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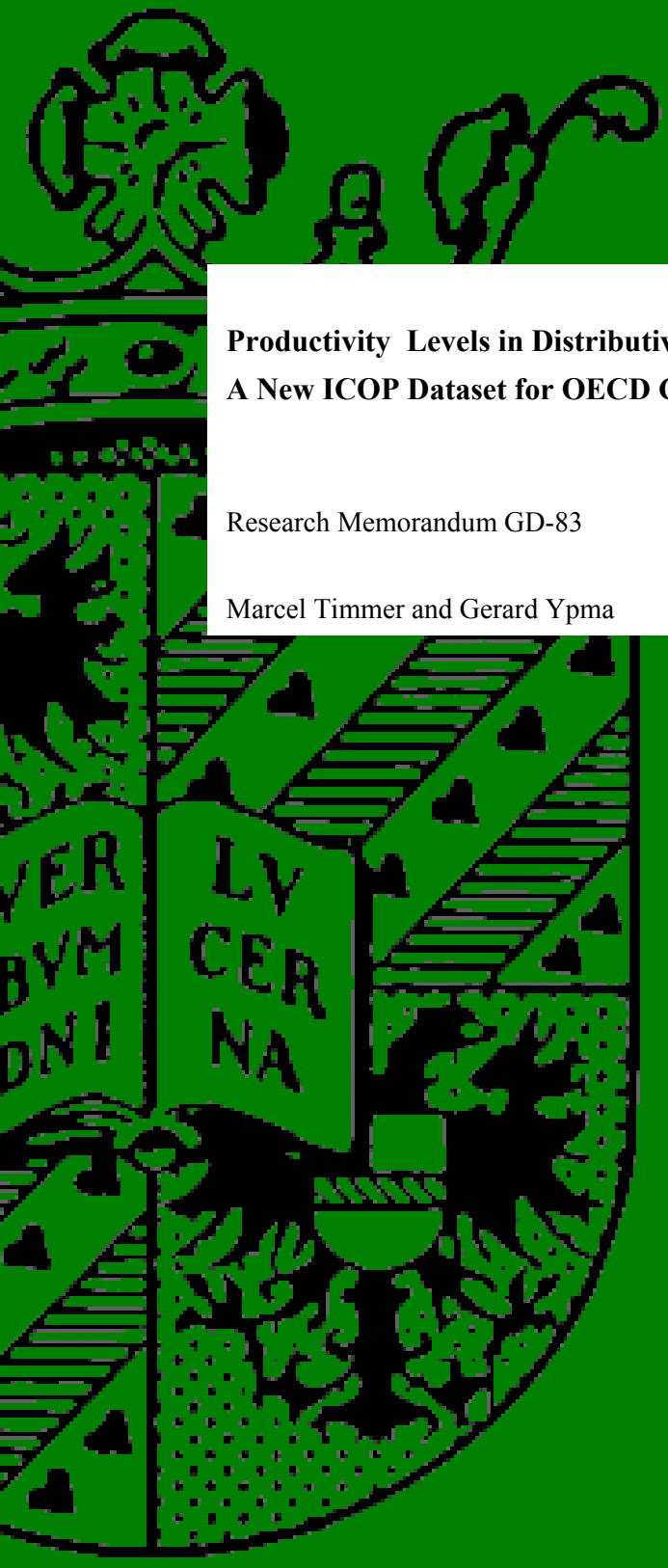
Timmer, Marcel P.; Ypma, Gerard

University of Groningen

RuG

Groningen Growth and Development Centre



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RESEARCH MEMORANDUM

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Marcel P. Timmer and Gerard Ypma[1]
Groningen Growth and Development Centre

Abstract

This study provides a new dataset for international comparisons of labour productivity levels in distributive trade (retail and wholesale trade) between OECD countries. The productivity level comparisons are based on a harmonised set of Purchasing Power Parities (PPPs) for 1997 using the industry-of-origin approach as developed in the International Comparisons of Output and Productivity (ICOP) project. The methodology mimics current national accounts practice in measuring real output over time. The comparative estimates are extrapolated from the benchmark year using those national accounts series. The main finding of this study is that there is still a wide variety in labour productivity levels in the distribution sector across the OECD area. In 2002, the Germany, the Benelux and Scandinavian countries (except Sweden) were leading in terms of PPP-converted value added per hour worked with higher levels than in the U.S.. In Asia, the comparative labour productivity level is on average 39% of the U.S. level, whereas it is 48% on average in Eastern Europe. Within the "old" EU-15, countries like Italy, Portugal, Spain and the U.K. had relative levels less than 70% of the U.S.. There is no clear sign of convergence in productivity levels among OECD countries during the past two decades.

[1] We would like to thank Bart van Ark for stimulating discussions and suggestions.

1. Introduction

International comparisons of productivity distributive trades are still a scarce statistic. This is partly because of the general perception the distribution sector is a static business without much potential for large differences in growth performance across countries. This is no longer true. The trade sector has been one of the strongest contributors to the resurgence of productivity growth in the U.S. in the 1990s (Jorgenson, Ho and Stiroh 2003, Triplett and Bosworth 2004). A detailed sectoral perspective on growth suggests that performance in distributive trade sectors is at the heart of the widening productivity gap between the U.S. and the European Union. Over half of the economy-wide labour productivity growth lead of the U.S. over Europe since 1995 is accounted for by diverging performance in wholesale and retail trade (van Ark, Inklaar and McGuckin 2003). The effects of Wal-Mart's success are a prime example of this process and have attracted a lot of attention. More generally, the rapid diffusion of ICT has led to major shifts in the characteristics of the trade business (Oi 1992, McKinsey Global Institute 2002, Baily and Kirkegaard 2004; McGuckin, Spiegelman and van Ark 2005). The development of computers, scanners and inventory control software and new ways of business organisation have all contributed to the rapid pace of innovation in this industry. In addition, these developments heightened competitive pressure building pressure on less-productive firms throughout the sector. The general view is that Europe is lagging behind in this second "distributive trade revolution", just as it did with the introduction of the supermarket concept of retailing in the 1950s and 1960s.

Another reason for the limited availability of international comparisons of productivity in the distributive trade sector are the serious problems in obtaining an adequate measure of real output. This problem has been addressed in various studies, but mostly from a growth perspective (Triplett and Bosworth 2004, Ratchford 2003, Timmer et al., 2005). The problems are even bigger in comparisons of productivity levels, as they require category-specific purchasing power parities. Indeed there are only a few studies which provide comparisons of output and productivity levels. Still, in addition to the growth studies, such estimates of productivity levels in the trade sector are potentially of great interest for academic, policy and business analysis. They allow benchmarking of countries' performance and indicate the gaps countries face compared with the productivity leaders. Productivity level comparisons are needed for analyses of catch-up and convergence, and help shed light on the relationship between productivity and competitiveness. It also strengthens the analysis of the locus of technical progress, in particular when supplemented by micro-oriented investigation of variance in performance between industries and between average and best practice firms.

In this paper we provide new estimates for differences in relative labour productivity levels in the distributive trade sector for a wide range of OECD countries. The study is in the tradition of earlier work by Smith and Hitchens (1985), Pilat (1996), O'Mahony, Oulton and Vass (1998) and van Ark, Monnikhof and Mulder (1999). We improve on previous studies by using a measurement method which is more consistent with the measurement of real trade output recommended in the System of National Accounts (SNA). In addition, this study provides results for a much wider set of countries, including 25 OECD and Taiwan. The benchmark year for which PPPs are developed is 1997 and the comparative levels of productivity are extrapolated to the period from 1979 to 2002.

In Section 2 we provide an overview of previous comparisons of distributive trade output and productivity. A wide variety of PPP adjustment methods have been used, but none of those is

consistent with current practice of volume measurement of the distributive trade sector in national accounts. In this study we will use a harmonised method which mimics current national accounts practice for the measurement of trade volumes over time. The latter is described in Section 3. In Section 4 the equivalent method for interspatial comparisons is laid out. This method is compared with alternative methods. In Section 5 we describe the basic data sources for the derivation of trade PPPs and the output and labour input data, which are required for the international comparisons of trade productivity. The set of PPPs used to obtain a comparable levels of trade output is described in Section 6 and the productivity level comparisons are discussed in Chapter 7. Section 8 concludes.

2. Previous Comparisons of Distributive Trade Productivity

International comparisons of output and productivity levels can be distinguished by two basic approaches: the case study approach and the sectoral approach. In the case study approach, detailed industry groups are singled out for close scrutiny on the basis of data for individual establishments. This is the approach taken in a series of studies by the McKinsey Global Institute, discussed in Baily (1993), Baily and Zitzewitz (2001) and Baily and Solow (2001). The sectoral approach focuses on industries in relation to the performance of the total economy. The latter typically stays as close as possible to the concepts and definitions used in the macroeconomic national accounts and it aims to achieve full coverage of all activities in an industry or sector. The sectoral approach typically relies on data from economic censuses, industry surveys and the national accounts. Major studies of distributive trade using the sectoral approach include those at the National Institute of Economic and Social Research (NIESR) by Smith and Hitchens (1985), O'Mahony, Oulton and Vass (1998) updated in O'Mahony and de Boer (2002), and within the ICOP project at the Groningen Growth and Development Centre by van Ark, Monnikhof and Mulder (1999), updated in van Ark and Timmer (2001). The study by Pilat (1996) and Mulder (1999) is also in the latter tradition.

International comparisons of relative levels of trade volumes differ in two important respects: first, in the choice of output and input concepts and, second, in the derivation of relative output prices to convert output in national currencies into a comparable unit. Firstly, output can either be measured as sales value (Pilat 1996), margin value (Baily and Zitzewitz 2001, van Ark, Monnikhof and Mulder 1999) or value added (Mulder 1999, van Ark, Monnikhof and Mulder 1999, O'Mahony, Oulton, and Vass 1998). Labour input be measured as number of employees (Pilat 1996), total employment, including self-employed workers (Pilat 1996, van Ark, Monnikhof and Mulder 1999) or total hours worked (Baily and Zitzewitz 2001, van Ark, Monnikhof and Mulder 1999, O'Mahony, Oulton, and Vass 1998). Secondly, studies differ in the derivation of relative output prices to convert output in national currencies into a comparable unit. Baily and Zitzewitz (2001) use purchasing power parities for consumption from the International Comparisons Program (ICP) to compare retail output across a small number of OECD countries. Their rationale for using the consumption goods PPP is that the general price level of all consumption goods should give an unbiased estimate of the price level (opportunity cost) of a specific consumption good, retail service, but they concede that the error in using a broad PPP may be substantial.[2] Also Pilat (1996) and O'Mahony, Oulton and Vass (1998) use expenditure PPPs for single deflation of output in both retail and wholesale trade. Mulder (1999) and Van Ark, Monnikhof and Mulder (1999) provide a first attempt to double deflate the margin value in retail by deflating sales with expenditure PPPs from ICP and purchases with unit value ratios for manufacturing from ICOP studies (see next section). For wholesale they used a single deflation procedure which was based on output-based unit value ratios for manufacturing.

The differences in output and input concepts and various PPP approaches are not trivial. In Table 1 we provide a comparison of the results from the earlier studies mentioned above. All studies

2 See discussion in Baily and Solow (2001, p. 165). They also experimented with an alternative approach called "format-bridging" in which retail formats are matched with each other. Using assumptions about the relative productivity across formats, differences in labour productivity across countries are measured through differences in the format mix. They call this methodology a PPP approach, but actually no PPP comparison is being made, either explicitly or implicitly.

here attempt to compare relative labour productivity levels in distributive trade across a small number of OECD countries (Canada, France, Germany, Netherlands, U.K. and U.S.) in the beginning of the 1990s.[3] The first rows indicate alternative estimates for the aggregate distribution sector (retail and wholesale combined), all expressed as a percentage of the labour productivity level in the U.S. The estimates are shown to differ by 20 percentage points or more. For example, estimates of relative productivity in Germany vary from 70 to 92 percent of the U.S. level, and for the Netherlands from 70 to 95 percent. At the sub-sector level differences can be even bigger. For retailing, estimates by McKinsey suggest that European productivity was on par with the U.S. But the other studies strongly disagree. For the U.K. estimates differ from 69 to 103 percent of the U.S. level, for the Netherlands from 55 to 95 percent and for Germany from 81 to 101 percent.

Part of these differences is due to the year of comparison, but more important are differences in output and input concepts and the PPP methodology. For example, the difference in retail productivity estimates for the Netherlands between van Ark et al.. (1999) and McKinsey is mainly due to different PPP methodologies, while the difference between the former and Pilat (1996) is mainly due to the labour concept used. A relatively large share of retail employees in the Netherlands are part-time workers, hence hours worked relative to the U.S. are much lower than the comparative number of employees.

Table 1 Comparative levels of labour productivity in retail and wholesale trade according to various studies, early 1990s

	U.S.	Canada	France	Ger-many	Nether-lands	U.K.		Output concept	Labour concept	PPP concept	Year
Wholesale and retail trade											
O'Mahony, Oulton and Vass (1998, Table 2)	100	*n.a.*	99	81	*n.a.*	71		GVA	hour	Exp	1993
van Ark, Monnikhof and Mulder (1999, Table 7)	100	51	102	70	70	*n.a.*		GVA	hour	Exp	1990
van Ark, Monnikhof and Mulder (1999, Table 6)	100	58	85	92	89	*n.a.*		Margin	hour	Exp/Pur	1992
Pilat (1996, Table 4)	100	58	97	79	95	60		GVA	person	Exp	1990
- Retail trade											
O'Mahony, Oulton and Vass (1998, Table 2)	100	*n.a.*	*n.a.*	81	*n.a.*	69		GVA	hour	Exp	1993
Baily and Solow (2001, Table 3)	100	*n.a.*	96	96	95	103		Margin	hour	Exp	1994
van Ark, Monnikhof and Mulder (1999, Table 6)	100	50	94	92	75	*n.a.*		Margin	hour	Exp/Pur	1992
Pilat (1996, Table 4)	100	*n.a.*	95	101	55	78		Sales	employ	Exp	1990
- Wholesale trade											
O'Mahony, Oulton and Vass (1998, Table 2)	100	*n.a.*	*n.a.*	72	*n.a.*	77		GVA	hour	Exp	1993
van Ark, Monnikhof and Mulder (1999, Table 6)	100	67	73	98	104	*n.a.*		Margin	hour	Pur	1992

Notes: Output concept: GVA = gross value added, Margin = gross margin and Sales = total sales
Labour concept: Hour = per hour worked, person = per person engaged and employ = per employee PPP concept: Exp = deflation of sales by expenditure PPP, Pur= deflation of purchases by purchase PPP, n.a. =not available

In this study we will use a harmonised approach to derive relative labour productivity levels in both retailing and wholesaling for 26 countries. Labour productivity is measured as value added per hour worked, which is the preferred concept in international comparisons of productivity (see OECD 2001). PPPs are derived by mimicking intertemporal deflation procedures for distributive trade sectors as used in the national accounts of individual countries. This deflation procedure is based on the assumption that changes in the sales volume equal that of the real margins. Thus an implicit PPP for margins are derived, which is consistent with those used in intertemporal estimates.

[3] An exception is Pilat (1996) who provides estimates for all OECD countries.

3. Current Practice in Measuring Real Output in Distributive Trade in Intertemporal National Accounts

In this study we follow the conventions of the System of National Accounts (SNA, see UN 1993) as applied to the time series of value added in current and constant prices in the national accounts of individual countries. It is useful to set out the different approaches in the national accounts in this section before translating this an international comparative perspective. In the SNA, retail and wholesale industries are treated as margin industries. Although wholesalers and retailers actually buy and sell goods, the goods purchased are not treated as part of intermediate consumption when they are resold with only minimal processing such as grading, cleaning, packaging, etc.. Wholesalers and retailers are treated as supplying services rather than goods to their customers by storing and displaying a selection of goods in convenient locations and making them easily available for customers to buy. Trade output is measured by the total value of the trade margins realized on the goods purchased for resale. A trade margin is defined as the difference between the value of the goods sold and the value of the goods that would need to be purchased to replace them. It therefore reflects the price a consumer must pay for the retail or wholesale services.[4] Gross value added is derived by subtracting costs of intermediate inputs from gross trade margins. Intermediate costs include operating costs such as rent, packing materials, advertising, communication services, electricity and so on.[5]

Let S denote the value of sales

$$S = p_S q_S \tag{1}$$

with p_S denoting the sales price and q_S the quantities sold. And similarly the costs of goods sold by C:

$$C = p_C q_C \tag{2}$$

with p_C the purchase price and q_C the quantity purchased for resale.

Then the gross trade margin (M) is given by

$$M = p_M q_M = S - C = p_S q_S - p_C q_C \tag{3}$$

The separation of the trade margin value in a price and quantity component is far from straightforward and has not yet been adequately resolved in statistical practice.[6] This is mainly related

[4] See UN (1993) *SNA*, para 6.110 and 6.111.
[5] The use of intermediate inputs in the distributive trade sector is not negligible as suggested by Baily and Zitzewitz (2001, footnote 10). In 1997 in the U.S., intermediate inputs made up about 35% of the gross margin in both wholesale and retail trade (derived from BEA, Detailed IO-table 1997).
[6] For the following we rely on Eurostat (2001) and Triplett and Bosworth (2004). Eurostat (2001, section 4.6) provides a useful discussion of the problems in measuring real output in the trade sector. Triplett and Bosworth (2004, Chapter 4) study these problems from the perspective of productivity measurement and describe current practice in the U.S. See also Hill (1977) and Griliches (1992) for more general statements on the difficulties of measuring output in service sector.

to the difficulty to properly measure the quality of the services provided by the trade firm. Its output can be seen as a composite bundle of services that surround the product that it sells. The quality of these service is dependent on store characteristics like the convenience of the location of the store, the variety of goods on offer, information and swiftness of service, but also includes ancillary services such as credit facilities, delivery, after-sales service etc. Hence the volume of trade services depends not only on the number of transactions, but also on the quality of the service. While the former can be proxied in terms of quantities of goods sold, the current state of statistical information does not allow the measurement of the latter (Eurostat (2001) and Triplett and Bosworth (2004)).

Four alternative methods have been tried in various studies to measure trade output volumes. As quantities are usually not directly observed, the volume measures are obtained by some combination of deflating the margin, sales and/or purchase values by their appropriate prices. The four methods are (1) margin pricing, (2) double deflation, (3) sales quantity indicators and (4) single deflation.

In principle the direct measurement of price margins of specific items is the best option to obtain a margin deflator. The margin price for a product is measured as the difference between the price of the good when purchased by the trade firm and the price received when it is sold to the customer. Margin pricing provides a straightforward way to correct prices for quality of trade services when complemented by store characteristics, e.g. in a hedonic framework. However, these measures are still experimental.[7]

Another method is double deflation. Basically, margin pricing is equal to double deflation at the lowest levels possible (products sold at a particular firm). But double deflation is normally applied at higher levels of aggregation. It implies that sales and goods purchased are each deflated by their own deflator. However, purchase prices of goods sold are generally not available. Another problem is that double deflated margins are quite sensitive to measurement errors in one of the price indices because of the relatively large share of purchases in sales values. This can make the estimate of the volume of the margin very erratic. Therefore double deflation of trade output is not practised in the national accounts any OECD country. However, Timmer, Inklaar and van Ark (2005) argue that double deflated measures need to be reconsidered given the increasing weakness of the standard national accounts methodology to measure margin volumes.

The standard national accounts methodology for measuring trade output volumes is what we call the 'sales indicator method'. Instead of constructing separate PPPs for sales and purchases, this method assumes that the volume index of margins equals the volume index of sales. It is based on the simple idea that when sales volumes double, trade services double as well.

Finally, margins can also be single deflated by a sales price index, but for national accounting this method is considered to be inferior to the other methods, because one essentially assumes that the price index for sales equals the price index for the margin. This implies that the price change of the products sold is the same as the price change of the services that the trade sector is providing. (Eurostat, 2001, p. 81). There is very little reason to assume that this is the case as margin prices will be mainly determined by the prices paid for labour and capital input, not the purchase (manufacturing) price of the product sold.

[7] Recently, the BLS in the U.S. has introduced a new initiative to measure margin prices in its PPI program by surveying directly the difference between the sales price of a specific item and its acquisition cost. Some services, such as service shops of auto-dealers, provide directly-priced services which can also be surveyed (Manser 2005). Experimentation with measurement of price margins is also taking place in Europe, for example in Finland (Eurostat, 2001) and Norway.

