes: Table shows annual average ICT Capital Services Growth in the U.S. and EU, Wholesale trade includes Trade and repair of motor vehicles.

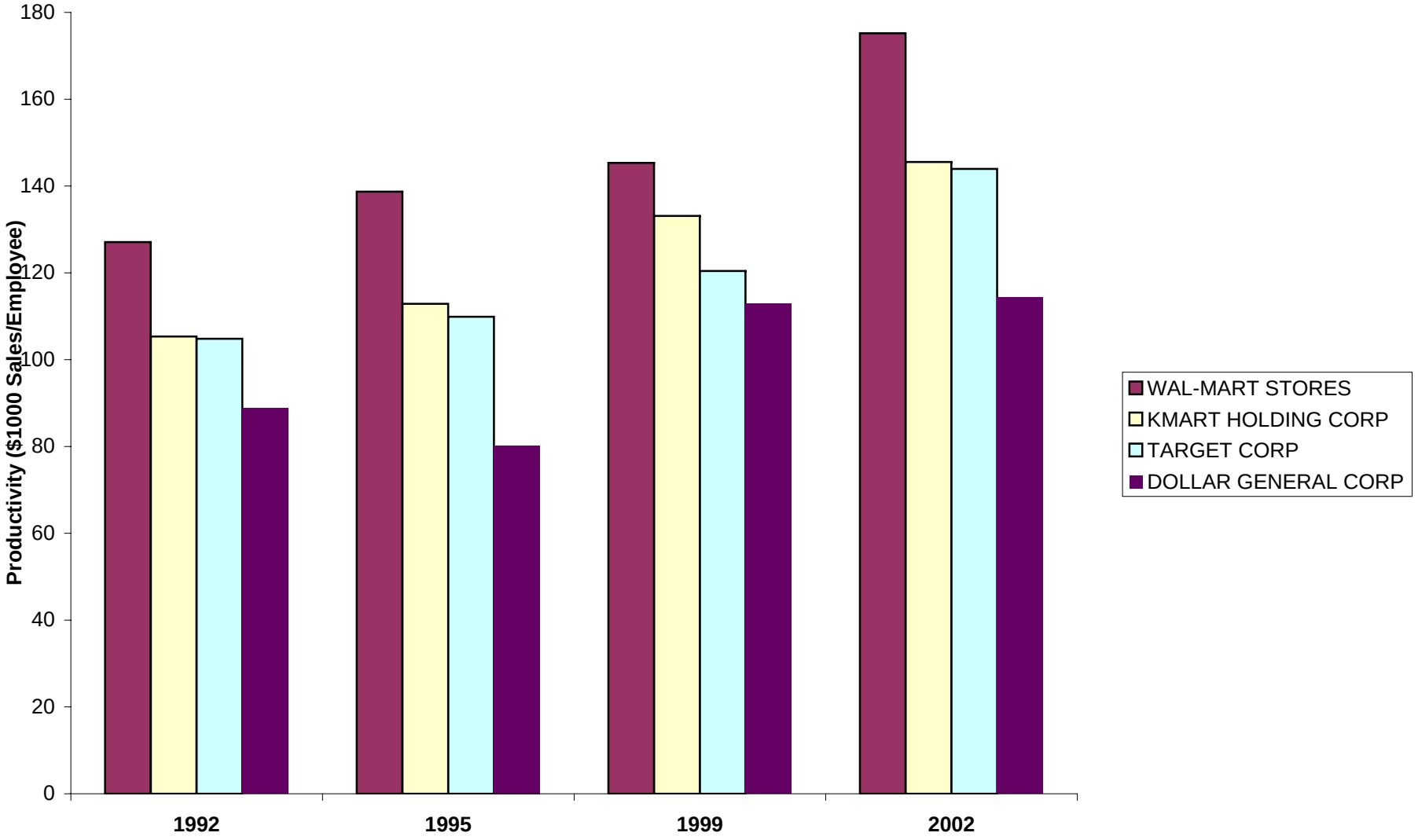
Source: O'Mahony and van Ark (2003) CD-ROM

Figure 10

U.S. Takes Early Lead in Annual ICT Capital Services Growth (in %)						
Retail Trade	*U.S.*	*EU*	*Germany*	*Vetherlands*	*France*	*U.K.*
1980-85	45.8	18.7	12.7	27.9	17.0	29.0
1985-90	16.6	20.4	26.6	18.8	12.7	20.5
1990-95	11.9	12.4	17.2	16.4	4.6	11.9
1995-00	17.6	14.8	17.8	33.3	13.3	11.1
Wholesale Trad	*U.S.*	*EU*	*Germany*	*Vetherlands*	*France*	*U.K.*
1980-85	32.2	20.8	7.3	24.5	17.6	37.4
1985-90	9.9	16.7	16.6	20.9	13.2	16.5
1990-95	16.2	12.7	16.1	9.7	6.2	12.4
1995-00	22.5	22.2	17.7	23.9	18.1	24.8

