

Session Number: Session 4
Session Title: Measuring factor input
Paper Number: 10

*Paper Prepared for the OECD Workshop on Productivity Measurement
organized jointly with Fundación BBVA & IVIE*

Madrid, 17-19 October 2005

*Fundación BBVA
Paseo Recolets 10
28001 Madrid*

**Labour productivity based on integrated labour accounts
– does it make any difference?**

**Kamilla Heurlén
and
Henrik Sejerbo Sørensen**

For additional information please contact:

Kamilla Heurlén (kah@dst.dk)
Henrik Sejerbo Sørensen (hss@dst.dk)
Statistics Denmark
Sejroegade 11
DK-2100 Copenhagen

The views expressed in this paper are those of the authors. They do not necessarily represent the views of Statistics Denmark.

Abstract

The Paper discusses what influence the choice of working hour's data has on labour productivity measures. Based on Danish data a detailed description of why working hours integrated in the National Accounts and working hours in the labour statistics differ is presented. Compilations of labour productivity based on the two sets of working hours are presented and the impact on growth rates and levels are quantified. The paper finally discusses international comparisons of labour productivity and makes suggestions for improving the consistency of international comparisons of labour productivity.

1. Introduction

In recent years empirical analyses of economic performance have been paid more attention. As a consequence of this compilation of productivity growth and productivity levels has been common. These estimations are done by a number of different organisations, agencies, institutions et cetera, but productivity estimates are often based on different data material depending of the researcher's choice.

The data material is of growing importance for politicians, analysers, because more accurate estimates can improve their rate of successful decisions. OECD has a precise description of why accurate estimates of productivity are of significant importance in their latest international comparisons of labour productivity levels:

International comparisons of productivity growth can give useful insights in the growth process, but should ideally be complemented with international comparisons of income and productivity levels. An examination of income and productivity levels may give insights into the possible scope for further gains, and also places a country's growth experience in the perspective of its current level of income and productivity.¹

Because labour productivity growth rates/level serves as official yardsticks of economic performance, it is unfortunate that significant variation of the basis for the estimates is seen. At national level the choice of data and methodology differ from researcher to researcher and when there are considerable variations in national estimates international comparisons are even more difficult.

Especially international organisations, such as Eurostat and OECD, are aware of the problem and put a lot of effort into the case to minimize the disparities resulting from different choices of data, methodology et cetera.

At national level is it often seen that for instance statistical agencies compile several estimates of employment and working hours. Specifically, statistical offices publish employment and working hours on regular basis in their labour accounts, but they are also obliged to publish these data within a national account framework. The latter data material is superior to the first in a productivity analysis perspective because of the harmonisation of definitions between numerator and denominator in the productivity fraction.

Compilation of productivity measures requires two sets of data – three if international comparisons are made – GDP, hours worked and Purchasing power parities to international comparisons. Definitions of the first and the latter are well covered within the SNA 1993/ESA 1995 standards compared to working hours where only a limited number of countries compile hours worked which are consistent with SNA 1993/ESA 1995 definitions. Because a chain is not stronger than its weakest

¹ OECD (2005), page 3

link – resources to future improvements should be concentrated on this subject to improve harmonization of data.

Even in countries where working hours are compiled in the Labour force statistics and in the national accounts there is a lack of documentation of the disparities between the two sets of data.

The aim of this paper is to give insight in why the two sets of statistics on Danish working hours differ and look at the problem from an empirical point of view with the aim to clarify whether Danish productivity results are sensitive to the choice of statistics on working hours.

It's important to emphasize that though National Accounts working hours are preferred in productivity analysis, it doesn't mean that Working Time Accounts is inferior. The two datasets serves different purposes and Working Time Accounts are an indispensable source for the National Accounts compilation and for many other purposes.

The paper is organized as follows:

Firstly, the paper presents in chapter 2 the two data set of working hours Statistics Denmark publish and explains why and in which industries disparities occurs. The Working Time Account is presented in a preliminary version.

Secondly, compilation productivity growth rates and levels for Denmark based on labour accounts and national accounts working hours are made in chapter 3. The two set of data will be compared at both aggregate and industry level and disparities will be quantified and briefly discussed.

Thirdly, in chapter 4, the implications at national level are discussed briefly, while the focus is on comparisons of labour productivity at both the national and international level.