Various of these methods have also been replicated in studies of comparisons of output and productivity levels in distributive sector. So far, international comparisons have mainly relied on the single deflation methodology (method 4). Most studies discussed in section 2 use a single deflation procedure with an expenditure PPP, which refers to the sales price of consumer items. Only van Ark, Monnikhof and Mulder (1999) attempted a double deflation procedure (method 2), which was further improved upon in van Ark and Timmer (2001). In the latter study the trade sector is considered as a completely integrated system of retailers which buy all their goods from wholesalers. Two sets of prices were available for the construction of PPPs: retail output prices were based on expenditure PPPs and wholesale input prices were based on production PPPs for manufacturing. Using the price margins (in national currencies) in wholesale and retail trade. The implicit PPPs for retail input and wholesale trade could be derived. Assuming that the latter two PPPs are equal, the differences are averaged with a geometric weighting. Unfortunately a number of difficulties appeared with this approach. First, only part of wholesale output is sold to retailing, and retailers increasingly obtain their purchases directly from the manufacturing. In addition, frequent occurrence of rebates and discounts may drive unmeasured wedges between wholesale sales prices and retail purchase prices. Finally, retail input and wholesale sales prices could only be matched at a fairly aggregated level of retail categories so that product mix problems may cause errors.

In this paper we therefore pursue the sales indicator method (method 3), which is most common in intertemporal national accounts setting, also from the international comparison of output and productivity. To facilitate the discussion we work from the perspective of constructing the appropriate PPPs from which the relevant volume measures can be obtained. We use relative expenditure prices from the ICP, and relative producer output prices from ICOP. It is important to apply the sales indicator method at the lowest level by distinguishing as much trade industries as possible. Shifts between trade industries and channels will be included in the volume component as ideally required.

4. The Derivation of Output PPPs for Trade Sectors

In this section we set out a general model for deriving a trade margin PPP. In analogy with the intertemporal case described in Section 3, four methods can be distinguished: (1a) PPPs based on margin prices, (2a) double deflated margin PPP, (3a) PPPs based on the sales quantity indicator and (4a) single deflated PPPs . In the case of a binary comparison between countries A and B and observations for margin prices (1a), the PPP would simply be the ratio of the margin price in A and B. However, internationally comparable margin prices have not been collected so far and its application will therefore not be pursued here any further. Before discussing our preferred method, which is the use of the sales quantity indicator (3a), we first set out the most general specification, which is the double deflation method (2a). We show that the double deflated margin PPP can be stated in terms of sales and purchases in national currencies and relative PPPs for sales and purchases. Indeed, if all PPP were correctly measured and available at the most detailed level with corresponding sales and purchase weights, double deflation would be the preferable method. However, in general only one set of prices is observed in each industry: retail sales prices in the retail trade sector and wholesale purchase prices in the wholesale trade sector. Because of this, single deflation (4a) has often been used in international comparisons. As discussed above, this method is considered to be inferior because the assumption that the relative prices of the goods sold equal that of the service provided in selling the goods is clearly unrealistic. Instead, in this paper we use the sales indicator method (3a), which assumes that volumes of sales are proportional to volumes of trade services. To apply this, we make use of sales PPP in retail (and purchase UVRs in wholesale) and corresponding margins but also of the additional information on margin-to-sales ratios (MTS) in national currencies. After having described the methods, the impact of the level of disaggregation of industries within the retail and wholesale sector is discussed on the basis of a hypothetical example.

Double deflation PPPs

Aggregate binary PPPs can be measured in two ways: using quantity weights of country A (Paasche index) or of country B (Laspeyres index). Let $M^{B(A)}$ denote the margin value in B at country A prices and $M^{B(B)}$ at country B's own prices. Then using (3) the trade margin PPP at country B quantity weights ($PPP_{M,Lasp}$) is given by:

$$PPP_{M,Lasp} = \frac{M^{B(A)}}{M^{B(B)}} = \frac{\sum_i p_{S,i}^A q_{S,i}^B - \sum_i p_{C,i}^A q_{C,i}^B}{\sum_i p_{S,i}^B q_{S,i}^B - \sum_i p_{C,i}^B q_{C,i}^B} \qquad (4a)$$

with *i* indexing the products being purchased and sold. Similarly the margin PPP at country A quantities ($PPP_{M,Paas}$) is given by:

$$PPP_{M,Paas} = \frac{M^{A(A)}}{M^{A(B)}} = \frac{\sum_i p_{S,i}^A q_{S,i}^A - \sum_i p_{C,i}^A q_{C,i}^A}{\sum_i p_{S,i}^B q_{S,i}^A - \sum_i p_{C,i}^B q_{C,i}^A} \qquad (4b)$$

For the empirical implementation, the PPP in equation (4) should be rewritten in terms of values and relative prices. Let $PPP_{S,i}$ denote the relative sales price of good *i* in country A relative to B:

$$PPP_{S,i} = \frac{p_{S,i}^{A}}{p_{S,i}^{B}} \tag{5a}$$

and similarly the relative price of goods purchased for resale $PPP_{C,i}$ given by

$$PPP_{C,i} = \frac{p_{C,i}^{A}}{p_{C,i}^{B}} \tag{5b}$$

By using (5), $M^{A(B)}$ and $M^{B(A)}$ as given in equation (4) can be rewritten as follows

$$\begin{aligned} M^{B(A)} &= \sum_i p_{S,i}^{A} q_{S,i}^{B} - \sum_i p_{C,i}^{A} q_{C,i}^{B} = \sum_i \frac{p_{S,i}^{B}}{p_{S,i}^{B}} p_{S,i}^{A} q_{S,i}^{B} - \sum_i \frac{p_{S,i}^{B}}{p_{S,i}^{B}} p_{C,i}^{A} q_{C,i}^{B} \\ &= \sum_i S_i^{B} PPP_{S,i} - \sum_i C_i^{B} PPP_{C,i} \end{aligned} \tag{6a}$$

and

$$\begin{aligned} M^{A(B)} &= \sum_i p_{S,i}^{B} q_{S,i}^{A} - \sum_i p_{C,i}^{B} q_{C,i}^{A} = \sum_i \frac{p_{S,i}^{A}}{p_{S,i}^{A}} p_{S,i}^{B} q_{S,i}^{A} - \sum_i \frac{p_{S,i}^{A}}{p_{S,i}^{A}} p_{C,i}^{B} q_{C,i}^{A} \\ &= \sum_i \frac{S_i^{A}}{PPP_{S,i}} - \sum_i \frac{C_i^{A}}{PPP_{C,i}} \end{aligned} \tag{6b}$$

Essentially this implies that the sales PPPs for item *i* are weighted by their sales value in national currencies and the purchase PPPs for items *i* are weighted by their purchase value in national currencies. Substituting (6a) in (4a) gives

$$PPP_{M,Lasp} = \frac{\sum_i S_i^{B} PPP_{S,i} - \sum_i C_i^{B} PPP_{C,i}}{\sum_i S_i^{B} - \sum_i C_i^{B}} \tag{7a}$$

and substituting (6b) in (4b) gives

$$PPP_{M,Paas} = \frac{\sum_i S_i^{A} - \sum_i C_i^{A}}{\sum_i \frac{S_i^{A}}{PPP_{S,i}} - \sum_i \frac{C_i^{A}}{PPP_{C,i}}} \tag{7b}$$

Equation 7a shows that the Laspeyres double deflated PPP for trade margins can be derived as the ratio of the margin in country B double deflated at country A prices, and the margin in country B at national prices. The Paasche is defined by ratio of the margin in country A at national prices and the margin in country A double deflated at country B prices.

Single deflation PPPs

It can be easily shown that in the case of single deflation, the margin PPP can be written as a weighted product sales PPP, with margin shares as weights. For single deflation one assumes $PPP_{S,i} = PPP_{C,i}$ so rewriting equation (7)

$$PPP_{M,Lasp} = \frac{\sum_i M_i^B PPP_{S,i}}{\sum_i M_i^B}$$

and

$$PPP_{M,Paas} = \frac{\sum_i M_i^A}{\sum_i \frac{M_i^A}{PPP_{S,i}}}$$

PPPs based on the sales indicator method

Instead of applying single deflation, one can also mimic the sales indicator method used in intertemporal analysis for the construction of PPPs. Relative to the single deflation method, the sales-indicator method makes use of the margin-to-sales ratio instead of simply using the margins as weights. Changing margin-to-sales ratios might reflect changes in the margin prices, and this information should be included. Relative to the double deflation method one makes the simplifying assumption that margin-to-sales ratios in common prices are similar in both countries. This is equivalent to stating that all sales transactions represent the same quantity of trade services in both countries. Obviously this is a strong assumption as service levels may differ between countries, even for the same set of goods and type of outlet. However, without detailed information on service quality levels, this assumption is necessary to separate prices and quantities and proxy the double deflated PPP as good as possible. The available price data is different for the wholesale and retail industries. For retail, only sales PPP are available while in the case of wholesale only purchase prices are available (see discussion on data sources in the next section). Therefore both sectors will be treated separately.

Retail PPP based on the sales indicator method

The assumption of constant margin-to-sales ratios in common prices can be stated in the case of the Laspeyres PPP as follows

$$\frac{M_i^{A(A)}}{S_i^{A(A)}} = \frac{M_i^{B(A)}}{S_i^{B(A)}} \qquad (8a)$$

and in the case of the Paasche PPP as[8]

$$\frac{M_i^{A(B)}}{S_i^{A(B)}} = \frac{M_i^{B(B)}}{S_i^{B(B)}} \tag{8b}$$

Using (5a) and (8a), the Laspeyres PPP in equation (4a) can be written as follows

$$\begin{aligned} PPP_{M,Lasp}^{Retail} &= \frac{M^{B(A)}}{M^{B(B)}} = \frac{1}{M^{B(B)}} \sum_i \frac{M_i^{A(A)}}{S_i^{A(A)}} S_i^{B(A)} = \frac{1}{M^{B(B)}} \sum_i \frac{M_i^{A(A)}}{S_i^{A(A)}} S_i^{B(B)} PPP_{S,i} \\ &= \sum_i \left(\frac{M_i^{B(B)}}{M^{B(B)}} \right) \frac{\left(\frac{M_i^{A(A)}}{S_i^{A(A)}} \right)}{\left(\frac{M_i^{B(B)}}{S_i^{B(B)}} \right)} PPP_{S,i} = \sum_i \left(\frac{M_i^{B(B)}}{M^{B(B)}} \right) \frac{R_i^A}{R_i^B} PPP_{S,i} \end{aligned} \tag{9a}$$

with $R_i^A = \frac{M_i^{A(A)}}{S_i^{A(A)}}$ and $R_i^B = \frac{M_i^{B(B)}}{S_i^{B(B)}}$. It shows that the Laspeyres PPP for the margin in retail trade can be derived as a weighted average of the sales PPP of all goods, corrected for the differences in margin-to-sales ratios between the two countries *in national prices*.[9] The weights are given by the shares of goods *i* in the total margin in country B.

Similarly using (5a) and (8b), the Paasche PPP in equation (4b) can be written as

$$PPP_{M,Paas}^{Retail} = \frac{1}{\sum_i \left(\frac{M_i^{A(A)}}{M^{A(A)}} \right) \frac{R_i^B}{R_i^A} \frac{1}{PPP_{S,i}}} \tag{9b}$$

It shows that the Paasche PPP for retail trade margin can be derived as a weighted average of the sales PPP of all goods, corrected for the differences in margin-to-sales ratios between the two countries *in national prices*.[10] The weights are given by the shares of goods *i* in the total margin in country A.

[8] It can be easily shown that assumptions (8a) and (8b) are equivalent to assuming that the volume ratio of margins between country A and B equals the volume ratio of sales by dividing through the margin-sales price ratio in A in case of (8a) or the margin-sales price ratio in B in case of (8b).

[9] Note that this does not contradict the assumption of constant margin-to-sales ratios in the two countries. This assumption is stated in common prices, in the case of the Laspeyres in prices of the base country, see (8a).

[10] Note again that this does not contradict the assumption of constant margin-to-sales ratios in the two countries. This assumption is stated in common prices, in the case of the Paasche in prices of the other country, see (8b).

Table 2 provides an example of the derivation of a retail margin PPP in a comparison between Germany and the U.S. for the benchmark year 1997. The retail trade sector is divided into sub-sectors (3-digit) and industries (4-digit) as shown in the first column. Columns 2 and 3 indicate the margin-to-sales ratio in the U.S. and Germany. These are the R's in equation (9). Next, the sales PPP (PPP_S) for each industry is given, either the Laspeyres which is used in (9a) or the Paasche which is used in (9b). Then the share of each industry in the sub-sector's margin value at national prices is shown. This share is M_i / M in equation (9). Finally, sub-sector margin PPPs are given, derived on basis of the previous columns using equation (9). The retail trade sector margin PPP can either be derived by reweighing the sub-sector PPPs by the share in retail margin given in the last columns, or directly on the basis of industry margin PPPs using equation (9). The final result is given in the last row. The Laspeyres retail margin PPP is 2.09, while the Paasche PPP is 1.79. As a summary measure the Fisher is often taken which is the square root of the product of Paasche and Laspeyres, which comes at 1.94.

Wholesale trade PPP based on the sales indicator method

In the case of the wholesale sector only purchase prices are observed, as derived from manufacturing output prices. Hence the available measure is $PPP_{C,i}$ instead of $PPP_{S,i}$. In this case the assumption of constant margin-to-sales ratios can be rewritten as constant margin-to-cost ratios and using a similar derivation as above the Laspeyres PPP is given by:

$$PPP^{Whole}_{M,Lasp} = \sum_i \left(\frac{M_i^{B(B)}}{M^{B(B)}} \right) \frac{\widetilde{R}_i^A}{\widetilde{R}_i^B} PPP_{C,i} \qquad (10a)$$

with $\widetilde{R}_i^A = \dfrac{M_i^{A(A)}}{C_i^{A(A)}}$ and $\widetilde{R}_i^B = \dfrac{M_i^{B(B)}}{C_i^{B(B)}}$.

It shows that the Laspeyres margin PPP for wholesale trade output can be derived as a weighted average of the purchase cost PPP of all goods, corrected for the differences in margin-to-cost ratios between the two countries *in national prices*. The weights are given by the shares of goods *i* in the total margin in country B. Similarly the Paasche PPP can be written as

$$PPP^{Whole}_{M,Paas} = \frac{1}{\sum_i \left(\frac{M_i^{A(A)}}{M^{A(A)}} \right) \frac{\widetilde{R}_i^B}{\widetilde{R}_i^A} \frac{1}{PPP_{C,i}}} \qquad (10b)$$

It shows that the Paasche margin PPP for wholesale trade output can be derived as a weighted average of the purchase cost PPP of all goods, corrected for the differences in margin-to-cost ratios between the two countries *in national prices*. The weights are given by the shares of goods *i* in the total margin in country A.

Table 2 Example of derivation of Retail margin PPP for Germany/US, 1997

		Margin to sales ratio			Sales PPP (DEM/$)			Share in margin value			Margin PPP (DEM/$)				Share in margin value	
		US	Ger		Lasp	Paas		US	Ger		Lasp	Paas	Fisher		US	Ger
52.1	**Non-specialized retail trade in stores**	**26%**	**24%**								**1.88**	**1.51**	**1.69**		**39%**	**30%**
52.11	Retail sale in non-specialized stores with food	25%	22%		1.89	1.57		68%	79%							
52.12	Other retail sale in non-specialized stores	28%	34%		1.86	1.73		32%	21%							
52.2	**Retail sale of food in specialized stores**	**28%**	**33%**								**1.71**	**1.57**	**1.64**		**2%**	**5%**
52.21	Retail sale of fruit and vegetables	26%	31%		1.51	1.51		4%	6%							
52.22	Retail sale of meat and meat products	26%	42%		2.94	2.29		10%	31%							
52.23	Retail sale of fish, crustaceans and molluscs	26%	43%		1.53	1.53		2%	2%							
52.24	Retail sale of bread and sugar confectionery	26%	50%		1.40	1.33		5%	11%							
52.25	Retail sale of alcoholic and other beverages	27%	26%		1.01	0.98		55%	27%							
52.26	Retail sale of tobacco products	43%	24%		1.71	1.71		12%	14%							
52.27	Other retail sale of food in specialized stores	26%	35%		1.88	1.66		11%	8%							
52.3	**Retail sale of pharmaceuticals**	**27%**	**33%**								**2.16**	**2.12**	**2.14**		**5%**	**10%**
52.31	Dispensing chemists	27%	31%		1.79	1.79		90%	68%							
52.32	Retail sale of medical and orthopaedic goods	32%	53%		1.91	1.97		5%	6%							
52.33	Retail sale of cosmetic and toilet articles	32%	34%		1.84	1.81		5%	26%							
52.4	**Other retail sales in specialized stores**	**36%**	**39%**								**2.04**	**1.78**	**1.90**		**44%**	**44%**
52.41	Retail sale of textiles	38%	47%		2.23	2.26		0%	1%							
52.42	Retail sale of clothing	41%	43%		2.32	2.27		16%	27%							
52.43	Retail sale of footwear and leather goods	42%	45%		2.25	2.35		4%	7%							
52.44	Retail sale of furniture and household articles n.e.c.	42%	39%		1.40	1.35		10%	20%							
52.45	Retail sale of electrical household appliances	25%	30%		1.69	1.70		6%	8%							
52.46	Retail sale of hardware, paint and glass	27%	34%		1.53	1.18		22%	11%							
52.47	Retail sale of books, newspapers and stationery	43%	34%		2.06	1.94		5%	4%							
52.48	Other retail sale in specialized stores	43%	41%		2.27	2.01		36%	22%							
52.5	**Retail sale of second-hand goods**	**43%**	**49%**		**1.47**	**1.47**		**100%**	**100%**		**1.65**	**1.65**	**1.65**		**0%**	**0%**
52.6	**Retail sale not in stores**	**43%**	**35%**								**1.80**	**1.56**	**1.67**		**9%**	**12%**
52.61	Retail sale via mail order houses	43%	46%		2.07	2.00		68%	69%							
52.62	Retail sale via stalls and markets	26%	34%		1.39	1.40		0%	9%							
52.63	Other non-store retail sale	44%	20%		1.83	1.72		32%	21%							
52	**Total Retail trade**	**31%**	**32%**								**1.95**	**1.68**	**1.81**		**100%**	**100%**

Impact of disaggregation on PPPs

Once our preference for the use of PPPs derived from the sales indicator method has been stated, another fundamental issue concerns the level of disaggregation of industries at which the method is applied. One may consider an example applying two variants of the sales indicator method: the sales indicator method at the aggregate level and the sales indicator method at the industry level. We show how the two measures can differ in three hypothetical situations. Suppose there are two trade industries: furniture and food supermarkets. In case 1, the MTSR in furniture shops is higher than in food supermarkets, but identical across the two countries. In case 2 , the MTSR are identical across industries, but higher in A than B. And in the final case MTSR differ both across industries and countries. The example is given in Table 3. Importantly, the three industry cases are constructed such that at the aggregate level sales, cost and sales PPP are the same. The basic data consists of the sales and cost of goods sold in national prices (columns 1-4), margin-to-sales ratios in 5 and 6, and the sales PPP in column 7.[11] At the aggregate level the sales PPP is 1.25 and the margin to sales ratio in country A (17.5%) is higher than in country B (15.0%). The margin PPP is then derived by adjusting the sales PPP for differences in the margin-to-sales ratio (MTSR) as in equation (9a): the margin PPP is 1.25, and relative volumes are 53%.

When the sales indicator method is applied at the industry level, the relative output volume will depend on the industry shares and the MTSRs at the industry level. It is shown that only in case 2 (industry structures are the same in both countries), application of the single indicator method at the industry level approach delivers the same result as application at the aggregate level. But as soon as industry structures differ, the aggregate approach will be biased. In most real world situations differences in aggregate MTSR are due to both differences in industry mix and price differences at the industry level, as in Case 3. The example confirms the importance of applying the sales indicator method at the lowest level possible in order to disentangle price and volume differences in a correct way.

[11] For simplicity we do not distinguish between Laspeyres and Paasche PPPs.