Wal-Mart maintains productivity lead, competitors always one stop behind

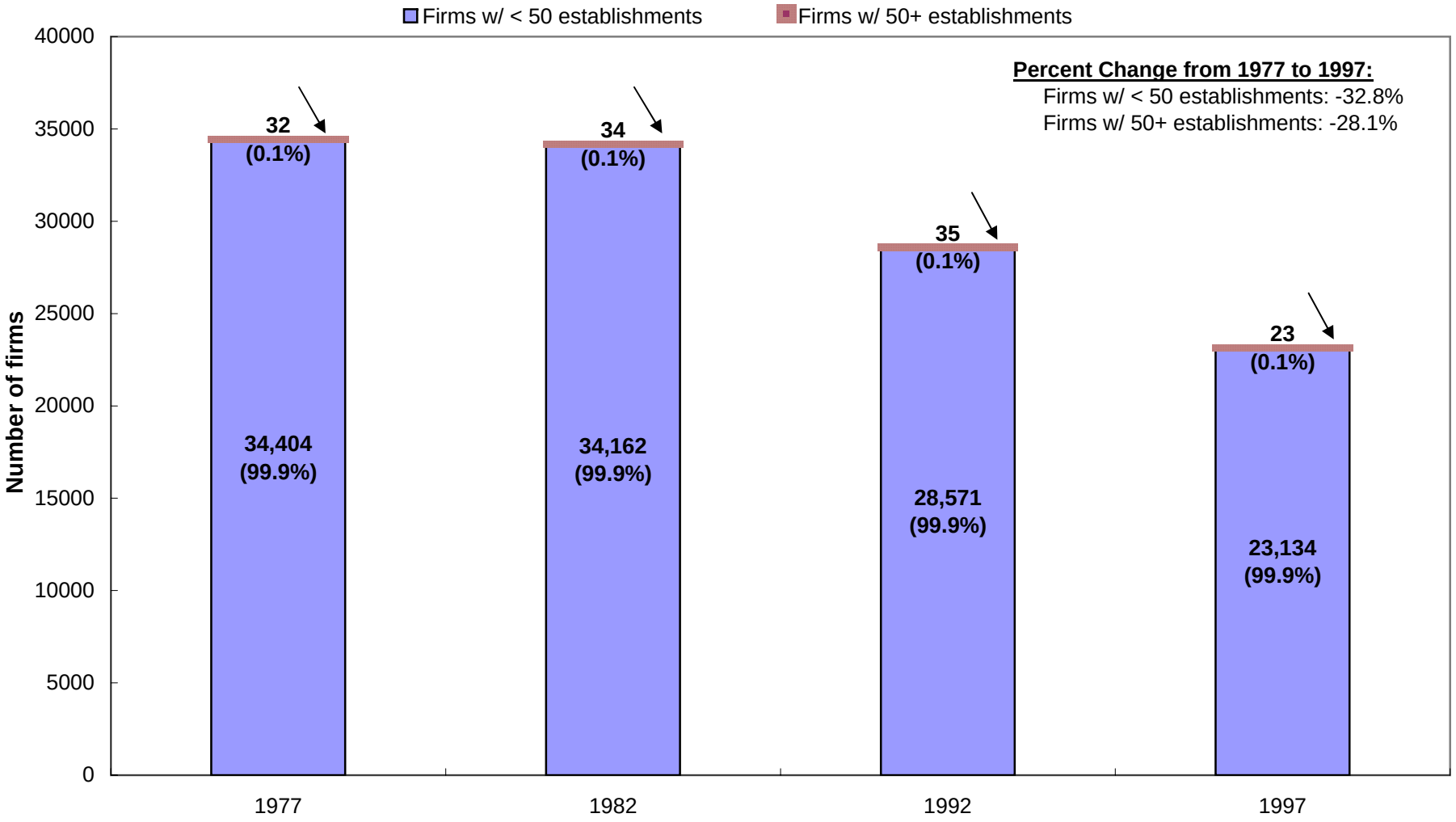
Figure 11



Source: S&P Computstat database, values were deflated using a deflator for the general merchandise sector computed by the Bureau of Labor Statistics.

Figure 12a

Massive consoldiation in the U.S. Pharmarcy/Drugstore sector...

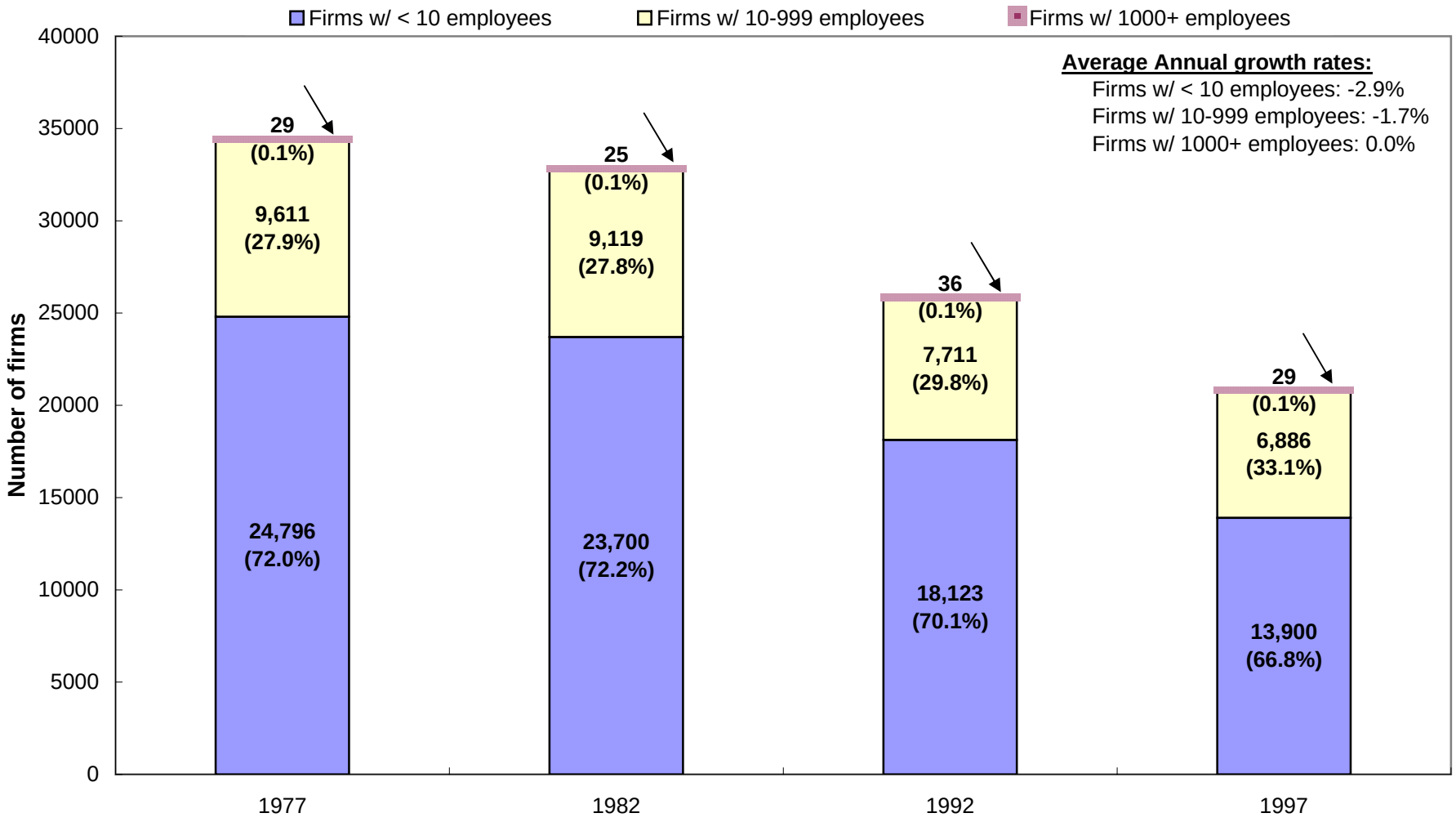


Sources: Census of Retail Trade

Notes: 1982 and 1977 do not include firms not in business at end of year; NAICS code 446110 used to match SIC code 591; 1977 categories slightly different