2. Hours worked in the Working Time Account and in the National Accounts

Integration of the Working Time Account (WTA or also referred to as Labour accounts) in the Danish National Accounts (NA) was carried through and published in January 2003 with final compilations of the year 1999 and provisional years 2000-2001. In Statistics Denmark the WTA is prepared by the division for Labour Market Statistics.

Because of the variety of data sources, their use of concepts for variables as hours worked, the methodology applied in compilation of the WTA in Denmark has been undergoing revisions and improvements. After a major revision of the first version of the WTA from December 1998 the second version was published in October 2003. Further refinements and use of alternative data sources have in June 2005 resulted in a revised – not yet published - version of the WTA. Linked with a data revision of the Danish NA the latter version of the WTA was integrated in the NA for the entire period 1995-2004 and published in July 2005.

2.1 The Working Time Account

The Danish Working Time Account (WTA) compiles hours actually worked and related variables, which are based on integration of a range of primary statistical data. The use of administrative data sources (in which concepts may differ from the desired though usually covering the full population) and household surveys (which

are flexible but costly to conduct) is optimized. A particularly difficult issue to address is the question of reference period. The integration of data sources in the WTA implies steps of harmonisation, completion, reconciliation and balancingⁱⁱ.

Data sources applied in the WTA to compile employment, jobs, hours worked and compensation of employees can roughly be listed as the following:

- Register based labour force statistics (RAS)
- Establishment Related Employment Statistics (ERE)
- Earning Statistics for the private sector and on central and local government employees
- Reports on payments of income tax (MIA)
- Labour Force Survey (LFS)
- ATP-Labour employment statistics (based on mandatory payments for a supplementary pension scheme)
- Indicators for aggregate payroll costs based on labour market contributions for employees

The WTA aims at coherence with SNA 1993 and ESA 1995 definitions. Though regarding specific issues the WTA differ from the compilation of e.g. hours worked in the National Accounts.

2.2 The National Accounts

The specific issues in which the WTA differs from the National Accounts can be divided in two types, where a distinction is made between issues, that remain neutral on the aggregated variable and issues resulting in a change of level.

The neutral adjustments made are typically a result of relocating activity from one industry to another due to relocation of economic activity in the functional part of the NA. Further descriptions of these adjustments are made in paragraph 2.3.

The level-changing corrections are made:

1. when alternative sources are preferred to the WTA, which is the case in a limited number of specific industries, and
2. as a explicit supplement to the labour input, where this is not included in the WTA, such as non-residents working within the production boundary and underground activity

It's important to emphasize that neither the level-neutral nor level-changing corrections are done due to dissatisfaction or mistakes in the WTA. The revisions should be seen as implementations of an additional source (the National Accounts) and another conceptual framework (SNA 1993 and ESA 1995 definitions).

2.3 From Working Time Account to National Accounts – The Danish case

The transition from the WTA to the NA is illustrated in table 2.1. It is chosen to present the transition regarding employment and not hours worked, due to the actual method applied in the Danish NA, where hours worked is the result of NA-

ⁱⁱ Naur (2004)

employment multiplied with the average hours worked per employee or per self-employed as compiled in the WTA.

Corrections number 2, 3, 5 and 7-10 are neutral definable corrections made according to the ESA 1995. These corrections can be described as relocations either between industries or between types (employee/self-employed) and the all remain neutral on the total.

The corrections made in number 6 and 12-15 are definable corrections made according to the ESA 1995, which are not neutral. These level-changing corrections can be caused by either application of alternative sources assessed to be superior to the WTA in view of the way the functional National Accounts is compiled or actual supplements due to either underground activity or consideration of economic instead of national boundary.

The corrections referred to in no. 17 are made subsequently to ensure consistency. These corrections are often a result of a thorough analyses of the initial results regarding wage shares and evaluations of the development in compensation per employee, compensation per hour worked, hours worked per person.