Table 3 Comparison of different methods for comparing volume differences across countries in retail trade

	BASIC DATA														
	Sales			Cost of goods sold			Margin to sales			Sales PPP		Margin PPP		Margin value			Margin volume
	A	B		A	B		A	B						A	B		A as
	€	$		€	$					€ / $		€ / $		$	$		% of B
	(1)	(2)		(3)	(4)		(5)	(6)		(7)		(8)		(9)	(10)		(11)
							= 1-(3)/(1)	= 1-(4)/(2)				=(7)*(5)/(6)		= [(1) - (3)]/(8)	= (2)-(4)		= (9)/(10)
Method A Single deflation at aggregate level																	
Total retail	2,000	3,000		1,650	2,550		17.5%	15.0%		1.25		(a) 1.25		280	450		62%
Method B Sales indicator method at aggregate level																	
Total retail	2,000	3,000		1,650	2,550		17.5%	15.0%		1.25		1.46		240	450		53%
Method C Sales indicator method at industry level																	
Case 1 Identical margin-to-sale ratios at industry level																	
bread in supermarket	*1,000*	*2,000*		*900*	*1,800*		*10.0%*	*10.0%*		*1.25*		*1.25*		*80*	*200*		*40%*
bread in bakery	*1,000*	*1,000*		*750*	*750*		*25.0%*	*25.0%*		*1.25*		*1.25*		*200*	*250*		*80%*
Total retail	2,000	3,000		1,650	2,550		17.5%	15.0%						280	450		62%
Case 2 Different margin-to-sale ratios at industry level, but identical industry structure																	
bread in supermarket	*1,000*	*1,500*		*825*	*1,275*		*17.5%*	*15.0%*		*1.25*		*1.46*		*120*	*225*		*53%*
bread in bakery	*1,000*	*1,500*		*825*	*1,275*		*17.5%*	*15.0%*		*1.25*		*1.46*		*120*	*225*		*53%*
Total retail	2,000	3,000		1,650	2,550		17.5%	15.0%						240	450		53%
Case 3 Different margin-to-sale ratios and industry structure																	
bread in supermarket	*1,000*	*1,750*		*855*	*1,575*		*14.5%*	*10.0%*		*1.25*		*1.81*		*80*	*175*		*46%*
bread in bakery	*1,000*	*1,250*		*795*	*975*		*20.5%*	*22.0%*		*1.25*		*1.16*		*176*	*275*		*64%*
Total retail	2,000	3,000		1,650	2,550		17.5%	15.0%						256	450		57%

Note: (a) same as sales PPP

5. Data sources

5.1 Sources for PPPs

In general two sets of international comparable prices can be used: expenditure PPPs from the International Comparisons Project (ICP) and agricultural and manufacturing producer prices from the ICOP (International Comparisons of Output and Productivity) project. The former can be used to proxy retail sales PPPs and the latter can be used as a proxy for wholesale purchase prices. Expenditure PPPs are well known for their use in obtaining international comparisons of GDP per capita. They have been developed in the ICP and are now regularly collected by the OECD and Eurostat. Expenditure PPPs reflect relative retail sales prices across countries of specified products. Unfortunately, they are not collected in comparable outlets by design. Prices are collected following the so-called "a-potato-is-a-potato" rule in ICP (Kravis, Summers and Heston, 1982, Chapter 2): where and how the potato is being bought is not taken into account. The same is true for the producer prices. Therefore, we will use PPPs at the most detailed industry level possible.

As the major part of retail sales is to final consumers, retail sales prices can be based on ICP expenditure PPPs (EPPPs).[12] These reflect consumer prices of final expenditure and should be corrected for differences in deductible value added taxes or sales taxes to reflect pre-tax sales prices for the retailers, which is the appropriate price concept for productivity analysis. In this study, sales prices of retail and motor trade industries are based on a detailed set of expenditure values and EPPPs for 1999 from the OECD. From this set we took about 120 basic heading EPPPs for goods, which have been allocated to the 4-digit retail industries on the basis of their presumed retail trade channel. For the repair service sub sectors we took the corresponding service EPPP. The 1999 EPPPs are deflated to 1997 on the basis of price deflators from the GGDC (2005) *60-industry database.* The basic heading EPPPs in each 4-digit retail industry are weighted with the nominal expenditure weights of the different countries and with US weights to get a Laspeyres and a Paasche retail sale PPP. EPPPs are corrected for deductible VAT or sales tax by using the OECD *Consumption Tax Trends 1999* and *VAT Rates Applied in the Member States of the European Union* from the European Commission. These publications contain value added taxes for all OECD countries, including a detailed description of tax exemptions. For countries with a detailed industry classification it was possible to incorporate these exemptions. At a more aggregate level this was not possible. In the United States no VAT exists, but each state has specific state sales taxes, which differ between states. To get a total sales tax rate for the United States, the state rates have been weighted with their share in U.S. GDP. This weighted sales tax was 5.3 %.[13] We also made an adjustment for excise taxes in the case of fuels sale.[14] The adjustments are based on *Energy policies of IEA countries 1999 Review,* which shows the tax components of a litre of gasoline and a litre of automotive diesel. Our adjustment is based on the unweighted average of the taxation rates of both products.

The prices of goods purchased by a wholesale industry can be estimated through the domestic output price of the producer of these goods.[15] Relative output prices for agricultural and

[12] A small part of retail sales are used as intermediates for which prices are not collected.
[13] There are also local taxes but these differ across states and products and could not be taken into account. This adjustment is similar to the ones used by van Ark et al. (1999) and O'Mahony et al. (1998).
[14] For other products with large excise taxes such as tobacco and alcohol, differences between countries are relatively small and no adjustment has been made.
[15] Part of the wholesale purchases might be from outside the country. Due to a lack of information of the share of imports, it has to be assumed that import prices are equal to domestic producer output price. This producer

manufacturing goods are measured by unit value ratios (UVRs) using the industry-of-origin approach based on manufacturing census data and a FAO database (see Timmer, Ypma and van Ark 2005). To each wholesale industry one 2-digit manufacturing industry has been linked on the basis of their importance in the wholesale industry purchases. This 2-digit UVR can be of the Laspeyres or Paasche type. Laspeyres are used in equation (10a) and Paasche in (10b).

For aggregation of product level PPPs, we used trade sales and costs. The only source, which provides detailed trade industry data are the censuses of trade industries, which are being held in almost all OECD countries. The trade sector can be subdivided in three sub sectors in the NACE revision 1 industrial classification: Motor trade (NACE 50), Wholesaling (NACE 51) and Retailing (NACE 52).[16] Within each sub-sector there are 4-digit sub-industries[17]: 34 sub-industries in Wholesaling[18], 26 sub-industries in Retailing and 5 sub-industries in Motor trade. These sub-industries are classified by type of product being traded: food, building materials, machinery etcetera in case of wholesaling; food, pharmaceutical, appliances in case of retailing and sale of motor vehicles, repair of motor vehicles, sale of fuel etc. in case of motor trade. Importantly, for retailing a distinction can also be made between various outlet types, in particular specialised and non-specialised stores.[19] A full list of industries is given in Appendix 1. For the United States and Canada a concordance between NAICS and NACE Rev. 1 has been used to convert the data to the European Classification. The exact concordance can also be found in Appendix 1. Binary PPPs with the U.S. as the base country are derived for one benchmark year: 1997.

For the following countries we have used national trade census data at the 4-digit level for data on sales[20], cost of goods sold and margins[21]: Australia, Austria, Canada, France, Germany, Japan, Netherlands, Norway, South Korea, Taiwan, United Kingdom and United States. Trade census data for Belgium, Czech Republic and Portugal is only available at 3-digit level. For other countries we have used 4-digit data derived from the Eurostat Structural Business Statistics Database. These include Finland, Hungary, Italy, Ireland, Luxembourg, Poland, Slovakia, Spain and Sweden. For Denmark a mix of the two sources has been used. In addition, data for Denmark and Spain refers to 1999 for margins for 50 and 1998 for 51 and Hungarian margins are all for 1998. For Greece only sales data on 2-digit level was available, we have used Italian margins and shares here to obtain a more detailed set.

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output price should be adjusted for transportation margins insofar transport is not done by the wholesaler and any non-deductible tax (less subsidy) on the good payable when it was produced or while in transit to the purchaser (see UN (1993), SNA, para 6.150). These values are generally small and ignored in this study.

[16] In this paper we use the NACE revision 1 classification which is almost identical to ISIC revision 3.

[17] In the remainder of the paper, "sub-sector" indicates 2-digit trade industries, 3-digit industries are indicated by "industries" and 4-digit industries by "sub-industries".

[18] Industry 51.1 (Wholesale on fee or contract basis) is not taken into account due to lack of data. Industries 51.63 (Wholesale of textile machinery) and 51.65 (Wholesale of other machinery for use in industry, trade and navigation) have been put together, because these categories have not been split up for most countries.

[19] Ideally, one would like to have a fuller breakdown of store formats such as traditional mom-and-pop stores, mass merchandisers, out-town specialised chains etcetera, as margin-to-sales ratio vary widely across these formats (see Baily and Zitzewitz 2001, Table 10.4). However, census data does not allow this fine distinction.

[20] Sales value excludes value added tax and other similar deductible taxes directly linked to turnover. Reductions in prices, rebates and discounts have been deducted, while charges passed on to the customer, like packaging and transportation costs are included.

[21] Margins have been defined as *Sales* minus *Cost of goods sold*.

5.2 Sources for trade value added and labour input data

For data on output and inputs one has two options: census data or data from the national accounts. Using census data for productivity benchmark comparisons has a number of advantages. Firstly, it provides a coherent source for both input and output as both are derived from the same set of surveyed firms. Hence consistency in the coverage of both is ensured, which is crucial for deriving meaningful labour productivity levels. This can be an important advantage of census data compared to national accounts data; especially for these countries where employment figures are not integrated with output figures in the national accounts. A second advantage is that census data normally provide more industry detail which allows for more disaggregated analysis (see e.g. O'Mahony 1997). The use of trade census data, however, has two disadvantages: the coverage of firms in the census is often incomplete, covering mostly large firms, whereas in the NA census figures are scaled to reflect the whole sector. In addition, not all censuses provide measures of value added, nor hours worked. As employment statistics are increasingly being integrated within the NA, we prefer the latter source. But to keep in line with previous studies, and to have a cross-check, we also make comparisons based on census data and indicate the differences.

Benchmark levels for gross value added, persons engaged and hours worked in 1997 are derived from the *GGDC 60-industry database*, release October 2005. Growth rates from the same database are used for extrapolation. This database provides a comprehensive internationally comparable dataset on industrial performance at a detailed industry level for OECD countries. It is mainly based on national accounts supplemented with census material to provide detailed industry breakdowns. The industrial classification used is NACE rev 1.

We deviate from the 60-industry database by adjusting hours worked for the benchmark year 1997. In the 60-industry database, hours worked at the trade sub-sector level (50,51,52) is often not available and an average over all sub-sectors is used instead. However, it is well known that hours worked per person engaged differ across trade industries. Normally, it is much lower in retail than in wholesale due to the higher number of part-time workers in retail industries. Therefore we have made an adjustment for hours worked in trade sub-sectors based on data of the share of part-timers in the labour force in each sub-sector in 1996 and 2001 from Eurostat (2003), European Business, Facts and figures.

Let H denote total hours worked, either by full-time workers denoted by H^{full} or by part-time workers, H^{part} so that $H = H^{full} + H^{part}$. Let L be total number of workers, including full- and part-timers, so $L = L^{full} + L^{part}$. Then $H = \frac{H^{full}}{L^{full}} \times L^{full} + \frac{H^{part}}{L^{part}} \times L^{part}$. Assume hours worked by part-timers to be a factor α of hours worked by full-timers. Then H can be written as $H = \left(\frac{H^{full}}{L^{full}} \times L^{full} \right) + \left(\alpha \times \frac{H^{full}}{L^{full}} \times L^{part} \right)$. Rearranging gives an estimate of the hours worked per full-time worker given α: $\frac{H^{full}}{L^{full}} = \frac{H}{H^{full} + \alpha \times H^{part}}$. For each sub-sector an estimate of H^{full} can be made and combined with data on the share of H^{part} in H, see Appendix Table 7. Factor α is set at 0.35 on basis of calibration with Dutch and Danish data for which detailed hours worked data is available.

6. Trade Margin PPPs

In this section, we first discuss differences in the structure of the trade sector and margin-to-sales ratios (MTSR) across countries in 6.1, followed by our findings on relative price levels for distributive trade in 6.2.

6.1 Trade margins

The detailed census data can be used to compare the structure of distributive trade across countries. In table 4 and Appendix Table 2, the shares of 2-digit sub-sectors and industries in total trade sales are given. In Table 4 the (weighted) averages of the 15 EU countries, 3 Asian countries, 4 Eastern European countries and 2 North-American countries are given. Country detail can be found in the Appendix. Wholesaling is relatively less important in North America than in the rest of the OECD. Especially in Asia, wholesaling is by far the most important trade activity. This is partly related to the much higher level of international trading activities in Asia and Europe compared to the U.S. International trade is mainly a wholesaling, not a retailing activity. As labour productivity levels in wholesaling are generally higher than in retailing (see Appendix Table 1), this mix of trading activities provides a bonus to overall trade sector productivity levels in Asia and Europe compared to North-America.

Table 4 Shares of industries in total trade sales, 1997

NACE		EU-15	Asia-3	North America	Eastern Europe
	Total trade	**100%**	**100%**	**100%**	**100%**
50	Motor trade	16%	11%	20%	11%
51	Wholesale	54%	69%	45%	59%
52	Retail	30%	20%	35%	30%
	Total retail trade	**100%**	**100%**	**100%**	**100%**
52.1	Non-specialized retail trade in stores	41%	31%	47%	47%
52.2	Retail sale of food, beverages and tobacco in specialized stores	7%	21%	3%	7%
52.3	Retail sale of pharmaceutical and medical goods, toilet articles	8%	4%	6%	4%
52.4	Other retail sales of new goods in specialized stores	37%	36%	37%	29%
52.5-52.7	Other retail sale	6%	7%	7%	13%

Source: see main text

Within the retailing sector, compositional differences are big. From a productivity perspective, one would be interested in differences in the mix of retailing store formats. For example Baily and Zitzewitz (2001) make a distinction between high productivity formats such as mass merchandisers and out-of-town specialised chains, average productivity formats such as in-town specialised chains and department stores, and low-productive traditional formats. Unfortunately, this format-store distinction is not made in the census which uses an activity-based classification. Nevertheless, the distinction between non-specialised retail (industry 521), retail sales of food and beverages in specialised stores (522) and other specialised trade (rest of 52) provides an interesting proxy. Non-specialised retail includes mass merchandisers, while retail sales of food and beverages in specialised stores includes traditional formats such as mom-and-pop stores. Table 4 shows that in North-America non-specialised trade has progressed further than in Europe, and especially Asia. Countries like the U.S. and Canada, but also Finland, Denmark, France, Ireland and the U.K. have relatively large shares of non-specialised retailing. Retailing in Japan, Korea and Taiwan, but also Mediterranean countries like Portugal, Spain and Italy consist still of a large share of traditional food

stores with low productive activities. This is comparable with available micro-level evidence on differences in the mix of store formats (Baily and Solow 2001).

In Table 5, Margin-to-Sales ratios (MTSR) are given for the four regions. In Appendix Table 3, country data is given. As is well known, MTSR is highest in retailing and lowest in wholesaling. This is true for all countries. There are also differences within trade sub-sectors, especially in retailing. Specialised retailing has a much higher MTSR than non-specialised retailing. This testifies that specialised traders are providing extra service that customers value such as convenience, product information etc. Between Europe and the U.S., MTS ratios do not differ much. For the trade sector as a whole, MTSR is lower in Europe, but this is mainly due to the composition of trade: Europe has a higher share of low MTSR wholesaling. At the industry level, trans-Atlantic differences in MTSR are only minor. This is also true when comparing individual European countries, see Appendix Table 3. O'Mahony (1996) also found little differences in MTSR between the U.S., Germany and the U.K. On the other hand, in almost all industries MTSR in Asia are much higher than in the rest of the OECD. Especially the higher MTSR in non-specialised retailing stands out.

Table 5 Margins as % of sales in distributive trade industries, 1997

NACE		EU-15	Asia-3	North America	Eastern Europe
50-52	**Total Trade**	**0.24**	**0.28**	**0.25**	**0.20**
50	Motor trade	0.22	0.23	0.21	0.19
51	Wholesale	0.18	0.22	0.18	0.15
52	Retail	0.31	0.34	0.31	0.24
52.1	Non-specialized retail trade in stores	0.24	0.31	0.25	0.20
52.2	Retail sale of food, beverages and tobacco in specialized stores	0.31	0.33	0.30	0.20
52.3	Retail sale of pharmaceutical and medical goods, toilet articles	0.31	0.17	0.27	0.19
52.4	Other retail sales of new goods in specialized stores	0.37	0.33	0.36	0.25
52.5	Retail sale of second-hand goods in stores	0.48	0.25	0.43	0.77
52.6	Retail sale not in stores	0.40	0.70	0.43	0.34
52.7	Repair of personal and household goods	0.69	0.66	0.64	0.47

Source: see main text

6.2 Trade Margin PPPs

Using the MTSR and two sets of PPPs (expenditure PPPs for retail sales and output PPPs for wholesale purchases) margin PPPs for retailing and wholesaling are derived using equations (9) and (10). In Appendix Table 4, Laspeyres, Paasche and Fisher margin PPPs for the trade sub-sectors are given for all countries. In Table 6 we provide differences between the Fisher PPPs, our preferred measure, and its main alternatives: the exchange rate and the overall GDP PPP. Exchange rates are heavily influenced by short-term fluctuations. In addition, trade services, especially retailing, are not heavily traded internationally. Therefore, conceptually, exchange rates do not provide a good measure of relative trade service prices. Also in practice the use of exchange rates to compare trade margin across countries is highly misleading. The last column in Table 6 shows that compared to our trade margin PPP, price levels can be highly over- or underestimated: they vary from a low 49% in the Czech Republic to over 180% in Japan.

Also the use of GDP PPPs can lead quite different assessments of trade service price and margin levels across countries, even for retailing. For the total trade sector, GDP PPPs provide underestimates of relative prices by more than 35% in Asia, but also by more than 10% for Austria, Canada and the U.K., while overestimating price levels in Denmark, Luxembourg and Finland by

almost 20%. Importantly, this bias is not uniform for all trade sub-sectors. For Germany for example, the GDP PPP is a serious underestimation for the wholesale margin PPP, but close to the retail margin PPP. For Ireland it is the other way around. These results show that using a GDP PPP, as for example advocated by Baily and Zitzewitz (2001) , for comparing margin levels across countries in the trade sector can be highly misleading, especially at the sub-sector level.

Table 6 Relative price levels for distributive trade sectors, 1997

	EKS PPP as % of GDP PPP				EKS PPP as % of exchange rate
	50	51	52	50-52	50-52
Australia	102	136	121	125	121
Austria	100	122	102	109	118
Belgium	59	93	100	88	92
Canada	94	106	104	102	89
Czech Republic	159	139	108	127	49
Denmark	88	88	70	80	100
Finland	72	71	98	79	89
France	80	99	93	92	102
Germany	83	75	92	82	92
Greece	167	157	120	139	116
Hungary	147	169	118	144	64
Ireland	63	95	84	85	87
Italy	133	141	113	127	114
Japan	95	173	130	143	200
Luxembourg	56	87	91	82	88
Netherlands	81	84	98	86	86
Norway	73	106	102	98	124
Poland	123	108	104	106	49
Portugal	103	134	80	106	74
Slovakia	216	149	115	142	53
South Korea	95	160	115	127	104
Spain	96	95	89	92	76
Sweden	60	115	84	94	120
Taiwan	43	38	41	41	97
U.K.	80	126	108	110	115
U.S.A.	100	100	100	100	100

Source: Appendix Table 4.

7. International Comparisons of Labour Productivity in Trade sectors

Using the margin PPPs presented in the previous sections, productivity comparisons in distributive trading can be made. In section 7.1., we provide comparisons of labour productivity in the benchmark year 1997. Labour productivity is measured as gross value added per person engaged and per hour worked. A comparison is made with alternative estimates based on GDP PPPs instead of our margin PPPs, and with census data rather than national accounts data. In Section 7.2, the benchmark labour productivity estimates are extrapolated over the period 1980-2002 for each trade sub-sector.

7.1 1997 Benchmark Estimates

In Table 7 we provide relative labour productivity levels for 25 OECD countries, including regional (weighted) averages for 1997. These are based on national accounts data for gross value added and labour input. Value added is put into comparable prices using our Fisher margin PPPs for trade sectors in a single deflation procedure. Double deflation of value added is to be preferred, but PPPs for intermediate inputs used in the trade sector are not available. As the share of intermediate input is relatively small, this will presumably not affect our results much.