Figure 12b

...And the smallest firms are affected most

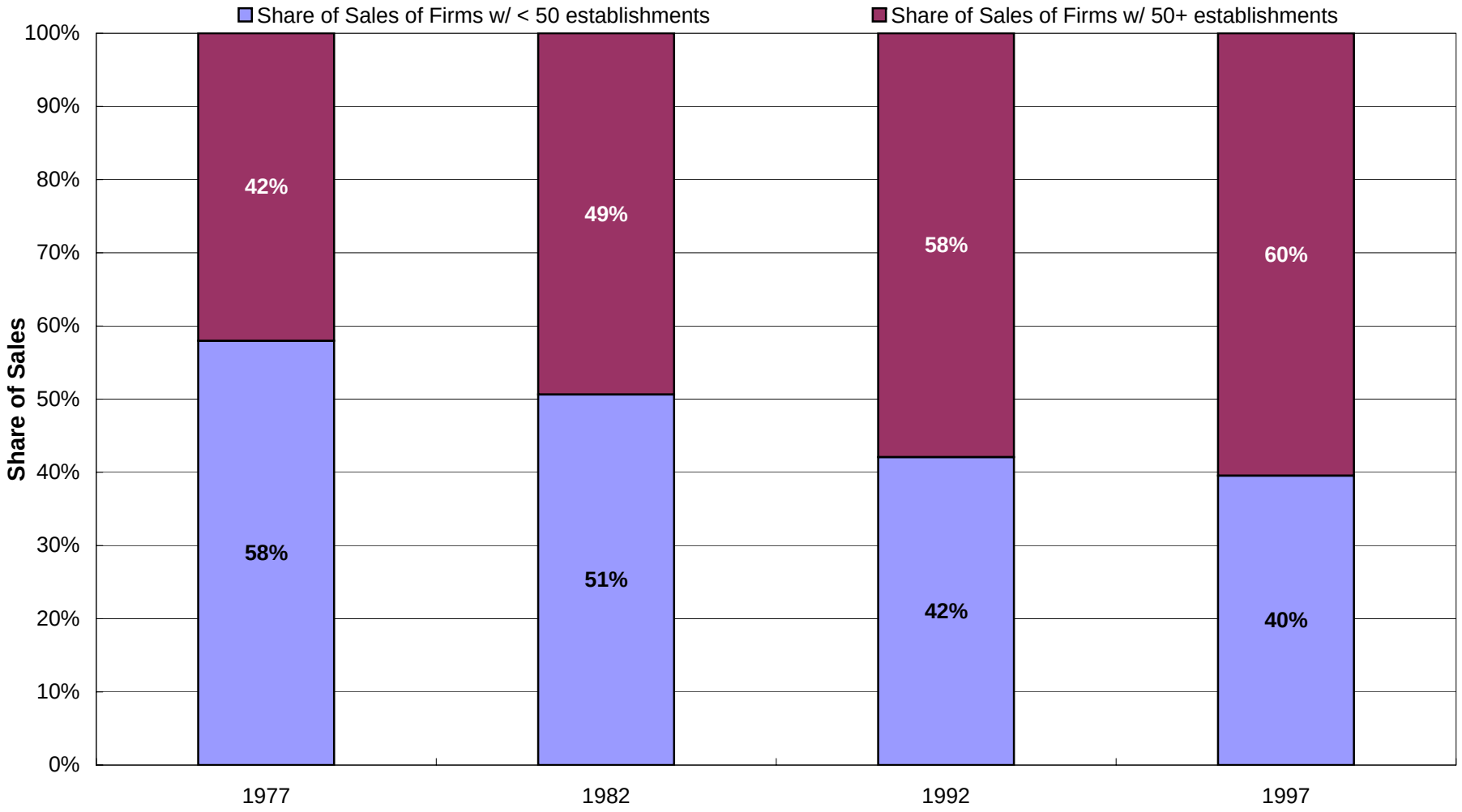


Sources: Census of Retail Trade

Notes: 1982 and 1977 do not include firms not in business at end of year; NAICS code 446110 used to match SIC code 591; 1977 categories slightly different

Figure 12c

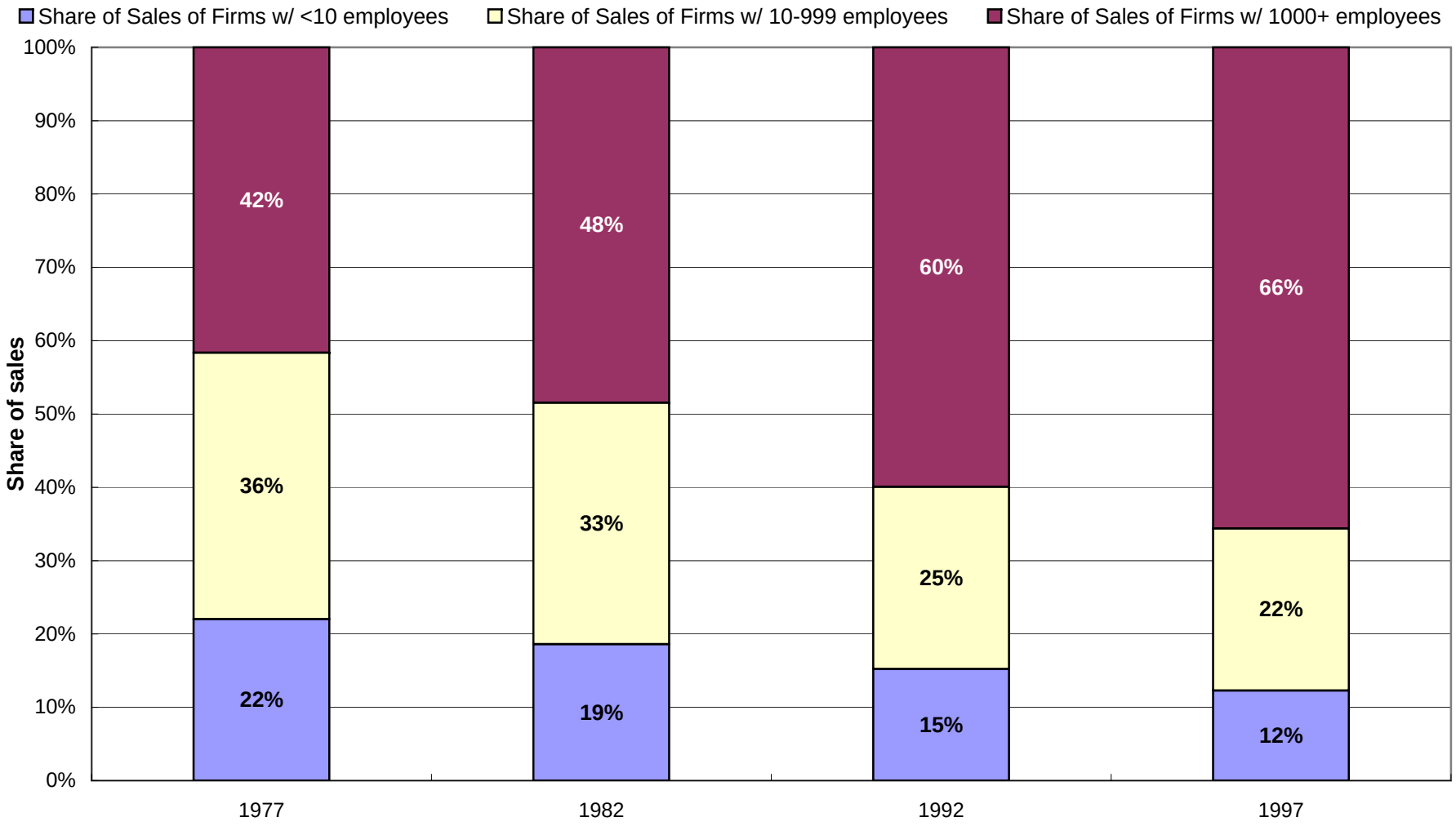
A few large firms rapidly grow their share of sales...