Comparisons are made with the U.S. as the reference (US = 100). Labour productivity levels in the EU-15 and North-America are quite similar for the total trade sector.[22] At the subsector level some differences can be noticed. In 1997, the EU is more productive in motor trade, but somewhat less productive in retailing and wholesaling. In contrast, levels in Asia are much lower than in the rest of the OECD. This result is even stronger when measuring labour productivity on the basis of hours worked rather than person engaged. Asian performance drops from 56 to 47 % due to much longer hours worked. Differences between per hour and per person engaged productivity measures are also pronounced for countries like Germany and the Netherlands in which large shares of the employees is part-time employed. The EU average hides considerably variation. Eastern European levels are 0% or more below the US-level. Relative trade productivity levels in Portugal and UK are below 85% of the US, while Belgium, Denmark and The Netherlands perform at levels of 35% or higher. In Asia, there is a large productivity gap to the U.S. in all three Asian countries and this is true for all trade sub-sectors.

To test the sensitivity of our results, we provide two alternative measures of relative labour productivity levels for total trade in Table 8. The first alternative uses GDP PPP as an estimate of relative margin prices instead of our preferred Fisher margin PPP. Countries are ranked according to their labour productivity level. Differences in ranking based on our margin PPP and the GDP PPP can be major. For example, using the GDP PPP, countries like Austria, Italy and Japan rank much higher, while Germany, Ireland and Spain rank much lower.

[22] In this paper, the EU refers to the 15 countries that were member of the European Union up to 1 May 2004.

Table 7 Labour productivity levels, 1997

	Gross value added per person as % of US level				Gross value added per hour as % of US level			
	50 Motor trade	51 Whole sale	52 Retail	50-52 Total trade	50 Motor trade	51 Whole sale	52 Retail	50-52 Total trade
EU-15	112	86	91	94	113	100	90	97
Asia-3	80	48	54	56	64	48	41	47
North America	100	96	97	98	100	96	95	97
Eastern Europe	43	52	56	57	38	52	42	48
Australia	102	42	48	53	85	40	46	49
Austria	98	70	103	94	104	89	107	103
Belgium	184	109	111	135	192	131	110	141
Canada	99	62	67	74	96	68	55	68
Czech Republic	33	44	40	45	28	43	29	36
Denmark	84	88	128	115	94	105	140	126
Finland	123	128	92	124	124	145	91	127
France	132	92	117	113	135	106	114	116
Germany	101	105	87	101	116	142	102	122
Greece	53	54	85	63	40	47	56	46
Hungary	39	24	53	37	33	23	38	30
Ireland	156	113	105	107	141	112	88	96
Italy	105	72	116	95	101	80	98	88
Japan	110	57	59	66	92	63	49	60
Luxembourg	209	126	137	156	224	155	129	161
Netherlands	125	105	76	107	145	131	101	133
Norway	148	69	80	93	114	99	83	109
Poland	50	63	61	67	46	65	47	58
Portugal	105	48	80	74	100	53	67	68
Slovakia	24	38	64	50	20	35	45	40
South Korea	37	17	28	24	27	14	17	16
Spain	98	75	109	93	90	79	89	83
Sweden	150	62	111	98	137	62	107	91
Taiwan	53	38	81	59	40	33	53	42
U.K.	128	69	54	66	118	72	57	69
U.S.A.	100	100	100	100	100	100	100	100

Note: value added converted in common prices using EKS output PPPs. Based on national accounts data
Source: Appendix Tables 4 and 5.

Also the switch from using margin and labour input data from the census rather than from the national accounts can create major differences. This was also noted by previous studies (O'Mahony, Oulton and Vass, 1998, and van Ark, Monnikhof and Mulder, 1999). Labour productivity levels according to the census are much lower than in the national accounts in Greece, Ireland, Italy and Poland. In contrast, census labour productivity is much higher than in the national accounts in Australia, Finland, U.K., US and especially South Korea. Differences between census and national accounts estimates can be due to a host of reasons, including differences in the definition and measurement of margins, value added and persons engaged, and the coverage of firms of various size classes. E.g. the US census uses the census concept of value added which includes purchased business services, while most European censuses follow the NA concept which excludes these services. Therefore, census based estimates are not easily compared. A reconciliation of these differences is

beyond the scope of this paper. Normally, the census is the building stone for national accounts estimates, but the comparison issues a clear warning that many adjustments are made by moving from the former to the latter. Integration and cross-checking of various statistical sources is an ongoing concern for national statistical offices, but many of the adjustments made are not tractable for the general public. Further research on the difference between census and national accounts based estimates are needed to be confident in the level estimates presented here, especially for South Korea.

Table 8 Rankings of labour productivity based on alternative data sources, 1997
Total trade sector (50-52)

	Preferred estimate (a)		Alternative 1: using GDP PPPs (b)			Alternative 2: using census data (c)		
	GVA per person engaged (US=100)	Rank	EKS PPP as % of GDP PPP	GVA per person engaged (US=100)	Rank	Census as % of National Accounts	GVA per person engaged (US=100)	Rank
Luxembourg	156	1	82	127	1	94	112	1
Belgium	135	2	88	118	3	90	92	4
Finland	124	3	79	98	7	113	107	2
Denmark	115	4	80	92	9	98	86	5
France	113	5	92	104	4	93	80	6
Ireland	107	6	85	91	13	85	69	9
Netherlands	107	7	86	92	10	93	76	7
Germany	101	8	82	83	16	n.a.	n.a.	n.a.
U.S.A.	100	9	100	100	6	131	100	3
Sweden	98	10	94	92	11	93	69	10
Italy	95	11	127	121	2	70	51	15
Austria	94	12	109	103	5	93	67	11
Norway	93	13	97	91	12	92	65	13
Spain	93	14	92	85	15	98	70	8
Canada	74	15	102	76	18	n.a.	n.a.	n.a.
Portugal	74	16	106	78	17	83	47	16
Poland	67	17	106	71	21	59	30	21
U.K.	66	18	110	72	19	131	65	12
Japan	66	19	143	94	8	n.a.	n.a.	n.a.
Greece	63	20	139	87	14	70	34	19
Taiwan	59	21	41	24	26	97	43	17
Australia	53	22	125	66	22	128	51	14
Slovakia	50	23	142	71	20	101	39	18
Czech Republic	45	24	127	57	23	n.a.	n.a.	n.a.
Hungary	37	25	144	54	24	70	20	22
South Korea	24	26	127	30	25	175	32	20

a) Based on National accounts data and EKS output PPP
b) Based on National accounts data and GDP PPP from Table 6
c) Based on census data and EKS output PPP
Sources: Table 7, Appendix Table 6

7.2 Comparative Labour Productivity Performance, 1980-2002

The labour productivity benchmark estimates for 1997 based on National Accounts data are extrapolated to the period 1980-2002. In Table 9 we provide the results for the total trade sector, followed by tables for motor trade (Table 10), wholesaling (Table 11) and retailing (Table 12). The tables provide comparative labour productivity levels in 1980, 1995 and 2002 for value added per person engaged and per hour worked, relative to the US. The tables also include national growth rates for the periods 1980-1995 and 1995-2002. In all tables, countries are ranked on the basis of their labour productivity level in 2002.

Table 9 Labour productivity in total trade (50-52), US=100

	Gross value added per person engaged					Gross value added per hour worked		
	Levels			Growth rates				
	1980	1995	2002	1980-1995	1995-2002	1980	1995	2002
Luxembourg	184	176	146	2.4	3.0	179	182	153
Netherlands	144	118	90	1.4	1.8	161	146	117
Finland	150	145	109	2.5	1.6	145	148	116
Belgium	222	155	109	0.3	0.7	232	165	116
Norway	91	93	94	2.9	5.9	104	106	113
Germany	149	119	88	1.2	1.4	157	139	110
Denmark	123	131	104	3.1	2.3	125	146	107
France	118	133	94	3.5	0.7	115	135	100
U.S.A.	100	100	100	2.7	5.7	100	100	100
Austria	129	105	84	1.3	2.5	127	111	91
Sweden	108	110	88	2.8	2.5	105	103	86
Ireland	156	114	85	0.6	1.5	134	100	81
Italy	136	110	76	1.3	0.5	125	103	71
Spain	162	108	75	0.0	0.3	136	97	66
U.K.	72	73	64	2.8	3.7	75	77	66
Canada	90	80	71	2.0	3.9	86	75	65
Poland	n.a.	76	65	n.a.	3.4	n.a.	64	56
Portugal	103	80	56	1.0	0.6	90	71	52
Japan	66	75	50	3.6	-0.2	55	68	47
Taiwan	41	60	61	5.3	5.8	27	44	46
Australia	67	57	47	1.7	2.9	60	52	45
Greece	126	67	56	-1.5	3.2	90	48	40
Czech Republic	n.a.	42	43	n.a.	6.2	n.a.	34	36
Slovakia	n.a.	52	38	n.a.	0.9	n.a.	43	30
Hungary	n.a.	45	33	n.a.	1.4	n.a.	37	28
South Korea	19	26	23	4.9	3.8	12	17	16
Coefficient of variation						0.45	0.48	0.46
EU-15	126	108	81	1.7	1.5	124	111	84
Asia-3	58	64	46	3.3	1.3	46	52	39
North America	99	98	97	2.7	4.2	98	97	96
Eastern Europe	n.a.	55	57	n.a.	5.1	n.a.	45	48

Source: GGDC 60-industry Database October 2005 and EKS output PPPs.

Table 10 Labour productivity in motor trade (50), US=100

	Gross value added per person engaged					Gross value added per hour worked		
	Levels			Growth rates				
	1980	1995	2002	1980-1995	1995-2002	1980	1995	2002
Luxembourg	169	211	194	3.2	2.4	170	225	208
Belgium	258	198	171	0.0	1.5	268	209	177
Sweden	126	149	149	2.9	3.6	119	136	146
U.K.	110	141	151	3.4	4.5	100	131	135
Netherlands	145	134	107	1.2	0.3	150	153	129
Ireland	184	147	134	0.3	2.2	161	132	120
Finland	138	141	117	1.9	0.9	132	142	118
France	163	155	109	1.4	-1.5	158	158	113
Japan	133	129	134	1.5	4.2	104	110	109
Norway	217	146	134	-0.9	2.3	164	110	101
U.S.A.	100	100	100	1.7	3.6	100	100	100
Germany	135	110	83	0.4	-0.5	136	124	94
Austria	158	112	92	-0.5	0.7	150	115	93
Portugal	105	95	98	1.0	4.0	95	87	92
Australia	104	100	110	1.5	4.9	89	83	90
Denmark	162	99	83	-1.6	1.0	167	112	86
Italy	103	110	90	2.2	0.7	99	106	85
Canada	87	94	87	2.3	2.5	89	93	84
Spain	145	109	85	-0.2	0.0	125	100	77
Poland	n.a.	48	68	n.a.	8.4	n.a.	43	61
Greece	82	51	68	-1.5	7.7	62	39	51
Hungary	n.a.	61	41	n.a.	-2.1	n.a.	52	35
Taiwan	37	57	42	4.6	-0.7	26	43	33
Czech Republic	n.a.	42	34	n.a.	0.9	n.a.	36	30
South Korea	21	37	38	5.4	3.8	14	26	28
Slovakia	n.a.	26	12	n.a.	-7.8	n.a.	23	10
Coefficient of variation						0.44	0.51	0.50
EU-15	132	123	103	1.2	1.0	125	122	102
Asia-3	94	91	89	1.5	3.2	70	72	70
North America	99	99	99	1.8	3.5	99	99	98
Eastern Europe	n.a.	55	44	n.a.	0.5	n.a.	48	39

Source: GGDC 60-industry Database October 2005 and EKS output PPPs

Table 11 Labour productivity in wholesale trade (51), US=100

	Gross value added per person engaged					Gross value added per hour worked		
	Levels			Growth rates				
	1980	1995	2002	1980-1995	1995-2002	1980	1995	2002
Luxembourg	178	157	126	3.1	4.2	210	191	154
Germany	168	128	95	2.1	3.0	217	170	129
Finland	212	162	106	2.1	1.2	233	183	124
Netherlands	169	117	86	1.4	2.9	204	145	111
Norway	79	72	70	3.3	6.9	107	101	103
Belgium	236	131	84	0.0	1.0	274	157	101
U.S.A.	100	100	100	3.9	7.3	100	100	100
France	105	110	78	4.2	2.4	115	125	93
Denmark	108	104	82	3.7	3.9	126	125	90
Austria	90	81	61	3.2	3.3	101	95	76
Ireland	202	133	70	1.1	-1.8	191	129	70
Spain	187	94	59	-0.7	0.7	190	98	61
Poland	n.a.	66	58	n.a.	5.5	n.a.	66	60
U.K.	85	79	58	3.4	2.9	87	83	60
Italy	120	90	52	2.0	-0.5	128	99	57
Canada	82	74	51	3.2	1.8	92	83	56
Sweden	100	85	51	2.8	0.2	96	83	54
Japan	59	65	39	4.5	0.0	58	70	45
Czech Republic	n.a.	38	42	n.a.	8.6	n.a.	37	42
Taiwan	32	41	42	5.6	7.9	24	35	38
Greece	132	59	42	-1.5	2.5	110	51	36
Portugal	88	57	31	1.0	-1.6	91	61	33
Australia	64	51	33	2.3	1.4	62	47	32
Hungary	n.a.	22	22	n.a.	7.5	n.a.	21	22
Slovakia	n.a.	42	21	n.a.	-2.6	n.a.	41	21
South Korea	16	20	16	5.4	3.8	12	16	14
Coefficient of variation						0.54	0.53	0.54
EU-15	132	104	71	2.3	1.9	148	119	82
Asia-3	52	54	35	4.2	1.1	48	54	37
North America	98	97	93	3.8	6.7	99	98	94
Eastern Europe	n.a.	44	52	n.a.	9.8	n.a.	43	53

Source: GGDC 60-industry Database October 2005 and EKS output PPPs

Table 12 Labour productivity in retail trade (52), US=100

	Gross value added per person engaged					Gross value added per hour worked		
	Levels			Growth rates				
	1980	1995	2002	1980-1995	1995-2002	1980	1995	2002
Luxembourg	176	146	111	0.9	1.4	166	136	107
Denmark	122	144	101	3.3	0.4	136	158	106
Sweden	100	111	103	2.9	4.3	96	106	104
U.S.A.	100	100	100	2.2	5.4	100	100	100
France	112	138	92	3.6	-0.4	109	133	95
Austria	158	112	88	-0.1	2.0	154	107	93
Germany	126	102	75	0.8	0.9	145	116	92
Norway	54	77	82	4.5	6.4	56	78	89
Belgium	178	128	87	0.0	-0.1	178	126	89
Netherlands	98	88	61	1.4	0.2	129	114	86
Finland	89	102	79	3.1	1.8	88	100	85
Ireland	135	111	91	0.9	2.7	110	90	85
Italy	167	131	95	0.6	0.7	141	110	81
Spain	162	123	85	0.4	0.1	132	100	70
Canada	91	71	76	0.5	6.4	80	59	64
U.K.	63	61	56	2.0	4.3	68	65	59
Taiwan	52	81	82	5.2	5.7	31	53	56
Portugal	102	86	63	1.0	1.0	84	70	54
Slovakia	n.a.	69	68	n.a.	5.1	n.a.	50	50
Greece	157	91	72	-1.5	2.0	103	59	47
Australia	59	47	45	0.6	5.0	52	44	45
Poland	n.a.	82	54	n.a.	-0.6	n.a.	62	43
Japan	62	70	46	3.0	-0.7	48	57	40
Hungary	n.a.	78	44	n.a.	-2.8	n.a.	57	33
Czech Republic	n.a.	40	36	n.a.	3.7	n.a.	29	27
South Korea	18	30	26	5.4	3.8	11	18	17
Coefficient of variation						0.44	0.42	0.38
EU-15	117	104	77	1.4	1.1	116	101	78
Asia-3	57	62	44	2.8	0.6	41	46	35
North America	99	97	98	2.1	5.5	98	96	96
Eastern Europe	n.a.	61	50	n.a.	2.6	n.a.	45	39

Source: GGDC 60-industry Database October 2005 and EKS output PPPs

In the 1990s, relative growth paths in Europe, Asia and North America changed drastically. In the period from 1980 to 1995, labour productivity growth rates in Europe and the U.S. were comparable, while Asian growth boomed. But after 1995 this pattern changed. Labour productivity growth in Europe slowed somewhat, while growth rates in North America boomed. Asian growth rates dropped to the slow crouch of Europe (see Figure 1). In the period from 1995 to 2002, labour productivity growth in the major European countries and Japan almost halted, being less than 0.5 % per year. In contrast, labour productivity growth in the U.S. accelerated to over 6 % per year. This had obvious consequences for the comparative labour productivity levels over this period. While the EU was leading the U.S. in the 1980s and 1990s, they lost this position at the end of the 1990s. In Figure 2a relative labour productivity levels for 2002 are given for all countries.

Looking at the results for 2002 in Fig 2a, one can make a distinction between various groups of countries. There is a leader group of countries with relative labour productivity levels higher than

the U.S.. This group consists of Belgium, Denmark, France, Germany, Luxembourg, Netherlands and Norway. The second group of countries has relative levels in-between 65 and 90%: Austria, Canada, Finland, Ireland, Italy, Norway, Spain, Sweden and U.K. . Finally, the last group with relative levels lower than 60% consists of Australia, Czech Republic, Japan, Portugal, South Korea and Taiwan.

At the sub-sector level a similar wide divergence in labour productivity performance can be seen, although the patterns differ by sub-sector. In motor trade, Asian growth performance has been much better than in the other trade sectors. Also, the productivity acceleration in the US, is less pronounced in this sector (see Fig 2b). In 2002, countries differ widely in the levels of gross value added per hour worked . In wholesale trade and retail trade growth rates patterns are as for total trade with stagnating Europe, accelerating North America and decelerating Asia (see Figures 2b and 2c). In general relative performance of a country in wholesaling and retailing reflects the performance in the total trade sector. In 2002, the U.S. is on top in both sub-sectors (except for Luxembourg in wholesaling). A number of exceptions should be noted: the Netherlands and Belgium are top performers in wholesaling, but much less so in retailing. The opposite is true for France, Italy and Sweden where relative performance in retailing is much better than in wholesaling.[23]

Looking at the coefficient of variation (standard deviation of levels across all countries divided by the average) it can be seen that there has been a continuous convergence process within the OECD since 1995.[24] This holds true for the total trade sector and all trade sub-sectors, except wholesaling, see Figure 3.

23 For a number of countries labour productivity growth rates of sub-sectors in the earlier periods are missing. They are assumed to be the same as for the total trade sector. This is the case for Belgium, Sweden, Spain and Portugal before 1996 and for Germany, Ireland and Italy before 1992.