Sources: Census of Retail Trade
Notes: 1982 and 1977 do not include firms not in business at end of year; Sales in current year 1,000 USD and not adjusted for inflation; NAICS code 446110 used to match SIC code 591; 1977 categories slightly different

Figure 12d

…While small and medium firms steadily contract

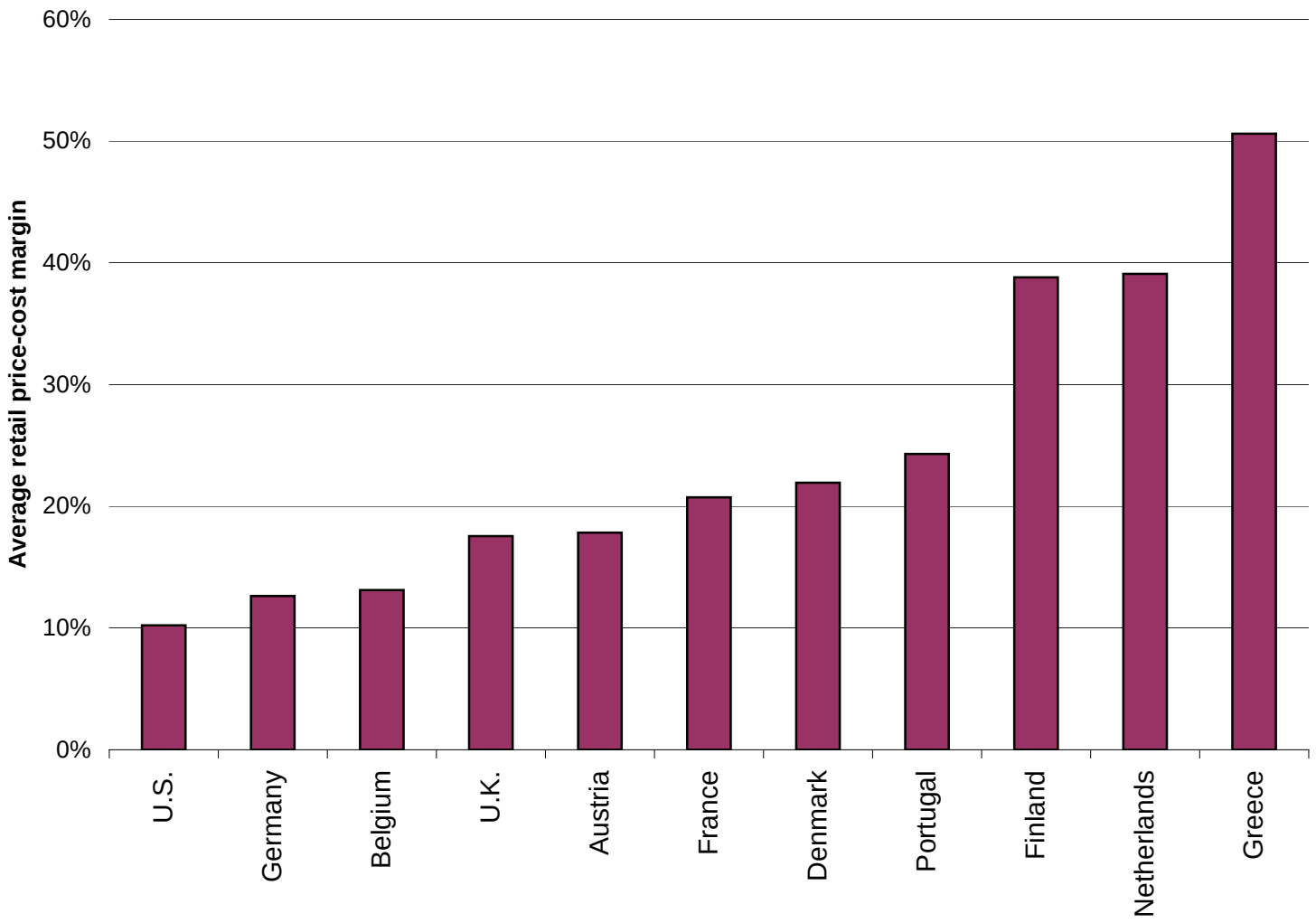


Sources: Census of Retail Trade

Notes: 1982 and 1977 do not include firms not in business at end of year; Sales in current year 1,000 USD and not adjusted for inflation; NAICS code 446110 used to match SIC code 591; 1977 categories slightly different

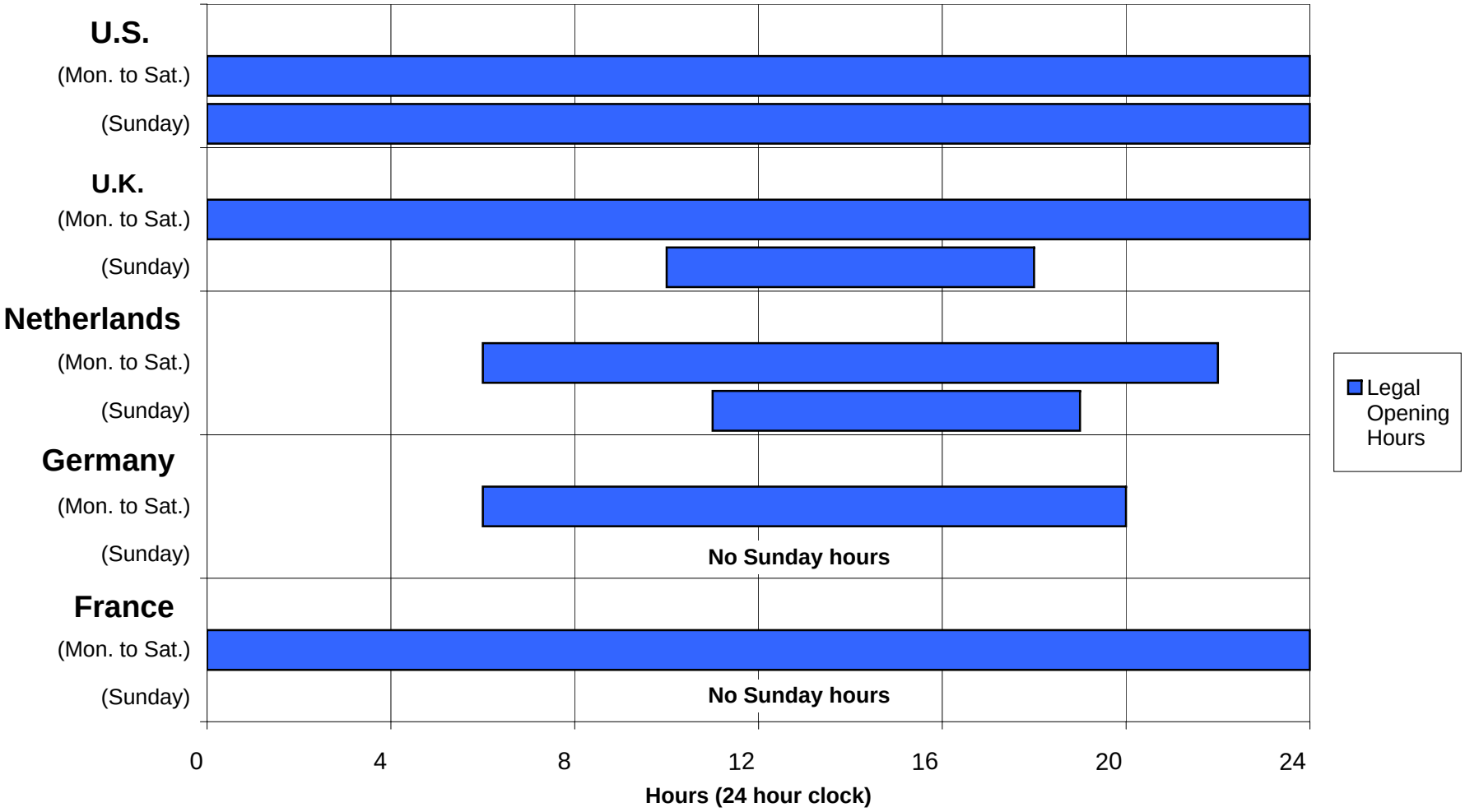
Figure 12X

Greater competitiveness in the U.S. is indicated by lower retail margins



Source: OECD STAN database. Data are for the year 1996 and use an operating surplus concept to derive price-cost margins.

Large Store Opening Hours More Restricted in Europe



Source: Netherlands: Breedveld et al (2002); Germany: US dept. of Commerce; France and UK: KPMG report on German Grocery Retailing 2004
Note: The hours indicate Store opening hours Monday to Saturday. Netherlands allows shops to open from 11 to 7pm on 12 Sundays a year

Summary of European Land Usage Policies

	France	Germany
Key Legislation	• 1973 Loi Royer - created strict retail planning controls and local commissions for regulating retail developments. Local commissions were ineffective. • 1996 the stricter Loi Raffarin - made the regulation size 300 sq. meters and a necessary public economic environment inquiry for projects over 6000 sq. feet. • Retail businesses need to obtain a building license *and* a usage license to carry out a retail activity	• Building law is fairly uncomplicated for up to 1200 square meter buildings or freestanding super markets. • On the other hand it is extremely difficult to obtain licenses for retail above 1200 square meters. • Local authorities write a non-binding land zoning plan and a binding development plan. The development plan specifies where retail is allowed
Relevant Store Size	Above 300 square meters	Above 1200 square meters
Extent of out of town center restriction	In the late 1990s and today very few licenses have been given for major out of town supermarkets.	The availability of out of town retail licenses that are beyond 1200 square meters is very limited because of the authorities' wish to spur town center business.
Result	Many hypermarkets were established before the stricter Raffarin Law came into effect.	It is because of the 1200 square meter rule that Aldi the small discount stores chain has become a great success
Overall law strictness	Previously Liberal, now Very strict	Somewhat Strict
	UK	**Netherlands**
Key Legislation	• The UK regions have a "plan-led approach" to zoning. The local planning authorities chart out the zones for business beforehand and give permission to build accordingly. • The planning policy is set out in the Planning Policy Guidelines (PPG6). The zoning bodies are very strict and do not give out licenses unless the area needs development	• Planning policy rules are divided into three administrative levels: kingdom, province and municipality. The municipalities draw up non-binding plans for the future and binding plans for deciding how to use the land. This split between plans is similar to Germany.
Relevant Store Size	All sizes	All sizes
Extent of out of town center restriction	The Legislation is heavily skewed toward town centers. Then edge of center sites, district centers and out of center sites are followed in that order of preference. Thus there are very few large out of town hypermarkets in the UK.	Out of town restrictions are subject to a two-tier system. 1. Locations allowing for a large-scale retail concentration 2. Locations for peripheral retail. The peripheral retail locations are reserved for specific product categories like Do-it-yourself (DIY), furniture, kitchen appliances, cars, boats and materials that present fire risk.
Result	Very few rural hypermarket centers	Large-scale retail centers in existence
Overall law strictness	Very strict	Liberal