24 As we study the changes in the dispersion of productivity levels we refer to σ-convergence, not to β-convergence.

Figure 1a
Growth rates of Value added, Total hours worked and Labour productivity per hour, 1995-2002

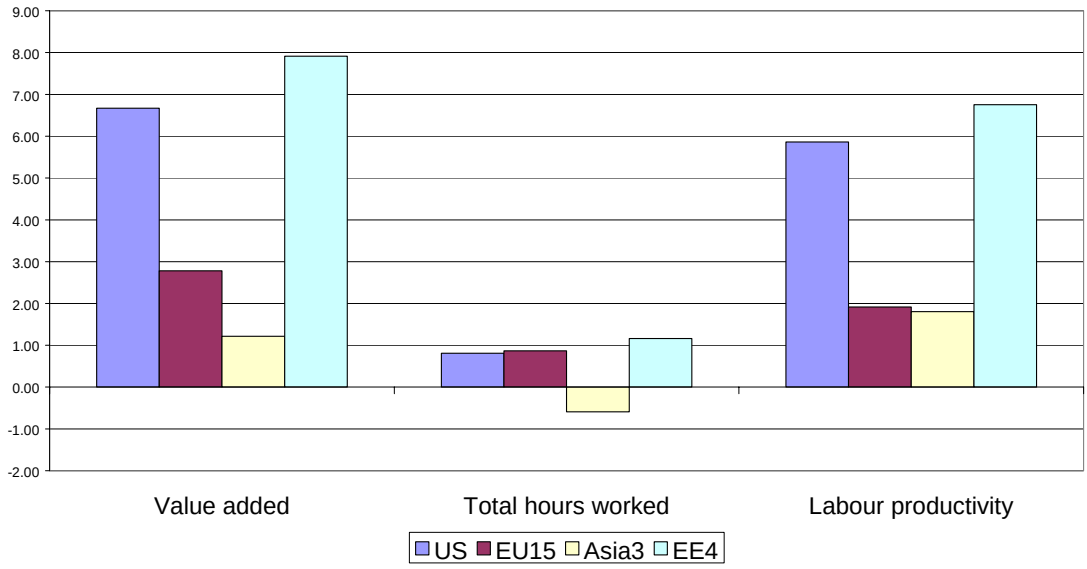


Figure 1b
Growth rates of Value added, Total hours worked and Labour productivity per hour, 1980-1995

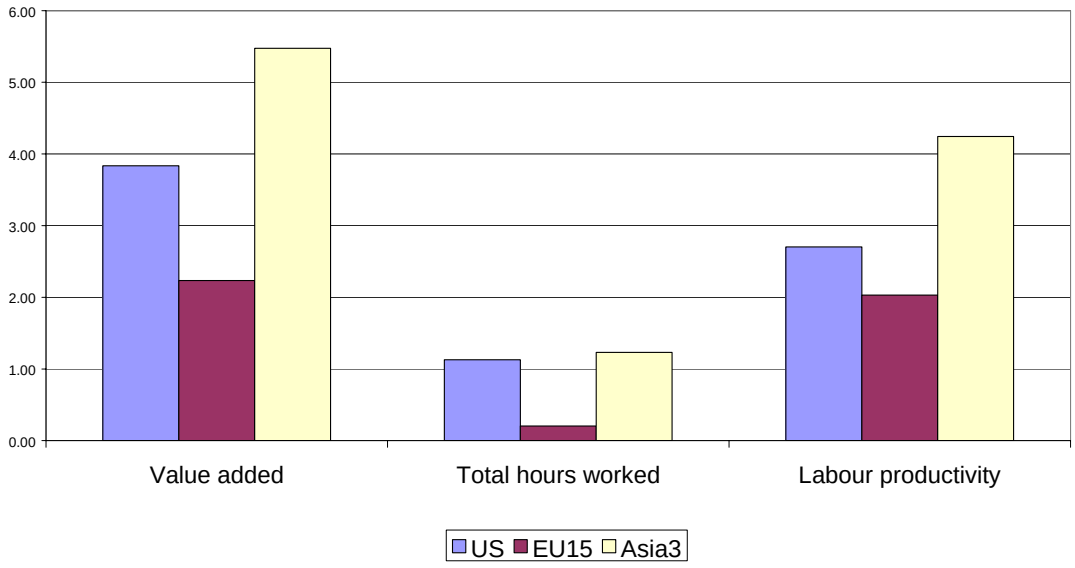


Figure 2a
Productivity per hour in the trade sector (50-52), 2002

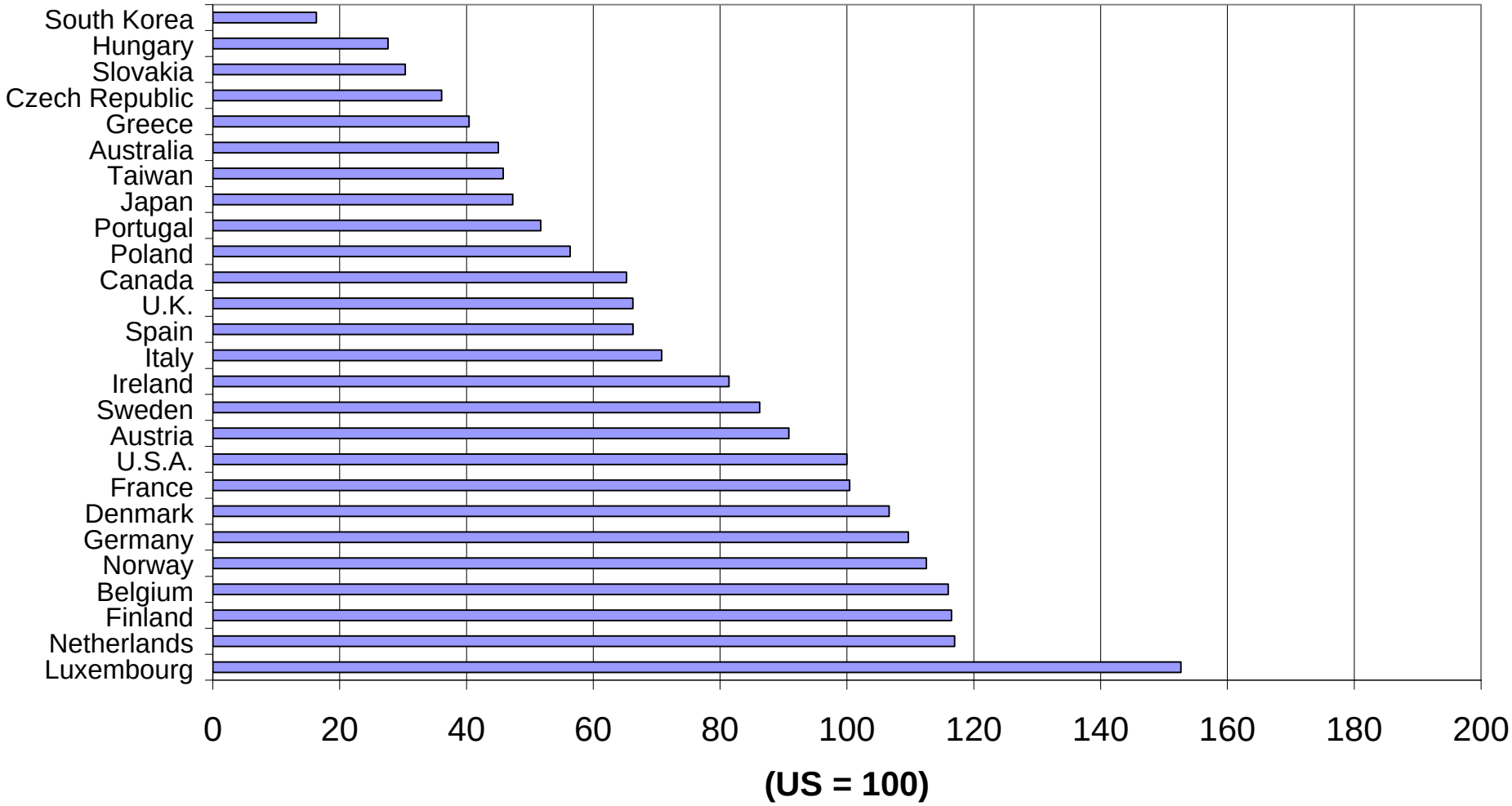


Figure 2b
Productivity per hour in Motor Trade (50), 2002

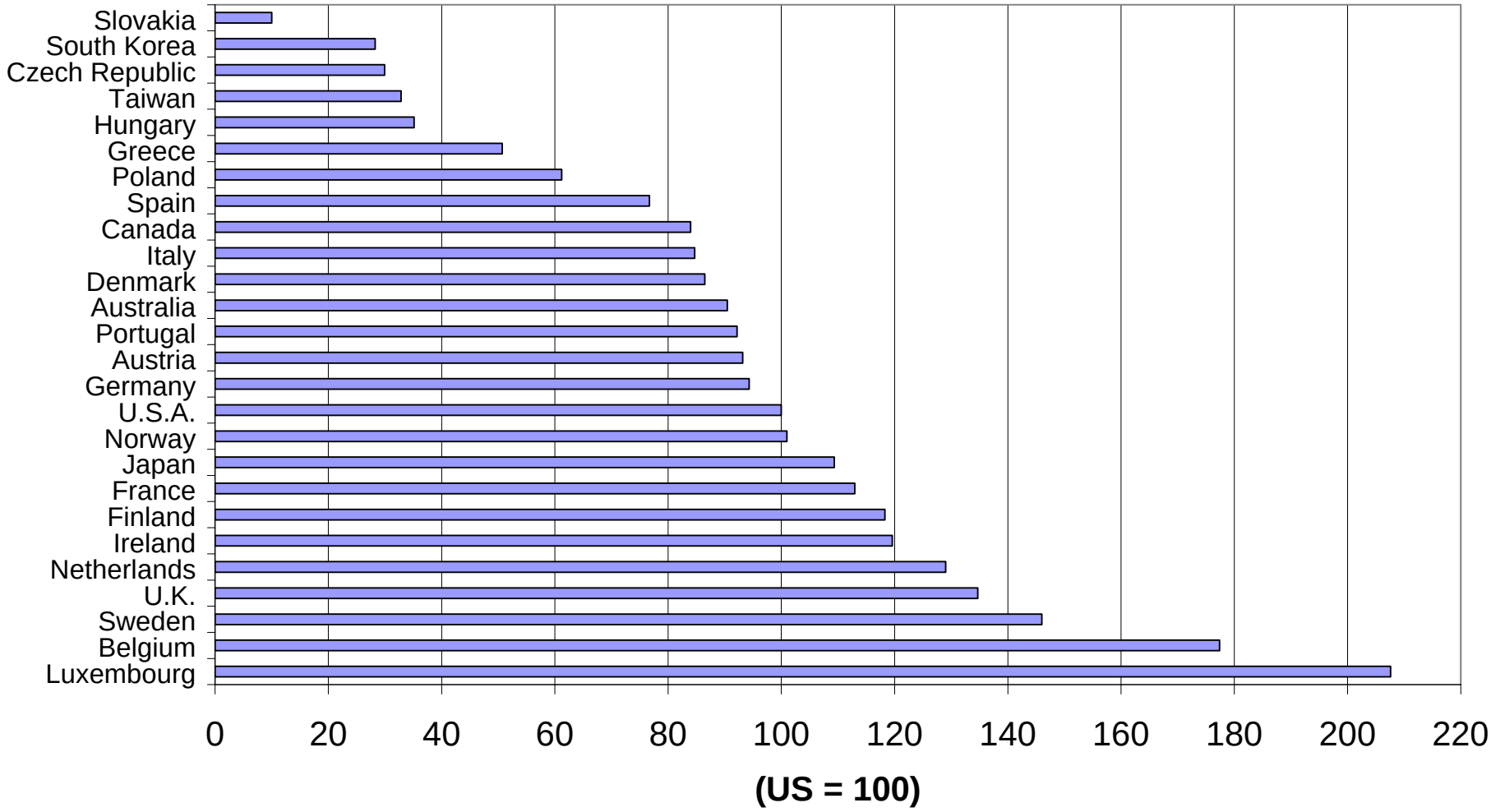


Figure 2c
Productivity per hour in Wholesale (51), 2002

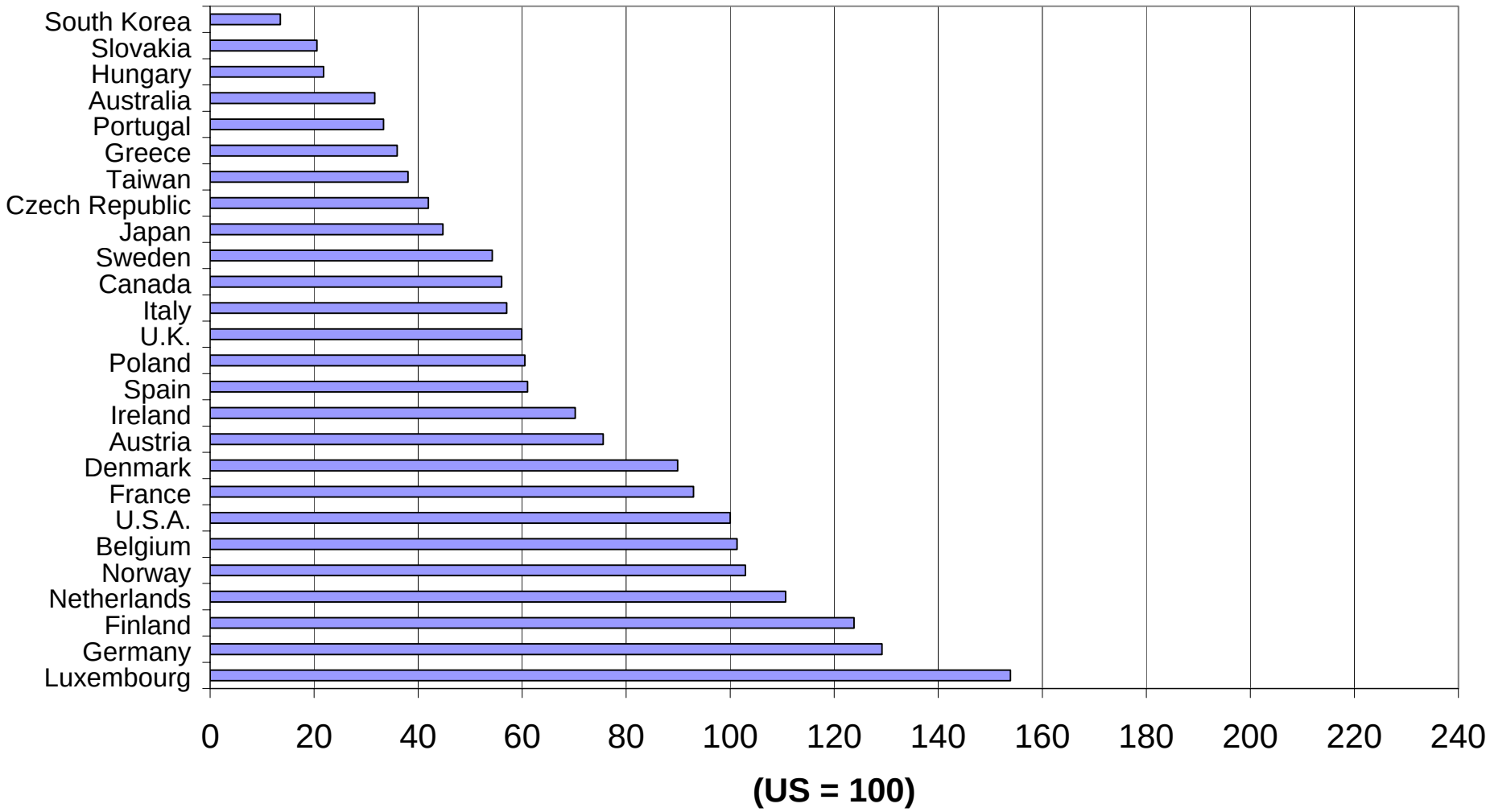
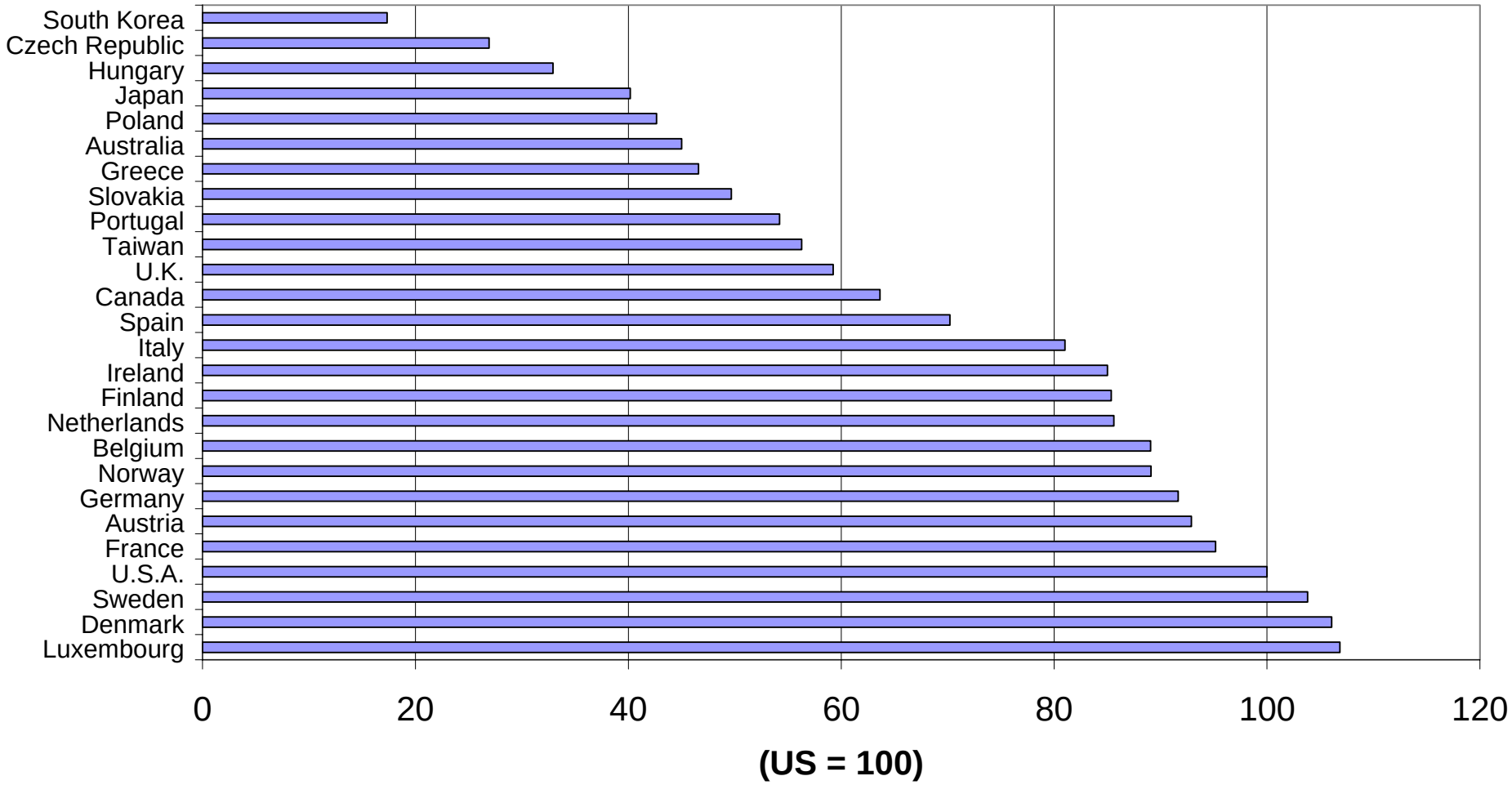


Figure 2d
Productivity per hour in Retail (52), 2002



Our broad findings on relative labour productivity levels confirm earlier studies for the 1980s and the beginning of the 1990s. For example, Pilat (1994) found very low levels of trade productivity in Japan and South Korea compared to the U.S. We find in addition that Japanese levels have further fallen behind in the 1990s, while Korean levels continued to catch up albeit from a very low level. Also the low levels of labour productivity in the U.K. and Canada compared to the U.S. and the rest of Europe have been found before (Smith and Hitchens 1985, O'Mahony, Oulton and Vass, 1998, and van Ark, Monnikhof and Mulder, 1999). Catch-up of the U.K. with the rest of Europe has taken place in the 1990s, but a sizeable gap still remains (see also O'Mahony and de Boer, 2002). The biggest difference in results from previous studies is in the relative performance level of the U.S. Our figures for the beginning of the 1990s show a sizeable productivity level lead in France, Germany and the Netherlands compared to the U.S., in contrast to Pilat (1996), O'Mahony, Oulton and Vass (1998), and van Ark, Monnikhof and Mulder (1999). Partly this is due to differences in concepts (see Section 2) and PPP-methodology. But the main reason is probably differences in the estimates of growth rates of trade margins and value added in the U.S. and Europe. Timmer and Inklaar (2005) show that due to the extensive use of hedonic price deflators in the U.S. compared to continental Europe, the U.S. trade output growth rates in the 1990s are overestimated. This is especially true for wholesaling, but much less so for retailing. They provide evidence that the use of hedonic methods to deflate sales of ICT goods explains more than half of the annual value added growth in U.S. wholesaling during the period 1995-2002. This creates an upward bias compared to the European countries where the adjustment of ICT sales prices for quality change is much less pervasive. The bias is much smaller in retailing due to the smaller share of ICT-goods in total retail sales compared to the share in wholesales. In our extrapolation procedure we use the national U.S. growth rates. This explains partly our higher estimates for Europe relative to the U.S. in the beginning of the 1990s compared to the earlier studies. And it also explains part of the rapid growing gap after 1995, especially for wholesaling.

In Table 13 we compare the relative productivity levels in trade sectors in the U.S. compared to the EU-15 when using the original deflators (as we did in this paper so far), and the adjusted deflators calculated by Timmer and Inklaar (2005). The benchmark estimates for 1997 are not changed of course, but because of the lower growth rates when using the alternative deflators, relative performance in the US in 2002 is lower than previously (113% of EU-15 instead of 119%), while relative performance in 1993 is higher (99% instead of 92%). At the subsector level, the difference is biggest for wholesaling. In both retailing and wholesaling the U.S. is still one of the top performing countries, but not out of line with some of the European top-performers.

Table 13 Influence of the use of hedonic deflators on labour productivity

	Gross value added per hour worked in U.S.			
	Levels (EU-15=100)			Average growth rate
	1993	1997	2002	1993-2002
(a) With national deflators				
Motor vehicle trade, repairs and gasoline sales (ISIC 50)	89	89	98	2.9
Wholesale trade except motor vehicles (ISIC 51)	88	100	121	5.8
Retail trade and repairs except motor vehicles (ISIC 52)	93	112	128	5.1
Total Trade (ISIC 50-52)	92	103	119	4.9
(b) With alternative deflators for U.S.				
Motor vehicle trade, repairs and gasoline sales (ISIC 50)	85	89	94	2.9
Wholesale trade except motor vehicles (ISIC 51)	105	100	105	2.2
Retail trade and repairs except motor vehicles (ISIC 52)	96	112	131	5.1
Total Trade (ISIC 50-52)	99	103	113	3.5

Source: GGDC 60-industry Database October 2005 and EKS output PPPs. Alternative deflators from Timmer and Inklaar (2005).

8. Concluding remarks

In this paper we outlined a new method for making international comparisons of trade output and productivity in line with current practice in intertemporal comparisons. The basic assumption in this method is that the relative volume of sales is an indicator for relative volumes of margins (trade services). This method mimics current practice in most countries' official national accounts. We showed how this method differs from other widely used methods such as single deflation with a sales deflator. The need to apply the new method at a low level of industry detail has been stressed.

Our new methodology is an improvement over methods previously used, but still leaves much to desire for. The most pressing issue is that in our methodology sales volumes are used an indicator for sales services. Although sales might be a good indicator for the number of trade transactions, they do not convey information about the quality of the serviced delivered during the transactions. Anecdotal evidence seems to suggest that the level of trade services is higher in U.S., especially compared to Europe. This is related to longer opening hours and the provision of lower marginal service activities such as packing bags. Lower minimum wages in the U.S. stimulate the provision of these labour-intensive services (Baily and Zitzewitz 2001). However, international comparisons of trade services are notoriously difficult. The service level depends on a wide set of service characteristics and their valuation by the customer in which cultural differences and tastes play an important role. In addition, U.S. customers seem to buy in much larger quantities than their European or Asian counterparts. This would indicate that the number of transactions per dollar sales is higher in Europe and Asia than in the U.S. Assuming that this is true and assuming equal service level per transaction, the level of trade services per dollar sales is higher in Europe than in the U.S. The relative importance of these two counter-acting effects (number and quality of transactions) is unknown.

A second important issue in comparing productivity in the trade industry is the consistency between data sources on output and labour input. In this paper we primarily relied on National Accounts data on value added and employment. In some countries, labour accounts are well integrated in the national accounts. But in many other countries this is not yet the case. In those cases making comparisons at a low industry level can be tricky. Labour data will be obtained from a survey which is not necessarily consistent with the output data in the National Accounts. By making comparisons with labour productivity levels based on census data, which does not suffer from this problem, the seriousness of this problem has been assessed. For the majority of countries, this appeared not to be a major problem. But for some countries discrepancies can be bigger than 30% (Australia, Finland, Greece, Ireland, Italy, Poland, South Korea and U.K.). Further research on the difference between census and national accounts based estimates are needed for these countries. In fact, this observation is probably true for more (non-manufacturing) industries alongside trade.

We applied our PPP methodology to a set of 26 OECD countries and Taiwan. Our main finding is that there is a wide spread in relative productivity levels in the trade sector within the OECD. The main finding of this study is that there is still a wide variety in labour productivity levels in the distribution sector across the OECD area. In 2002, the Germany, the Benelux and Scandinavian countries (except Sweden) were leading in terms of PPP-converted value added per hour worked with higher levels than in the U.S.. In Asia, the comparative labour productivity level is on average 39% of the U.S. level, whereas it is 48% on average in Eastern Europe. Within the "old" EU-15, countries like Italy, Portugal, Spain and the U.K. had relative levels less than 70% of the U.S.. There is no clear

sign of convergence in productivity levels among OECD countries during the past two decades. In the period 1995-2002 some low level countries have had high growth rates (like South Korea, Czech Republic and Taiwan), but also high-level countries like Sweden, Norway and especially the U.S. showed rapid productivity growth. While the EU was outperforming the U.S. in the beginning of the 1980s, it lost ground in the 1990s. The latter is partly, but by no means completely, due to differences in sales measurement between the U.S. and the EU.

At the sub-sector level a similar wide divergence in labour productivity performance can be seen, although the patterns differ somewhat by sub-sector. In general relative performance of a country in wholesaling and retailing reflects the performance in the total trade sector. A number of exceptions should be noted: the Netherlands and Belgium are top performers in wholesaling, but much less so in retailing. The opposite is true for France, Italy and Sweden where relative performance in retailing is much better than in wholesaling.

What can explain the high variance in levels and growth rates in this sector? From a production theoretic perspective, differences in labour productivity can be decomposed into differences in capital intensity (capital services per hour worked) and total factor productivity (TFP). Studies of TFP levels in trade sectors are scarce due to the need for detailed capital stock and services estimates in trade industries. Van Ark, Monnikhof and Mulder (1998, Table 8) found that in 1990 the capital stock per hour worked in France, Germany and the U.S. was almost the same. Results for 1999 in O'Mahony (1999), updated in O'Mahony and de Boer (2002),[25] suggest that within Europe, variation in total factor productivity is lower than for labour productivity as capital intensity differs greatly across countries. But also in TFP levels, the U.S. is leading Europe. Differences in TFP are hard to breakdown. They include a combination of differences in scale effects, efficiency and disembodied technology differences. Differences in the diffusion of new technologies can be measured by looking at the differences in shares of various store formats across countries. As shown by Baily and Zitzewitz (2001), store formats such mass merchandisers or chain stores provide the best possibilities for application of new ICT-based technology. The U.S. lead in labour productivity is partly based on its higher share of stores following this format, and their faster application of these new technologies than the European counterparts. McGuckin, Spiegelman and van Ark (2005) provide an in-depth overview of why U.S. productivity growth has been so much quicker in the recent period than in Europe.

[25] See also Inklaar, O'Mahony and Timmer 2003.

References

Ark, B. van, and M. P. Timmer (2001), "PPPs and International Productivity Comparisons: Bottlenecks and New Directions", Joint World Bank–OECD Seminar on PPPs, 30 January – 2 February, Washington D.C.

Ark, B. van, E. Monnikhof and N. Mulder (1999), 'Productivity in Services: An international Comparative Perspective', *Canadian Journal of Economics*, 32(2), pp.471-99.

Ark, B. van, R.C. Inklaar and R.H. McGuckin (2003), " "Changing Gear: Productivity, ICT and Service Industries in Europe and the United States", in J.F. Christensen and P. Maskell, eds., *The Industrial Dynamics of the New Digital Economy*, Edward Elgar, pp. 56-99.

Baily, M.N. (1993), "Competition, Regulation and Efficiency in Service Industries", *Brookings Papers on Economic Activity, Microeconomics 2*, Washington D.C., December, pp. 71-159.

Baily, M.N. and R.M. Solow (2001), "International Productivity Comparisons Built From The Firm Level", *Journal Of Economic Perspectives*, 15(3), Pp. 151-172.

Baily, M. N. and E. Zitzewitz (2001), "Service sector productivity comparisons: lessons for measurement", in C.R. Hulten, E.R. Dean and M.J. Harper (eds), *New Developments in Productivity Analysis*, NBER Studies in Income and Wealth, volume 63.

Baily, Martin Neil and Kirkegaard, Jacob Funk (2004), *Transforming the European Economy*, Institute of International Economies, 2004.

Eurostat (2001), *Handbook on price and volume measures in national accounts*, European commission, Luxembourg.

Inklaar, R., M. O'Mahony and M.P. Timmer (2003), 'ICT and Europe's Productivity Performance: Industry-level growth account comparisons with the United States,', *GGDC Research Memorandum GD-68,* Groningen Growth and Development Centre, December.

Jorgenson, D.W., M.S. Ho, and K.J. Stiroh (2003), 'Growth of US Industries and Investment in IT and Higher Education', *Economic Systems Research,* 15, pp. 279-325.

Kravis, I.B., A. Heston and R. Summers (1982), *World Product and Income*, Baltimore: John Hopkins.

Manser, M. (2004), "Productivity Measures for Retail Trade: Data and Issues", paper presented for OECD Workshop on Services, Paris, 15-16 November**.**

McGuckin, R.H., M. Spiegelman and B. van Ark (2005), *Perspectives on a Global Economy: The U.S. Advantage in Trade Performance. How Can Europe Catch-Up?*, The Conference Board,.

McKinsey Global Institute (1992), *Services Productivity*, Washington D.C.

McKinsey Global Institute (2002), *Reaching Higher Productivity Growth in France and Germany*, October 2002.

Mulder, N. (1999), "The Measurement of Performance in Distribution, Transport and Communications" The ICOP Approach Applied to Brazil, Mexico, France and the United States", in R. Lipsey and A. Heston, *International and Interarea Comparisons of Prices, Income and Output*, NBER, Chicago University Press, pp. 279-325.

OECD (2001), *OECD Productivity Manual: A Guide to the Measurement of Industry-Level and Aggregate Productivity Growth*, OECD, Paris.

Oi, W. (1992), "Productivity in the Distributive Trades: The Shopper and the Economies of Massed Reserves", in Z. Griliches, ed., *Output Measurement in the Service Sectors*, University of Chicago Press

O'Mahony, M. (1996), "Comparative productivity in market services: the distributive trades.", *National Institute Of Economic And Social Research, Discussion Paper No. 110*, December.
O'Mahony, M. (1999), *Britain's Productivity Performance 1950-1996 – An International Perspective*, National Institute Of Economic And Social Research, London
O'Mahony and W. de Boer (2002), "Britain's relative productivity performance: Updates to 1999", National Institute for Economic and Social Research, mimeographed.
O'Mahony, M.N. Oulton and J. Vass (1998), "Market Services: Productivity Benchmarks for the UK", *Oxford Bulletin of Economics and Statistics*, November, p. 529-551.
Pilat, D. (1996), *Labour productivity levels in OECD countries: estimates for manufacturing and selected service sectors*, OECD Economics Department Working Papers no. 169, Paris.
Ratchford, B.T. (2003), "Has the productivity of retail food stores really declined?", *Journal of Retailing*, Vol. 79, Issue 3 , pp. 171-182
Smith, A.D. and D.M.W.N. Hitchens (1985), *Productivity in the Distributive Trades – A Comparisons of Britain, America and Germany*, National Institute of Economic and Social Research, Cambridge University Press, London.
Timmer, M.P. and R.Inklaar (2005), "Productivity Differentials in the U.S. and EU Distributive Trade Sector: Statistical Myth Or Reality?", *GGDC Research Memorandum GD-76*, April 2005, Groningen Growth and Development Center.
Timmer, M.P., R.Inklaar and B. van Ark (2005), "Alternative Output Measurement for the U.S. Retail Trade Sector", *Monthly Labor* Review, July 2005, pp. 2-8.
Timmer, M.P., G.Ypma and B. van Ark (2005), "Industry-of-origin prices and PPPs: A new dataset for international comparisons", *GGDC Research Memorandum GD-***, Groningen Growth and Development Centre, forthcoming.
Triplett, J. and B. Bosworth. (2004), *Productivity in the U.S. Services Sector. New Sources of Economic Growth*, The Brookings Institution, Washington D.C.

Statistical sources used

Bank of Korea, 1997 estimated Input-Output table
CBS Statline, CBS Statline, bedrijfsleven-Detailhandel en Groothandel 2004, 03-26, http://statline.cbs.nl/StatWeb/start.asp?LA=nl&DM=SLNL&lp=Search/Search
Czech Statistical Office (2004), Data kindly provided by the Information services unit (Zdenka Strnadlová).
The Report on the 1996 Census of the Republic of China, Census Bureau, DGBAS
European Commission (2004), VAT Rates Applied in the Member States of the European Union, Brussels
EUROSTAT (2000), Panorama of European Business, Distributive trade, Data 1989-1999, Theme 4, Industry, Trade and Services
EUROSTAT (2001), Distributive trades in Europe, Theme 4, Industry, Trade and Services
EUROSTAT (2003), European Business, Facts and Figures, Part 5: Trade and Tourism, Data 1991-2001.
EUROSTAT (2005), NewCronos Database, Structural Business Statistics, Annual Detailed Entreprise Statistics on trade
GGDC (2003), Agricultural database 2003, version II.

GGDC (2005), 60-industry database, February 2005, http://www.ggdc.net.
GGDC and the Conference Board (2005), Total Economy Database, January 2005, http://www.ggdc.net
INSEE (2000), Enquete Annuelle d'entreprise dans le commerce (from Annuaire Statistique de la France 2001)
INSEE (2001), Enquete Annuelle d'entreprise dans le commerce (from Annuaire Statistique de la France 2001)
Instituto Nacional de Estadistica (2000), Estatísticas das Empresas - Comércio e Outros Serviços, 1997, http://www.ine.pt/prodserv/quadros/mostra_quadro.asp
Nationaal Instituut voor de Statistiek (1999), Enquete Structuur van de ondernemingen 1997
National Statistical Office (1999), Korea Statistical Yearbook 1999, http://www.nso.go.kr/eng/
OECD (1999), Consumption Tax Trends, 1999 edition, Paris
OECD (2004), OECD Historical PPPs 1980-2003
OECD (2005), STAN Database for industrial analysis 2005, rev. 01
OECD and International Energy Agency (1999), Energy policies of IEA countries, 1999 review, Paris.
O'Mahony and van Ark (2003) CD-ROM
Office for National Statistics (ONS), Annual Abstract of Statistics 2000
Office for National Statistics (ONS), Annual Business Inquiry, 2004, http://www.statistics.gov.uk/abi/
Statistisches Bundesamt (1997), Binnenhandel, Gastgewerbe, Tourismus, Fachserie 6, Reihe 3.2 Beschaftigung, Umsatz, Wareneingang, Lagerbestand und Investitionen im Einzelhandel 1997
Statistisches Bundesamt (1997) Binnenhandel, Gastgewerbe, Tourismus, Fachserie 6, Reihe 3.2 Beschaftigung, Umsatz, Wareneingang, Lagerbestand und Investitionen im Grosshandel 1997
Statistik Austria (1997), Handel, Dienstleistungen 1997
Statistics Canada (2000), Wholesaling and Retailing in Canada 1997, Catalogue no. 63-236-XIB
Statistics Denmark, STATBANK Danmark, Accounts statistics
Statistics Japan (1999), Statistics on Japanese Industries 1999, Census of Commerce
Statistics Japan (2000), Detailed I-O table 1995
Statistics Norway (2000), Yearbook of statistics Norway 2000, http://www.ssb.no/english/yearbook/2000/
US Bureau of Census (1997), 1997 Economic Census, http://www.census.gov/epcd/www/econ97.html#1997

Appendix 1 Detailed tables

Appendix Table 1 Labour productivity levels (Value added per person engaged) in national currency, 1997, total trade = 1

NACE Rev.1		Aus-tralia	Austria	Bel-gium	Cana-da	Czech Republic	Den-mark	Finland	France	Ger-many	Greece	Hungary	Ireland	Italy
50-52	**Total trade**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
50	**Motor trade**	**2.00**	**1.08**	**1.42**	**1.38**	**0.76**	**0.76**	**1.03**	**1.21**	**1.03**	**0.86**	**1.08**	**1.51**	**1.15**
51	**Wholesale**	**1.33**	**1.25**	**1.35**	**1.40**	**1.65**	**1.28**	**1.71**	**1.36**	**1.73**	**1.44**	**1.07**	**1.76**	**1.26**
52	**Retail**	**0.64**	**0.78**	**0.58**	**0.64**	**0.64**	**0.79**	**0.53**	**0.74**	**0.62**	**0.96**	**1.00**	**0.70**	**0.87**
50	**Motor trade**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**n.a.**	**1**	**1**	**1**
50.1	Sale of motor vehicles	1.23	0.85	1.16	1.12	1.23	0.68	1.27	1.15	1.00	n.a.	1.19	1.19	1.29
50.2	Maintenance & repair	1.12	1.14	0.90	n.a.	0.43	1.73	1.31	0.96	n.a.	n.a.	0.90	1.53	0.98
50.3	Sale of motor vehicle	0.69	1.52	1.00	0.87	2.60	0.75	0.70	0.92	1.43	n.a.	0.93	0.78	1.48
50.4	Sale & repair of motor	0.58	0.63	0.23	0.18	0.34	0.61	0.28	0.39	0.80	n.a.	0.31	0.19	0.41
50.5	Retail sale of fuel	0.87	0.61	0.71	0.35	2.20	0.41	0.42	0.46	0.42	n.a.	0.76	0.44	0.52
51	**Wholesale**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**n.a.**	**1**	**1**	**1**
51.2	Agricultural raw mater	0.63	0.50	0.40	2.54	0.22	0.64	0.29	0.72	0.80	n.a.	0.65	0.52	0.42
51.3	Food, beverages & tol	0.85	0.55	0.68	0.89	1.31	1.55	0.81	0.74	0.93	n.a.	0.86	0.78	0.66
51.4	Household goods	0.83	0.80	0.85	1.38	1.78	1.08	1.00	0.86	0.78	n.a.	1.16	0.86	1.18
51.5	Non-agr. intermediate	0.93	1.42	1.92	0.77	1.91	1.21	1.34	1.19	1.28	n.a.	0.70	1.56	1.05
51.6	Machinery & equipme	1.26	1.31	0.77	1.11	1.04	0.87	1.17	1.21	0.83	n.a.	1.68	1.11	1.83
51.7	Other wholesale	0.30	2.17	1.01	0.10	0.81	0.62	10.67	0.79	1.40	n.a.	1.06	0.54	1.04
52	**Retail**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**n.a.**	**1**	**1**	**1**
52.1	Non-specialized trade	1.02	0.81	1.31	0.91	0.84	0.89	1.11	1.26	0.97	n.a.	0.87	0.84	1.16
52.2	Food, beverages & tol	0.60	1.36	0.64	1.24	1.05	1.04	0.86	0.66	0.80	n.a.	0.78	0.76	0.59
52.3	Pharm. & medical goo	1.38	1.19	1.31	0.70	1.57	1.42	1.05	1.54	0.86	n.a.	1.63	1.80	2.54
52.4	New goods in spec. st	1.25	1.03	0.88	1.36	1.24	1.08	0.84	0.81	0.96	n.a.	1.01	1.12	0.90
52.5	Second-h. goods in st	1.15	0.94	0.83	0.86	1.38	0.32	0.63	0.81	0.87	n.a.	1.41	0.78	0.88
52.6	Sale not in stores	1.02	1.06	0.70	n.a.	1.74	0.61	1.53	0.59	1.71	n.a.	1.38	1.92	0.63
52.7	Repair of goods	1.43	0.52	0.71	n.a.	0.79	0.79	0.77	0.81	n.a.	n.a.	1.72	1.03	0.83

Appendix Table 1 (continued)

NACE Rev.1	Japan	Luxem-bourg	Nether-lands	Nor-way	Poland	Portu-gal	Slo-vakia	South Korea	Spain	Sweden	Taiwan	U.K.	U.S.A.
50-52 Total trade	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
50 Motor trade	**1.75**	**1.39**	**1.21**	**1.64**	**0.78**	**1.48**	**0.50**	**1.60**	**1.09**	**1.58**	**0.93**	**2.02**	**1.04**
51 Wholesale	**1.45**	**1.35**	**1.63**	**1.24**	**1.58**	**1.09**	**1.25**	**1.22**	**1.34**	**1.06**	**1.08**	**1.75**	**1.67**
52 Retail	**0.64**	**0.62**	**0.50**	**0.61**	**0.65**	**0.76**	**0.91**	**0.83**	**0.83**	**0.81**	**0.98**	**0.58**	**0.71**
50 Motor trade	**n.a.**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
50.1 Sale of motor vehicles	n.a.	0.85	0.88	1.26	0.92	1.18	1.09	1.08	1.61	1.19	1.05	0.94	1.62
50.2 Maintenance & repair	n.a.	1.25	1.11	1.31	1.06	0.87	0.90	1.41	0.66	0.97	n.a.	1.17	n.a.
50.3 Sale of motor vehicle	n.a.	1.10	1.41	0.90	1.06	0.97	0.74	0.66	1.08	0.90	1.03	0.82	1.02
50.4 Sale & repair of motor	n.a.	0.52	0.68	0.36	0.42	0.48	0.40	0.14	0.47	0.28	1.01	0.47	0.93
50.5 Retail sale of fuel	n.a.	1.26	1.19	0.48	0.83	1.25	1.48	0.49	0.59	0.77	0.82	1.22	0.97
51 Wholesale	**n.a.**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
51.2 Agricultural raw mater	n.a.	0.32	0.76	0.40	0.07	0.59	0.09	0.11	0.61	0.16	0.22	0.37	1.22
51.3 Food, beverages & tol	n.a.	0.60	0.85	1.33	0.10	1.06	0.48	0.53	0.52	0.90	0.63	0.51	0.76
51.4 Household goods	n.a.	0.97	0.86	0.79	0.16	0.90	0.62	0.94	1.20	0.74	1.08	1.15	1.06
51.5 Non-agr. intermediate	n.a.	1.62	1.27	0.75	0.11	1.78	3.20	1.43	1.37	1.16	0.79	0.90	1.04
51.6 Machinery & equipme	n.a.	0.90	1.13	1.21	0.16	0.74	1.38	1.28	1.42	1.23	1.41	1.53	0.98
51.7 Other wholesale	n.a.	1.17	0.69	0.45	0.15	1.10	0.27	2.32	1.01	0.26	1.43	0.90	1.90
52 Retail	**n.a.**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
52.1 Non-specialized trade	n.a.	1.12	0.81	0.99	0.93	1.21	1.05	1.86	1.32	0.97	1.01	0.97	0.85
52.2 Food, beverages & tol	n.a.	0.77	0.97	0.77	0.95	0.74	0.36	0.37	0.95	1.10	1.08	0.63	0.85
52.3 Pharm. & medical goo	n.a.	1.82	1.35	1.60	1.29	1.63	0.73	1.02	1.69	1.69	1.65	1.38	0.81
52.4 New goods in spec. st	n.a.	0.92	1.10	1.01	1.11	0.97	0.93	1.04	0.82	0.96	0.94	1.02	1.13
52.5 Second-h. goods in st	n.a.	1.15	n.a.	0.81	1.57	0.54	0.26	0.75	0.79	1.19	0.76	2.24	0.61
52.6 Sale not in stores	n.a.	1.05	0.99	0.60	1.01	0.56	1.07	0.61	0.65	0.83	0.51	1.43	2.45
52.7 Repair of goods	n.a.	0.49	n.a.	0.43	0.24	0.50	2.01	2.95	0.47	0.59	n.a.	1.67	n.a.