Sources: UK competition Commission, Restructuring Urbanized Areas (Reurba)

figure 15

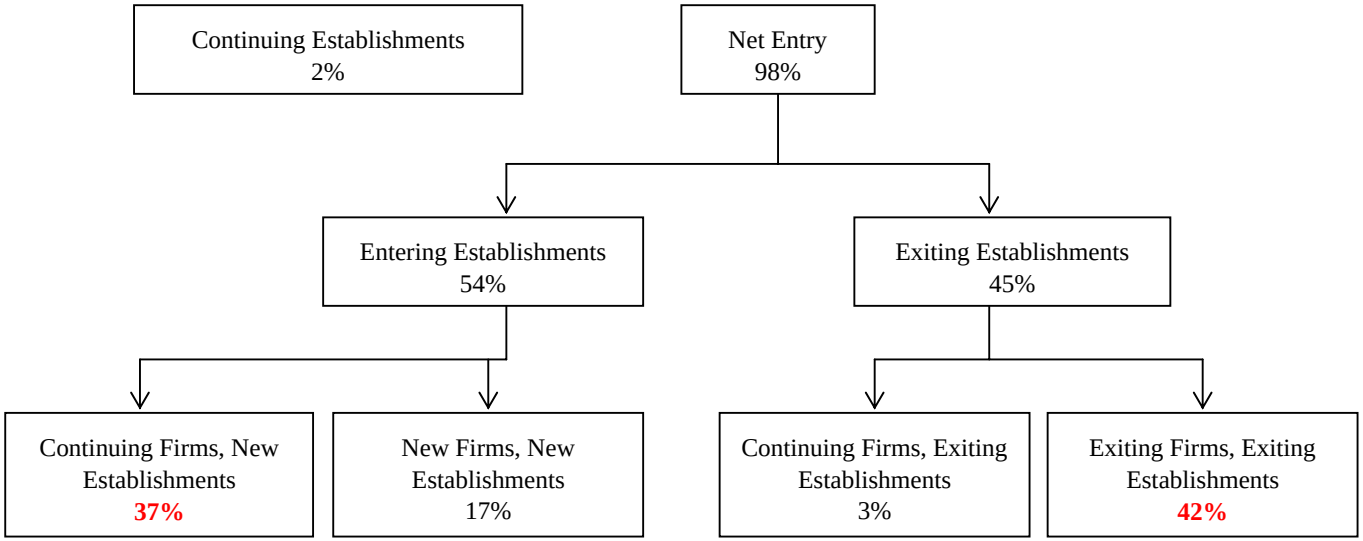
U.K. Lags Behind U.S. and Continental Europe in Hypermarket Development

	Spain	France	U.K.	U.S.
Number of Stores	267	496	71	650
Square Meters / 1000 population	53	71	7	40

Source: Templeton College Study

Dominant source of U.S. retail productivity growth: New establishments of existing chains displace exiting firms

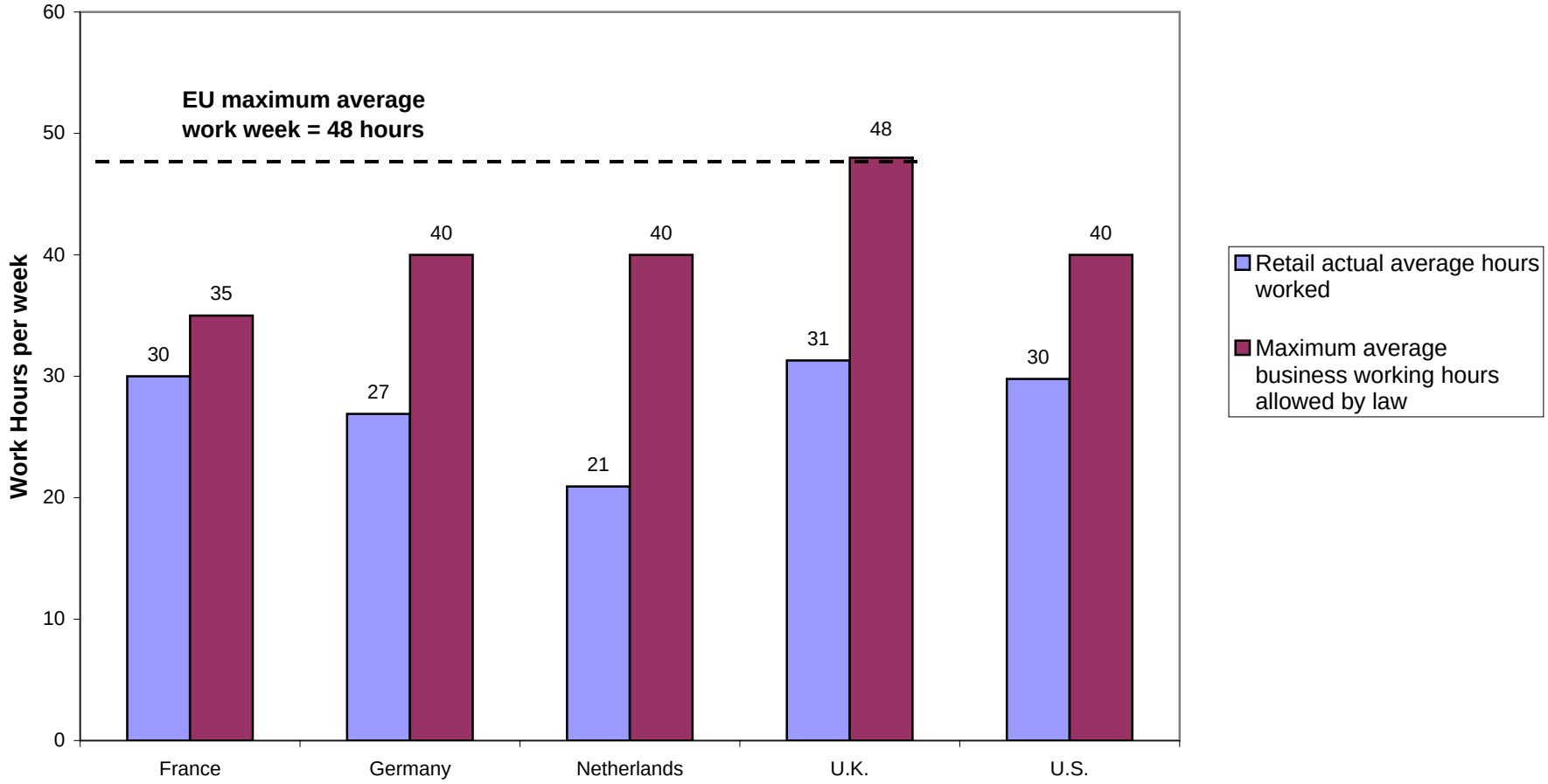
Figure 15X



Source: Foster, Haltiwanger, Krizan (2002). Data are labor productivity for 1987-1997.