Source: based on national census and Eurostat material

Appendix Table 2 Shares of industries in total trade sales, 1997

NACE		EU 15	Asia 3	North America	Eastern Europe	Aus-tralia	Austria	Belgium	Canada	Czech Rep.	Den-mark	Finland	France	Ger-many	Greece	Hungary
50-52	**Total trade**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
50	**Motor trade**	16%	11%	20%	11%	20%	15%	18%	24%	13%	14%	16%	14%	12%	15%	15%
51	**Wholesale**	54%	69%	45%	59%	47%	59%	61%	53%	55%	59%	56%	50%	56%	29%	56%
52	**Retail**	30%	20%	35%	30%	33%	27%	21%	23%	32%	27%	28%	36%	32%	55%	28%
50	**Motor trade**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
50.1	Sale of motor vehicles	67%	62%	72%	46%	54%	63%	71%	66%	37%	63%	55%	75%	79%	51%	58%
50.2	Maintenance & repair	8%	6%	7%	15%	11%	16%	9%	5%	20%	13%	19%	8%	0%	13%	10%
50.3	Sale of motor vehicle par	10%	11%	13%	15%	12%	12%	11%	16%	10%	8%	13%	11%	14%	8%	9%
50.4	Sale & repair of motorcyc	2%	0%	1%	0%	3%	2%	1%	1%	1%	1%	1%	3%	2%	3%	0%
50.5	Retail sale of fuel	13%	20%	8%	24%	20%	7%	9%	12%	33%	16%	11%	4%	5%	25%	23%
51	**Wholesale**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
51.2	Agricultural raw materials	6%	11%	8%	3%	10%	8%	5%	9%	2%	8%	2%	13%	6%	4%	6%
51.3	Food, beverages & tobac	22%	11%	19%	18%	18%	18%	17%	18%	15%	20%	13%	25%	21%	23%	33%
51.4	Household goods	20%	21%	22%	15%	15%	21%	20%	13%	19%	20%	14%	19%	21%	25%	21%
51.5	Non-agr. intermediate pr	30%	23%	24%	24%	25%	32%	40%	34%	27%	23%	27%	23%	34%	34%	14%
51.6	Machinery & equipment	16%	19%	23%	6%	30%	18%	15%	25%	12%	24%	26%	21%	11%	9%	6%
51.7	Other wholesale	5%	15%	3%	34%	1%	4%	3%	0%	25%	5%	19%	0%	7%	5%	21%
52	**Retail**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
52.1	Non-specialized trade	41%	31%	47%	47%	44%	30%	39%	52%	59%	38%	59%	50%	40%	35%	52%
52.2	Food, beverages & tobac	7%	21%	3%	7%	14%	8%	8%	8%	3%	10%	3%	4%	4%	8%	4%
52.3	Pharm. & medical goods	8%	4%	6%	4%	7%	9%	8%	9%	4%	4%	7%	9%	9%	9%	8%
52.4	New goods in spec. store	37%	36%	37%	29%	34%	49%	42%	31%	28%	29%	29%	30%	36%	43%	31%
52.5	Second-h. goods in store	0%	0%	0%	1%	1%	0%	0%	0%	0%	1%	0%	1%	0%	0%	1%
52.6	Sale not in stores	6%	6%	6%	11%	0%	4%	3%	0%	4%	17%	2%	5%	10%	5%	2%
52.7	Repair of goods	0%	0%	1%	1%	1%	0%	0%	0%	1%	1%	1%	1%	0%	1%	2%

Appendix Table 2 (continued)

NACE		Ireland	Italy	Japan	Luxem-bourg	Nether-lands	Norway	Poland	Portu-gal	Slo-vakia	South Korea	Spain	Sweden	Taiwan	U.K.	U.S.A.	Average
50-52	**Total trade**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
50	**Motor trade**	21%	19%	10%	19%	13%	19%	9%	21%	8%	15%	16%	17%	21%	18%	19%	16%
51	**Wholesale**	46%	49%	71%	60%	67%	54%	61%	49%	74%	49%	54%	57%	36%	53%	45%	55%
52	**Retail**	33%	32%	19%	21%	20%	27%	29%	30%	18%	36%	30%	26%	43%	29%	36%	28%
50	**Motor trade**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
50.1	Sale of motor vehicles	67%	51%	64%	54%	68%	53%	48%	61%	59%	42%	67%	60%	74%	71%	73%	61%
50.2	Maintenance & repair	6%	13%	6%	3%	3%	21%	13%	8%	16%	12%	10%	12%	0%	7%	7%	10%
50.3	Sale of motor vehicle par	11%	8%	11%	6%	11%	7%	21%	9%	3%	10%	8%	9%	14%	9%	12%	11%
50.4	Sale & repair of motorcyc	1%	3%	0%	1%	2%	1%	0%	3%	2%	1%	2%	1%	1%	1%	1%	1%
50.5	Retail sale of fuel	16%	25%	19%	37%	15%	18%	19%	18%	20%	35%	13%	18%	11%	12%	8%	17%
51	**Wholesale**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
51.2	Agricultural raw materials	5%	4%	11%	3%	11%	4%	2%	7%	4%	2%	6%	4%	6%	2%	8%	6%
51.3	Food, beverages & tobac	29%	23%	10%	27%	20%	28%	18%	27%	15%	24%	28%	19%	13%	19%	19%	20%
51.4	Household goods	16%	25%	21%	11%	17%	18%	13%	25%	14%	22%	23%	21%	29%	17%	23%	19%
51.5	Non-agr. intermediate pro	28%	34%	22%	38%	21%	25%	22%	23%	54%	35%	27%	31%	26%	35%	23%	30%
51.6	Machinery & equipment	16%	9%	19%	19%	26%	24%	3%	11%	7%	15%	15%	24%	21%	17%	23%	18%
51.7	Other wholesale	5%	5%	16%	2%	5%	2%	43%	7%	6%	2%	1%	1%	5%	10%	3%	7%
52	**Retail**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
52.1	Non-specialized trade	51%	35%	32%	37%	36%	46%	38%	26%	67%	27%	35%	42%	23%	47%	47%	41%
52.2	Food, beverages & tobac	6%	8%	22%	8%	8%	5%	10%	10%	3%	16%	16%	9%	17%	7%	2%	9%
52.3	Pharm. & medical goods	6%	9%	4%	6%	3%	5%	4%	8%	3%	4%	9%	7%	3%	4%	6%	6%
52.4	New goods in spec. store	35%	43%	34%	46%	49%	42%	29%	53%	23%	47%	36%	36%	54%	36%	37%	38%
52.5	Second-h. goods in store	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	1%	0%	0%
52.6	Sale not in stores	1%	5%	7%	2%	4%	2%	17%	2%	3%	3%	3%	3%	3%	5%	6%	5%
52.7	Repair of goods	0%	1%	0%	0%	0%	1%	1%	1%	0%	2%	1%	1%	0%	0%	1%	1%

Source: see main text
Note (a): Wholesale is excluding Wholesale on fee or contract basis (51.1)

Appendix Table 3 Margins as % of sales in distributive trade industries, 1997

NACE		EU-15	Asia-3	North America	Eastern Europe	Australia	Austria	Belgium	Canada	Czech Rep.	Den-mark	Finland	France	Ger-many	Greece	Hungary
50-52	**Total Trade**	**0.24**	**0.28**	**0.25**	**0.20**	**0.27**	**0.26**	**0.21**	**0.23**	**0.21**	**0.22**	**0.19**	**0.24**	**0.22**	**0.34**	**0.22**
50	**Motor trade**	**0.22**	**0.23**	**0.21**	**0.19**	**0.23**	**0.27**	**0.15**	**0.22**	**0.21**	**0.22**	**0.18**	**0.22**	**0.20**	**0.34**	**0.15**
50.1	Sale of motor vehicles	0.17	0.22	0.17	0.16	0.14	0.22	0.11	0.18	0.18	0.18	0.10	0.16	0.18	0.25	0.12
50.2	Maintenance & repair	0.54	0.47	0.49	0.38	0.57	0.52	0.43	0.45	0.41	0.35	0.33	0.56	n.a.	0.71	0.35
50.3	Sale of motor vehicle p	0.29	0.10	0.32	0.18	0.45	0.30	0.23	0.27	0.17	0.45	0.28	0.34	0.26	0.36	0.19
50.4	Sale & repair of motorc	0.25	0.21	0.17	0.24	0.22	0.23	0.18	0.15	0.26	0.18	0.20	0.27	0.22	0.31	0.29
50.5	Retail sale of fuel	0.21	0.25	0.23	0.13	0.17	0.14	0.12	0.26	0.14	0.14	0.15	0.30	0.26	0.33	0.12
51	**Wholesale**	**0.18**	**0.22**	**0.18**	**0.15**	**0.23**	**0.23**	**0.19**	**0.21**	**0.20**	**0.21**	**0.15**	**0.21**	**0.17**	**0.17**	**0.24**
51.2	Agricultural raw materia	0.12	0.16	0.12	0.17	0.20	0.17	0.15	0.14	0.24	0.15	0.21	0.12	0.10	0.10	0.17
51.3	Food, beverages & tobi	0.15	0.21	0.14	0.12	0.17	0.23	0.16	0.16	0.12	0.11	0.12	0.18	0.14	0.14	0.19
51.4	Household goods	0.21	0.28	0.21	0.16	0.28	0.30	0.26	0.25	0.20	0.23	0.24	0.27	0.23	0.23	0.24
51.5	Non-agr. intermediate p	0.18	0.15	0.16	0.14	0.20	0.18	0.15	0.19	0.17	0.19	0.15	0.21	0.16	0.16	0.26
51.6	Machinery & equipmen	0.20	0.21	0.21	0.20	0.25	0.27	0.29	0.27	0.27	0.28	0.22	0.25	0.24	0.24	0.29
51.7	Other wholesale	0.17	0.25	0.20	0.17	0.54	0.13	0.19	0.23	0.26	0.32	0.03	0.17	0.12	0.12	0.30
52	**Retail**	**0.31**	**0.34**	**0.31**	**0.24**	**0.34**	**0.34**	**0.29**	**0.30**	**0.22**	**0.25**	**0.26**	**0.28**	**0.32**	**0.36**	**0.23**
52.1	Non-specialized trade	0.24	0.31	0.25	0.20	0.28	0.26	0.23	0.23	0.20	0.21	0.21	0.18	0.24	0.29	0.18
52.2	Food, beverages & tobi	0.31	0.33	0.30	0.20	0.40	0.25	0.34	0.40	0.23	0.18	0.36	0.38	0.33	0.47	0.28
52.3	Pharm. & medical gooc	0.31	0.17	0.27	0.19	0.34	0.35	0.32	0.28	0.17	0.20	0.32	0.32	0.33	0.30	0.19
52.4	New goods in spec. sto	0.37	0.33	0.36	0.25	0.38	0.38	0.32	0.40	0.25	0.25	0.34	0.39	0.39	0.39	0.30
52.5	Second-h. goods in sto	0.48	0.25	0.43	0.77	0.55	0.53	0.58	0.42	0.55	0.84	0.46	0.50	0.49	0.63	0.42
52.6	Sale not in stores	0.40	0.70	0.43	0.34	0.46	0.53	0.43	n.a.	0.26	0.35	0.29	0.47	0.35	0.45	0.36
52.7	Repair of goods	0.69	0.66	0.64	0.47	0.62	0.82	0.72	n.a.	0.45	0.56	0.51	0.70	n.a.	0.64	0.28

Appendix Table 3 (continued)

NACE	Ireland	Italy	Japan	Luxem-bourg	Nether-lands	Norway	Poland	Portu-gal	Slo-vakia	South Korea	Spain	Sweden	Taiwan	U.K.	U.S.A.	Average
50-52 Total Trade	**0.21**	**0.32**	**0.29**	**0.18**	**0.21**	**0.22**	**0.19**	**0.20**	**0.20**	**0.28**	**0.22**	**0.24**	**0.25**	**0.25**	**0.25**	**0.23**
50 Motor trade	**0.15**	**0.34**	**0.23**	**0.14**	**0.17**	**0.19**	**0.18**	**0.16**	**0.25**	**0.24**	**0.20**	**0.17**	**0.18**	**0.18**	**0.21**	**0.20**
50.1 Sale of motor vehicles	0.12	0.25	0.22	0.15	0.16	0.13	0.17	0.13	0.24	0.18	0.13	0.13	0.16	0.16	0.17	0.16
50.2 Maintenance & repair	0.26	0.71	0.44	0.41	0.57	0.32	0.35	0.49	0.37	0.61	0.68	0.37	0.46	0.36	0.49	0.46
50.3 Sale of motor vehicle p	0.26	0.36	0.06	0.25	0.21	0.27	0.18	0.29	0.30	0.31	0.25	0.24	0.30	0.30	0.32	0.28
50.4 Sale & repair of motorc	0.26	0.31	0.14	0.19	0.20	0.16	0.23	0.19	0.17	0.32	0.21	0.19	0.16	0.22	0.17	0.21
50.5 Retail sale of fuel	0.16	0.33	0.27	0.07	0.10	0.15	0.11	0.07	0.17	0.16	0.19	0.14	0.22	0.12	0.22	0.17
51 Wholesale	**0.20**	**0.29**	**0.28**	**0.15**	**0.19**	**0.21**	**0.16**	**0.21**	**0.19**	**0.24**	**0.20**	**0.24**	**0.23**	**0.25**	**0.22**	**0.22**
51.2 Agricultural raw materia	0.19	0.21	0.19	0.15	0.12	0.16	0.14	0.09	0.56	0.21	0.13	0.43	0.22	0.19	0.13	0.21
51.3 Food, beverages & toba	0.14	0.21	0.27	0.14	0.13	0.11	0.13	0.11	0.22	0.24	0.16	0.14	0.22	0.24	0.17	0.17
51.4 Household goods	0.25	0.31	0.40	0.20	0.26	0.26	0.15	0.27	0.23	0.29	0.24	0.30	0.25	0.29	0.27	0.26
51.5 Non-agr. intermediate p	0.18	0.34	0.18	0.12	0.18	0.27	0.17	0.26	0.13	0.21	0.21	0.21	0.23	0.22	0.20	0.21
51.6 Machinery & equipmen	0.26	0.29	0.27	0.22	0.22	0.22	0.21	0.29	0.22	0.27	0.22	0.26	0.23	0.27	0.27	0.26
51.7 Other wholesale	0.29	0.32	0.33	0.15	0.24	0.35	0.18	0.20	0.22	0.18	0.24	0.54	0.22	0.23	0.25	0.27
52 Retail	**0.26**	**0.36**	**0.34**	**0.30**	**0.32**	**0.28**	**0.25**	**0.22**	**0.22**	**0.34**	**0.28**	**0.28**	**0.30**	**0.31**	**0.31**	**0.29**
52.1 Non-specialized trade	0.23	0.29	0.33	0.22	0.25	0.21	0.21	0.16	0.18	0.22	0.21	0.23	0.22	0.27	0.26	0.23
52.2 Food, beverages & toba	0.30	0.47	0.33	0.36	0.30	0.20	0.18	0.18	0.19	0.35	0.22	0.20	0.36	0.29	0.28	0.29
52.3 Pharm. & medical gooc	0.31	0.30	0.12	0.28	0.33	0.27	0.20	0.24	0.44	0.38	0.29	0.22	0.40	0.26	0.27	0.29
52.4 New goods in spec. sto	0.30	0.39	0.32	0.35	0.36	0.35	0.25	0.25	0.28	0.38	0.34	0.34	0.31	0.36	0.36	0.33
52.5 Second-h. goods in sto	0.51	0.63	0.20	0.46	0.42	0.48	0.84	0.51	0.44	0.50	0.55	0.31	0.33	0.39	0.43	0.50
52.6 Sale not in stores	0.37	0.45	0.72	0.36	0.36	0.44	0.35	0.34	0.44	0.51	0.40	0.39	0.36	0.41	0.43	0.41
52.7 Repair of goods	0.65	0.64	n.a.	0.78	n.a.	0.90	0.56	0.67	0.44	0.66	0.91	0.63	n.a.	0.60	0.64	0.66

n.a = not available
Source: see main text

Appendix Table 4 Output PPPs for distributive trade sectors, 1997 (national currency per US$)