Figure 16

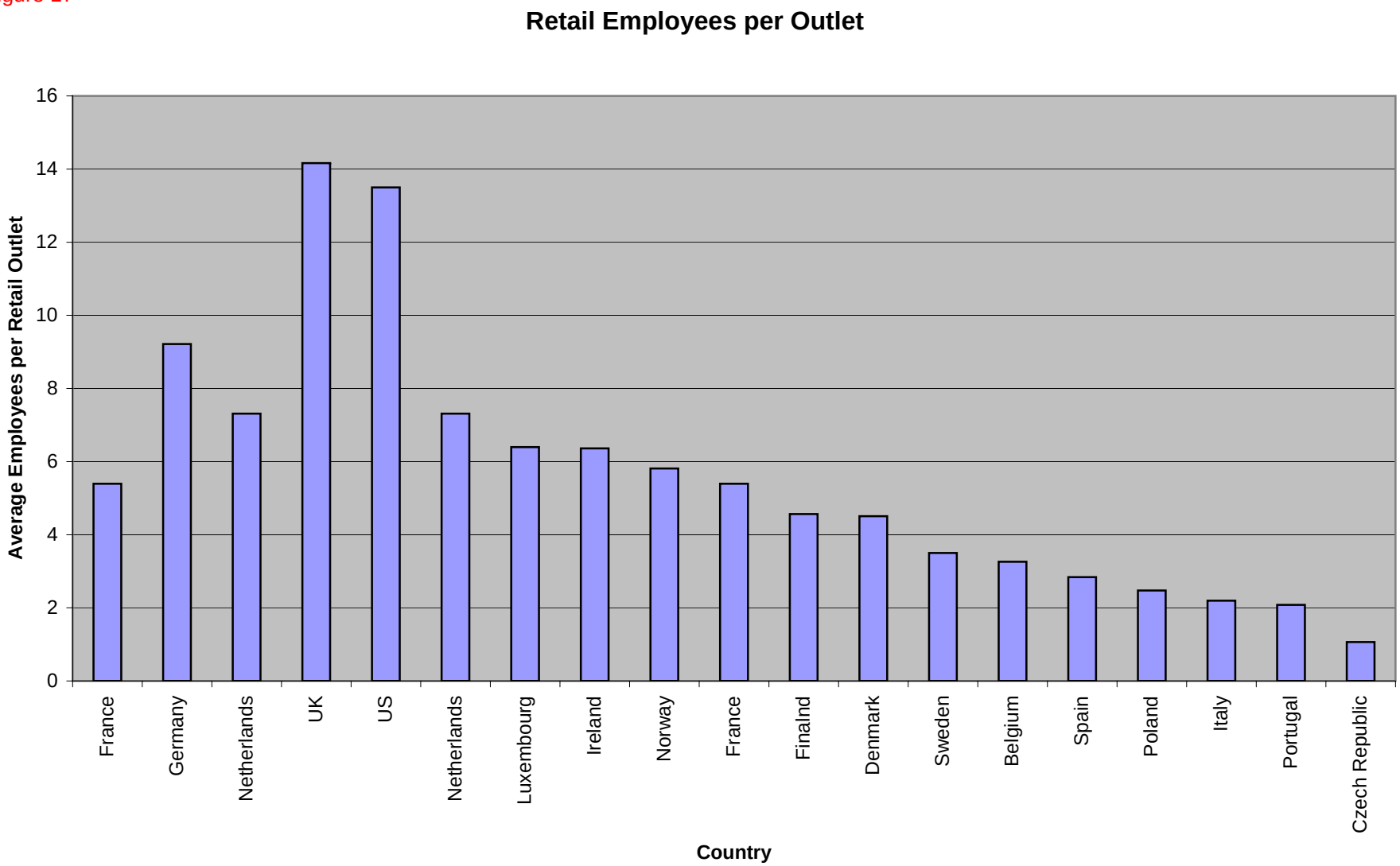
EU Retail Working Hours



Note: Anything above the noted maximum average must be paid as overtime- Explanation is in the data sheet. EU refers to the EU work hours directive. The actual average hours worked are given for the year 2001. The maximum working hours are for the whole economy

Source: Netherlands: Van der Heijden (1998). Germany: International Labour organization. France: Ministry of Labour. UK: Department of Trade and Industry