	Motor Trade (50)				Wholesale trade (51)				Retail trade (52)				Total trade (50-52)		
	Laspeyres	Paasche	Fisher	EKS	Laspeyres	Paasche	Fisher	EKS	Laspeyres	Paasche	Fisher	EKS	Laspeyres	Paasche	Fisher
Australia	1.43	1.25	1.34	1.33	2.00	1.50	1.73	1.77	1.65	1.55	1.60	1.58	1.75	1.47	1.60
Austria	14.42	11.86	13.08	13.16	17.71	15.36	16.49	16.15	15.19	12.10	13.56	13.47	16.05	13.51	14.72
Belgium	22.59	21.07	21.81	22.07	44.44	25.49	33.66	34.94	40.94	34.41	37.53	37.43	39.32	26.82	32.47
Canada	1.17	1.16	1.17	1.14	1.31	1.22	1.26	1.28	1.28	1.25	1.27	1.25	1.27	1.22	1.24
Czech Republic	22.21	15.65	18.65	19.40	18.48	16.05	17.22	16.94	15.90	10.95	13.20	13.11	17.93	13.84	15.75
Denmark	8.85	6.37	7.51	7.23	8.26	6.31	7.22	7.26	6.10	5.69	5.89	5.78	7.39	6.11	6.72
Finland	4.47	3.65	4.04	4.23	5.78	3.22	4.31	4.19	5.96	5.38	5.66	5.74	5.65	3.90	4.69
France	5.36	4.93	5.14	5.18	6.93	6.21	6.56	6.38	6.61	5.45	6.00	5.98	6.53	5.68	6.09
Germany	1.69	1.61	1.65	1.61	1.52	1.44	1.48	1.44	1.95	1.68	1.81	1.79	1.74	1.56	1.65
Greece	420.31	341.26	378.73	380.54	382.70	328.08	354.34	358.68	309.47	245.36	275.55	274.20	355.96	274.93	312.83
Hungary	130.96	112.79	121.53	121.58	144.97	137.36	141.11	139.46	111.92	87.48	98.95	97.99	127.88	115.64	121.61
Ireland	0.47	0.42	0.45	0.42	0.82	0.46	0.62	0.64	0.59	0.54	0.56	0.57	0.66	0.49	0.57
Italy	2,029.88	1,929.80	1,979.21	2,028.22	2,461.69	1,820.67	2,117.06	2,158.47	1,914.66	1,585.58	1,742.37	1,730.01	2,146.36	1,748.30	1,937.14
Japan	155.67	165.59	160.55	161.07	386.91	206.57	282.71	291.70	214.85	192.76	203.51	219.13	272.55	199.41	233.13
Luxembourg	24.67	22.14	23.37	21.78	38.47	29.13	33.48	33.72	37.34	33.77	35.51	35.25	35.73	29.24	32.32
Netherlands	1.67	1.60	1.64	1.57	1.80	1.54	1.67	1.64	2.16	1.77	1.95	1.92	1.94	1.61	1.77
Norway	7.11	5.66	6.34	6.54	10.16	8.00	9.01	9.54	9.97	8.49	9.20	9.11	9.58	7.63	8.55
Poland	2.25	1.12	1.59	1.89	1.85	1.38	1.60	1.65	1.76	1.48	1.61	1.59	1.87	1.39	1.61
Portugal	140.02	119.82	129.53	126.00	226.89	133.23	173.87	164.04	106.11	91.48	98.52	97.33	158.64	113.96	134.46
Slovakia	32.42	22.34	26.92	26.98	23.38	12.30	16.96	18.56	17.27	11.57	14.14	14.40	22.11	12.74	16.78
South Korea	861.53	613.38	726.94	738.53	1,475.09	1,049.57	1,244.27	1,240.09	1,057.94	840.30	942.86	889.13	1,188.51	873.16	1,018.71
Spain	111.66	110.05	110.85	116.97	127.76	102.74	114.57	115.54	123.67	100.36	111.40	108.37	123.31	102.84	112.61
Sweden	6.10	5.55	5.82	5.86	13.52	8.95	11.00	11.26	9.19	7.47	8.28	8.18	10.38	7.87	9.04
Taiwan	36.32	33.01	34.63	33.75	33.83	26.04	29.68	29.77	34.78	25.81	29.96	31.78	34.66	26.77	30.46
U.K.	0.56	0.51	0.54	0.51	0.89	0.69	0.78	0.80	0.74	0.65	0.69	0.69	0.77	0.64	0.70
U.S.A.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: see main text.
GDP PPPs from OECD Historical PPPs 1980-2003

Appendix Table 5 Output and inputs in trade industries, 1997

NACE	Australia	Austria	Belgium	Canada	Czech Republic	Denmark	Finland	France	Germany	Greece	Hungary	Ireland	Italy
Value added (million national currency)													
50 Motor trade	15,793	42,211	120,066	20,258	19,543	15,871	9,156	127,590	53,355	756,117	102,755	646	44,426,400
51 Wholesale	22,229	148,710	521,357	39,922	115,846	70,717	31,596	343,309	169,981	1,223,857	365,094	1,878	92,034,500
52 Retail	20,836	108,848	303,612	31,131	60,768	38,307	19,603	320,409	144,927	2,385,270	398,936	2,266	113,556,300
50-52 Total trade	58,857	299,769	945,035	91,312	196,157	124,895	60,355	791,307	368,263	4,365,244	866,785	4,789	250,017,200
Persons engaged (thousands)													
50 Motor trade	285	81	73	443	76	64	43	458	808	93	53	24	514
51 Wholesale	455	201	208	767	237	169	90	892	1,716	96	167	40	905
52 Retail	996	282	263	1,328	411	186	133	1,638	3,329	367	277	136	2,026
50-52 Total trade	1,736	564	544	2,539	725	419	267	2,988	5,853	556	497	200	3,444
Employees (thousands)													
50 Motor trade	n.a.	74	n.a.	n.a.	n.a.	53	n.a.	417	808	n.a.	n.a.	18	n.a.
51 Wholesale	n.a.	196	n.a.	n.a.	n.a.	162	n.a.	863	1,716	n.a.	n.a.	29	n.a.
52 Retail	n.a.	245	n.a.	n.a.	n.a.	166	n.a.	1,377	3,329	n.a.	n.a.	111	n.a.
50-52 Total trade	n.a.	515	n.a.	n.a.	n.a.	381	n.a.	2,656	5,853	n.a.	n.a.	158	n.a.
Annual hours worked per person													
50 Motor trade	2,062	1,611	1,644	1,770	1,997	1,537	1,697	1,676	1,480	2,230	1,999	1,901	1,780
51 Wholesale	2,028	1,528	1,622	1,770	1,997	1,628	1,700	1,685	1,430	2,232	1,999	1,955	1,752
52 Retail	1,515	1,388	1,463	1,770	1,997	1,330	1,460	1,495	1,245	2,212	1,999	1,731	1,724
50-52 Total trade	1,739	1,470	1,548	1,770	1,997	1,480	1,579	1,579	1,332	1,332	1,797	1,797	1,740

Appendix Table 5 (continued)

NACE	Japan	Luxem-bourg	Nether-lands	Norway	Poland	Portugal	Slovakia	South Korea	Spain	Sweden	Taiwan	U.K.	U.S.A.
Value added (million national currency)													
50 Motor trade	5,938,938	10,202	10,941	19,123	7,818	659,921	5,396	4,567,545	1,961,358	25,750	172,522	14,540	184,714
51 Wholesale	45,835,944	34,595	49,709	52,160	48,883	1,132,223	54,889	14,341,291	2,689,297	95,890	624,689	38,860	371,390
52 Retail	28,319,256	22,978	26,746	29,429	30,496	705,596	31,461	17,066,164	4,287,268	59,306	590,529	32,428	381,175
50-52 Total trade	80,094,138	67,775	87,397	100,712	87,197	2,497,740	91,745	35,975,000	8,937,923	180,946	1,387,740	85,828	937,279
Persons engaged (thousands)													
50 Motor trade	821	6	137	48	202	122	20	415	421	72	238	552	4,539
51 Wholesale	4,223	12	444	120	714	217	120	1,023	474	210	846	1,080	5,673
52 Retail	7,788	17	659	145	1,130	326	122	2,478	1,297	234	825	3,129	13,661
50-52 Total trade	12,832	35	1,240	314	2,046	666	263	3,915	2,193	516	1,909	4,762	23,873
Employees (thousands)													
50 Motor trade	n.a.	n.a.	114	n.a.	n.a.	101	n.a.	n.a.	318	n.a.	n.a.	n.a.	3,992
51 Wholesale	n.a.	n.a.	399	n.a.	n.a.	188	n.a.	n.a.	420	n.a.	n.a.	n.a.	5,473
52 Retail	n.a.	n.a.	551	n.a.	n.a.	243	n.a.	n.a.	768	n.a.	n.a.	n.a.	12,524
50-52 Total trade	n.a.	n.a.	1,064	n.a.	n.a.	532	n.a.	n.a.	1,506	n.a.	n.a.	n.a.	21,989
Annual hours worked per person													
50 Motor trade	2,051	1,599	1,473	2,230	1,880	1,800	1,800	2,330	1,862	1,869	2,231	1,859	1,711
51 Wholesale	1,755	1,580	1,542	1,350	1,880	1,777	1,777	2,330	1,839	1,946	2,231	1,854	1,938
52 Retail	1,755	1,544	1,095	1,399	1,880	1,734	1,734	2,330	1,788	1,514	2,231	1,378	1,453
50-52 Total trade	1,773	1,566	1,298	1,387	1,880	1,760	2,055	2,330	1,812	1,729	2,231	1,539	1,539

n.a = not available
Source: see main text

Appendix Table 6 Comparison of Census and National Accounts data on value added and labour input, 1997 (census as % of NA)

	Aus-tralia	Austria	Bel-gium	Canada	Czech Republic	Den-mark	Finland	France	Ger-many	Greece	Hun-gary	Ireland	Italy
Total trade (50-52)													
Gross value added	1.08	0.87	0.93	n.a.	n.a.	0.99	0.89	0.95	n.a.	n.a.	0.51	0.91	0.60
Total persons engaged	0.85	0.93	1.04	0.73	1.01	1.01	0.79	1.02	0.75	n.a.	0.49	1.06	0.86
Gross value added per person engaged	1.28	0.93	0.90	n.a.	n.a.	0.98	1.13	0.93	n.a.	n.a.	0.96	0.85	0.70
Motor trade (50)													
Gross value added	0.67	0.88	0.89	1.58	1.12	1.03	0.84	0.78	0.89	n.a.	0.58	1.00	0.47
Total persons engaged	0.81	0.92	1.04	0.64	1.01	0.93	0.72	0.96	0.56	n.a.	0.53	1.26	0.84
Gross value added per person engaged	0.83	0.95	0.86	2.49	1.11	1.10	1.17	0.81	1.59	n.a.	0.91	0.79	0.56
Wholesale trade (51)													
Gross value added	1.14	0.90	0.96	1.60	1.25	1.02	0.85	1.00	1.11	n.a.	0.69	1.00	0.78
Total persons engaged	0.78	0.96	1.04	0.72	1.01	0.99	0.88	1.15	0.73	n.a.	0.54	1.26	1.08
Gross value added per person engaged	1.46	0.94	0.93	2.23	1.24	1.03	0.96	0.87	1.52	n.a.	0.78	0.79	0.72
Retail trade (52)													
Gross value added	1.33	0.83	0.90	1.41	1.61	0.90	0.99	0.98	1.36	n.a.	0.33	0.80	0.50
Total persons engaged	0.89	0.91	1.04	0.77	1.01	1.05	0.75	0.97	0.81	n.a.	0.46	0.97	0.76
Gross value added per person engaged	1.50	0.90	0.86	1.84	1.59	0.86	1.32	1.01	1.68	n.a.	1.39	0.82	0.66

Appendix Table 6 (continued)

	Japan	Luxem-bourg	Nether-lands	Norway	Poland	Portu-gal	Slo-vakia	South Korea	Spain	Swe-den	Taiwan	U.K.	U.S.A.
Total trade (50-52)													
Gross value added	n.a.	0.97	0.90	0.97	0.56	0.99	0.28	1.16	1.17	0.93	0.83	1.22	1.22
Total persons engaged	n.a.	1.03	0.96	1.06	0.94	1.19	0.28	0.66	1.19	1.00	0.86	0.94	0.93
Gross value added per person engaged	n.a.	0.94	0.93	0.92	0.59	0.83	1.01	1.75	0.98	0.93	0.97	1.31	1.31
Motor trade (50)													
Gross value added	n.a.	0.94	0.83	0.85	0.56	0.61	0.47	1.24	0.69	0.93	0.67	1.22	0.89
Total persons engaged	n.a.	1.10	0.96	1.07	0.95	1.19	0.28	0.64	0.77	1.00	0.62	1.02	0.75
Gross value added per person engaged	n.a.	0.85	0.86	0.79	0.58	0.51	1.69	1.93	0.90	0.93	1.08	1.20	1.19
Wholesale trade (51)													
Gross value added	n.a.	1.02	0.91	0.93	0.56	1.11	0.32	1.29	1.91	0.93	0.97	1.22	1.24
Total persons engaged	n.a.	1.03	1.02	0.91	0.83	1.19	0.28	0.65	1.86	1.00	0.88	1.07	1.01
Gross value added per person engaged	n.a.	0.99	0.90	1.03	0.67	0.93	1.16	1.98	1.03	0.93	1.10	1.15	1.23
Retail trade (52)													
Gross value added	n.a.	0.91	0.90	1.12	0.56	1.15	0.17	1.02	0.91	0.93	0.74	1.22	1.36
Total persons engaged	n.a.	1.01	0.92	1.18	1.00	1.19	0.28	0.67	1.08	1.00	0.90	0.88	0.96
Gross value added per person engaged	n.a.	0.90	0.97	0.95	0.55	0.97	0.62	1.53	0.85	0.93	0.82	1.39	1.43

Source: see main text and Table 5

Appendix Table 7 Share of part-timers in total labour force (%)

	Motor trade		Wholesale		Retail	
	1996	2001	1996	2001	1996	2001
Austria	6	8	13	16	26	31
Belgium	7	10	9	11	22	28
Denmark	18	20	11	8	37	38
Finland	11	7	10	7	29	33
France	8	7	7	7	23	25
Germany	9	11	14	16	31	38
Greece (a)	3	3	3	3	4	4
Ireland (b)	13	13	6	9	23	36
Italy	3	6	6	8	8	12
Luxembourg (c)	7	10	9	9	12	14
Netherlands	21	31	16	21	55	62
Portugal (d)	3	4	6	4	9	11
Spain	3	4	6	4	9	10
Sweden	14	18	9	9	42	39
U.K.	14	13	14	15	50	50

Notes: (a) motor trade data for 1998
(b) motor trade 1996 as for 2001
(c) motor trade as for Belgium, wholesale 1996 as for 2001
(d) as for Spain
Source: EUROSTAT (2003), European Business, Facts and figures Part 5: Trade and tourism, Data 1991-2001

Appendix 2 Concordance NAICS and NACE rev 1

Motor trade, 1997

NACE	Industry (ISIC code)	NAICS
50.1	*Sale of motor vehicles*	**4411**, 42111, 44121
50.2	*Maintenance and repair of motor vehicles*	**8111**
50.3	*Sale of motor vehicle parts and accessories*	**4413**, 42112, 42113, 42114
50.4	*Sale, maintenance and repair of motorcycles and related parts and accessories*	441221
50.5	*Retail sale of automotive fuel*	44719

Wholesale, 1997

NACE	Industry (ISIC code)	NAICS
51.2	**Wholesale of agricultural raw materials and live animals (ISIC 51.21)**	
51.21	*Wholesale of grain, seeds and animal feeds*	42251+42291
51.22	*Wholesale of flowers and plants*	42293
51.23	*Wholesale of live animals*	42252
51.24	*Wholesale of hides, skins and leather*	42259(excl. 4225902)
51.25	*Wholesale of unmanufactured tobacco*	4225902
51.3	**Wholesale of food, beverages and tobacco (ISIC 51.22)**	
51.31	*Wholesale of fruit and vegetables*	42248
51.32	*Wholesale of meat and meat products*	42247+42244
51.33	*Wholesale of dairy produce, eggs and edible*	42243
51.34	*Wholesale of alcoholic and other beverages*	**4228+**4224903
51.35	*Wholesale of tobacco products*	42294
51.36	*Wholesale of sugar and chocolate and sugar confectionery*	42245
51.37	*Wholesale of coffee, tea, cocoa and spices*	4224901
51.38	*Wholesale of other food, including fish, crustaceans and molluscs*	42246, 4224902, 4224904-6
51.39	*Non-specialized wholesale of food, beverages and tobacco*	42241, 42242
51.41-42	**Wholesale of textiles, clothing and footwear (ISIC 51.31)**	
51.41	*Wholesale of textiles*	42231, 4212202, 4229903
51.42	*Wholesale of clothing and footwear*	42232-4
51.43-47	**Wholesale of other household goods (ISIC 51.39)**	
51.43	*Wholesale of electrical household appliances and radio and television goods*	42161-2, 4212204, 4216901, 4219904, 4219906, 42199041-2
51.44	*Wholesale of china and glassware, wallpaper and cleaning materials*	4212201
51.45	*Wholesale of perfume and cosmetics*	4222102
51.46	*Wholesale of pharmaceutical goods*	42145, 4222101
51.47	*Wholesale of other household goods*	4212101, 4212203, 42141, 42191-2, 42194**,** 42212, 42292, 42146, 4219901, 4219906
51.51	**Wholesale of solid, liquid and gaseous fuels and related products (ISIC 51.41)**	**4227, 4215201**
51.52	**Wholesale of metals and metal ores (ISIC 51.42)**	**42151, 4215202**
51.53-54	**Wholesale of construction materials, hardware, plumbing and heating equipment and supplies (51.43)**	
51.53	*Wholesale of wood, construction materials and sanitary equipment*	**4213**, 4219902
51.54	*Wholesale of hardware, plumbing and heating equipment and supplies*	42171-3
51.55-57	**Wholesale of other intermediate products, waste and scrap (ISIC 51.49)**	
51.55	*Wholesale of chemical products*	**4226,** 42295
51.56	*Wholesale of other intermediate products*	42211, 42213
51.57	*Wholesale of waste and scrap*	42193
51.6	**Wholesale of machinery, equipment and supplies (ISIC 51.5)**	
51.61	*Wholesale of machine-tools (51.18 in rev 1.1)*	42183021-2
51.62	*Wholesale of construction machinery (82 in rev 1.1)*	42181
51.64	*Wholesale of office machinery and equipment (84+85 in rev 1.1)*	42142-3, 4212102
51.65 incl.	*Wholesale of other machinery for use in industry, trade and*	42144, 42149, 42174, 4218301-7, 4216902, 42184-6
51.63	*navigation/Wholesale of machinery for the textile industry and of sewing and knitting machines (83+87+86 in rev 1.1)*	
51.66	*Wholesale of agricultural machinery and accessories and implements, including tractors (88 in rev 1.1)*	42182
51.7	**Other wholesale (ISIC and NACE 1.1: 51.9,)**	**4219903, 4229901-2, 4229904**

NACE	Industry (ISIC code)	NAICS
52.1	**Non-specialized retail trade in stores (ISIC 52.1)**	
52.11	*Retail sale in non-specialized stores with food, beverages or tobacco predominating (ISIC 52.11)*	**4451,** 45291
52.12	*Other retail sale in non-specialized stores (ISIC 52.19)*	**4521,** 44711, 45299
52.2	**Retail sale of food, beverages and tobacco in specialized stores (ISIC 52.2)**	
52.21	*Retail sale of fruit and vegetables (incl. 52.62)*	44523
52.22	*Retail sale of meat and meat products*	44521
52.23	*Retail sale of fish, crustaceans and molluscs*	44522
52.24	*Retail sale of bread, cakes, flour confectionery and sugar confectionery*	*445291-2*
52.25	*Retail sale of alcoholic and other beverages*	**4453**
52.26	*Retail sale of tobacco products*	*453991*
52.27	*Other retail sale of food, beverages and tobacco in specialized stores*	*445299, 446191*
52.3	**Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles (ISIC 52.31)**	
52.31	*Dispensing chemists*	44611
52.32	*Retail sale of medical and orthopaedic goods*	*446199*
52.33	*Retail sale of cosmetic and toilet articles*	44612
52.41-52.43	**Retail sale of textiles, clothing, footwear and leather goods (ISIC 52.32)**	
52.41	*Retail sale of textiles*	45113
52.42	*Retail sale of clothing*	**4481**
52.43	*Retail sale of footwear and leather goods*	**4482,** 44832
52.44-45	**Retail sale of household appliances, articles and equipment (52.33)**	
52.44	*Retail sale of furniture, lighting equipment and household articles n.e.c.*	**4421**, 44229
52.45	*Retail sale of electrical household appliances and radio and television goods*	44311, 45114, 45122
52.46	**Retail sale of hardware, paint and glass (ISIC 52.34)**	**4441, 44421**
52.47-48	**Other retail trade in specialized stores (ISIC 52.39)**	
52.47	*Retail sale of books, newspapers and stationery*	45121, 45321
52.48	*Other retail sale in specialized stores*	44221, 44312, 44422, 44613, 45111-2, **4531,** 45322, 45391, 45393, *441222-9,* 44313, 44831, *453998, 454312-9*
52.5	**Retail sale of second-hand goods in stores (ISIC 52.4)**	**4533**
52.61	**Retail sale via mail order houses (ISIC 52.51)**	**4541**
52.62	**Retail sale via stalls and markets (ISIC 52.52)**	
52.63	**Other non-store retail sale (ISIC 52.53)**	**4542, 45439, *454311***
52.7	**Repair of personal and household goods (ISIC 52.6)**	
52.71	*Repair of boots, shoes and other articles of leather*	81143
52.72	*Repair of electrical household goods*	*811211, 811412*
52.73	*Repair of watches, clocks and jewellery*	8114901
52.74	*Repair n.e.c.*	81142, *811411,* 8114904-9

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