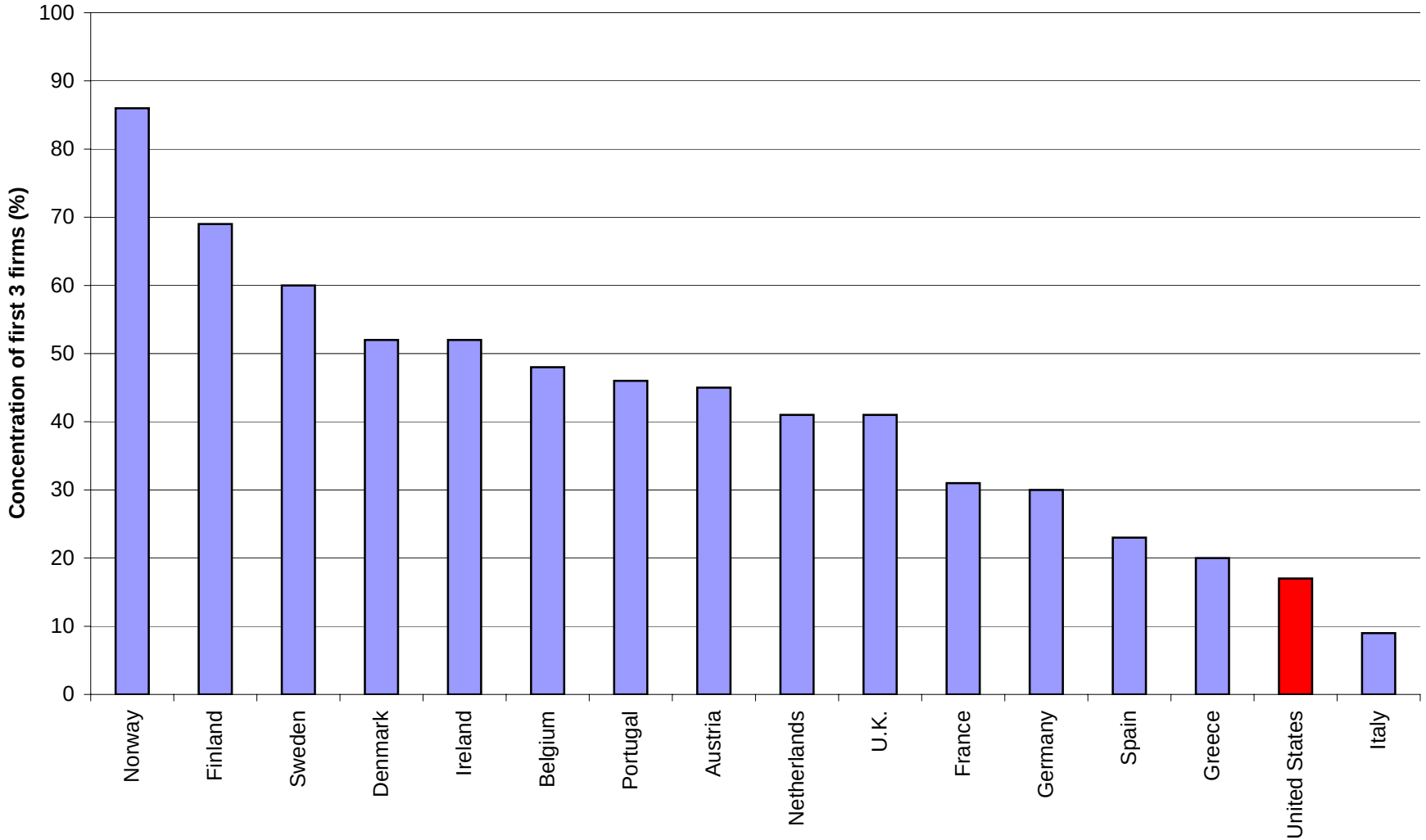
Figure 17



Note: The data are taken from years between 1998 and 2002
Source: Mintel Retail Intelligence

Figure 18

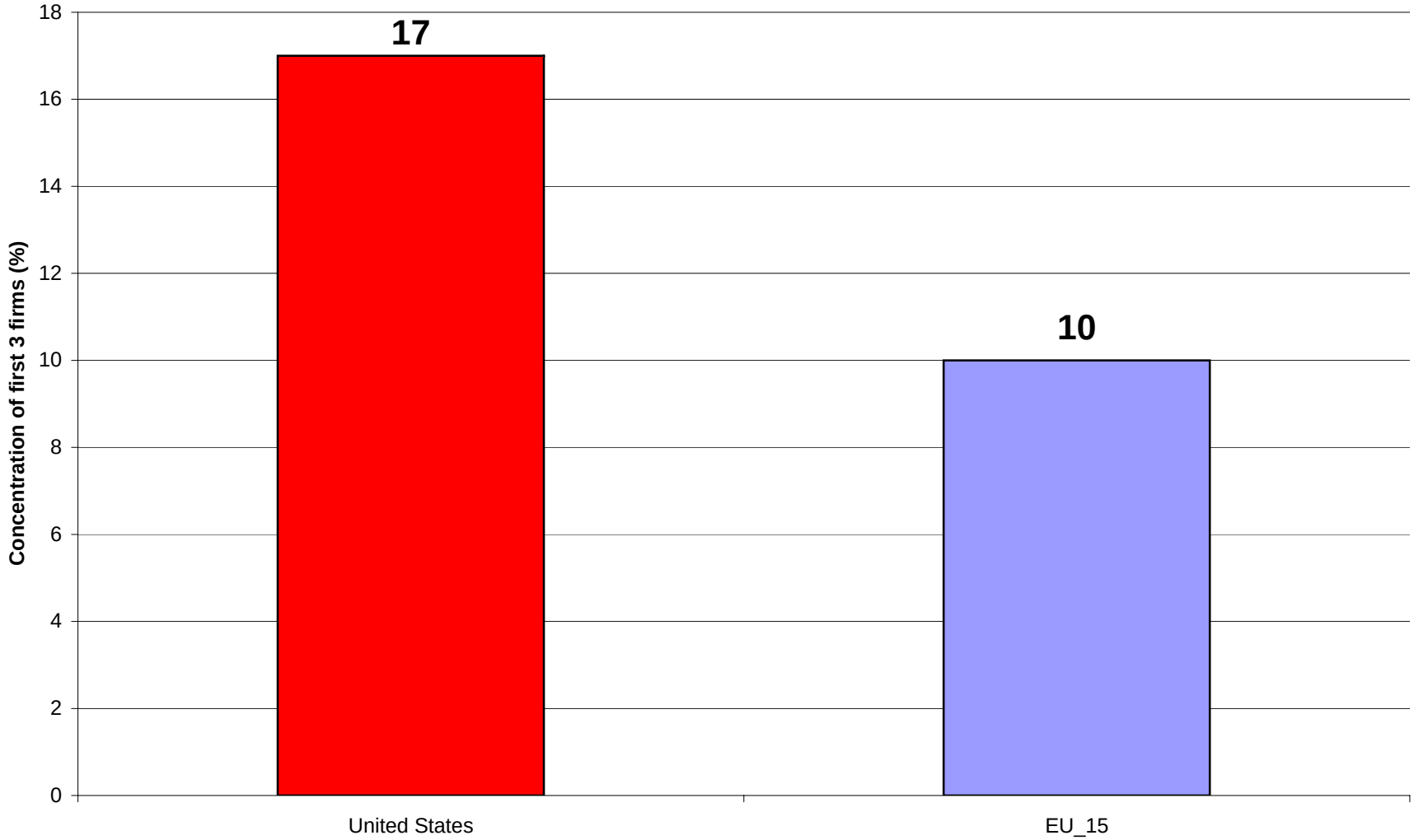
EU retailers have great in their home country markets...



Source: Boylaud, Olivier, "Regulatory Reform in Road Freight and Retail Distribution", OECD, 2000.

Figure 18a

…But lack of cross-border activity mean U.S. retailing is more concentrated economy-wide



Source: Boylaud, Olivier, "Regulatory Reform in Road Freight and Retail Distribution", OECD, 2000.