Table 2.1 Overview of transition from Working Time Account to National Account

Employment 2001	Employees	Self-employed	Total
	Persons		
1 Working Time Account¹	2 524 463	205 786	2 730 249
2 Transformation to 132 industries	0	0	0
3 Possible distribution of not-stated if any	0	0	0
4 WTA as input to the NA	2 524 463	205 786	2 730 249
5 Relocation of private employees in industries purely general governmental	0	0	0
6 Employment in general government consistent with compensation of employees	14 792	0	14 792
7 Relocation of industries due to kind of activity (manufacturing to wholesale)	0	0	0
8 Other relocations due to activity	0	0	0
9 Relocation of self-employed to employees, if there is no production in the household sector	0	0	0
10 Relocation of owners of partnerships employed from self-employed to employees	25 961	-25 961	0
11 WTA inclusive of neutral relocations and general government	2 565 216	179 825	2 745 041
12 Alternative sources	-9 437	-2 142	-11 579
13 Hidden economy (here without extra explicit hours)	17 880	0	17 880
14 Non-residents employees in resident production	25 658	0	25 658
15 Special correction-effect when alternative sources only in compensation of employees	9.350	1.902	11 252
16 National Account initial results	2 608 667	179 585	2 788 252
17 Possible corrections to ensure consistency	-3 300	0	-3 300
18 National Account	2 605 367	179 585	2 784 952

1: Preliminary version

2.3 Transition described in details on aggregated levelⁱⁱⁱ

In this section the transition from the WTA to the National Accounts is reviewed in order to elaborate on the content of each head in table 2.1. For completion all heads are included below, though the heads (1, 4, 11, 16 and 18) merely refer to data at some level of compilation, whereas the others refer to a specific correction.

ⁱⁱⁱ Section based on Heurlén (2003)

At aggregated level a number of cells are blank since the relocations are neutral. If a similar transition table was presented broken down into industries the relocations would be visible. Later on – in paragraph 2.4 – the transition by activity in 132 industries is illustrated though only divided in the two main types of corrections, the neutral corrections and the level-changing corrections.

No. 1 Working Time Account

Data from WTA as supplied from the Division of Labour Market. In this paper a preliminary version of the WTA is presented.

No. 2 Transformation to 132 industries

The WTA is divided into industries according to the NA-grouping except regarding the industry 450000 Construction. This industry is divided into 4 sub-groups in the NA.

No. 3 Not stated

A proportionate distribution of the persons in the item Not stated in the WTA is undertaken in the NA.

No. 4 WTA as input to the NA

Data from WTA as supplied from the Division of Labour Market accommodated to the format used in the NA.

No. 5 Relocation of private employees in clear-cut public industries

The NA operates with a number of clear-cut public industries in which occurrence of private employees is not allowed. Any private employees engaged in - according to the NA clear-cut public industries - in the WTA are relocated to adjacent industries, implying that the relocation is neutral. This relocation is undertaken to ensure consistency with the relocation of the compensation of employees and the rest of the NA in clear-cut public industries^{iv}. An example of illustration is the industry 751100 General (overall) public service activities, in which the WTA has approximately 200 private employees, which is relocated to adjacent industries^v.

No. 6 Employment in general government

The NA compensation of employees for the general government is obtained from Statistics Denmark's Division for General Government Statistics and overrules the WTA-source. The reason for this is to take into consideration the consistency and long time series in the NA, as there is a discrepancy in industries between the figures from the General Government statistics and the WTA-figures for the general government. In principle, adjustments of employment in the general government are made in such a way that the growth rate in compensation per employee remains the same in relation to the compensation per employee in the WTA. The NA practice of applying the compensation of employees of the General Government Statistics and then relocate employment in the general government according to the compensation of employees includes a step, where the total number of employees in the general government is adjusted to the WTA total, so that the corrections of the NA initially do not cause any changes in total employment in the general government compared to the WTA. A specific not substantial supplement to the employment in general government is made to cover persons that the WTA does not consider as employees, but for whom their compensation – in fact benefit – is included in the General government statistics.

No. 7 Relocation of industries due to kind of activity

^{iv} The clear-cut public industries in the Danish NA are as listed: 014002, 730002, 751100, 751209, 751300, 752002, 801000, 802000, 803000, 804002, 853109, and 920002.

^v The adjacent industries are as listed: 722000, 742009, 747000, 748009, 851209, and 910000.

In the NA, commercial activity is combined into distributive trades defined by activity, irrespective of their location in the primary statistical data. The practice of adjusting employment and compensation of employees among industries is made in order to ensure consistency between the industrial classification of employment and the functional part of the NA, implying that a number of employees will be relocated from the manufacturing industry to the wholesale trade.

No. 8 Other relocations of industries

Other relocations among some industries are necessary in order to ensure consistency between the industries defined by activity. An example is relocation of compensation and thus employment and hours worked from industries with integrated canteens to the industry 553009 Restaurants.

No. 9 Self-employed in the household sector

In the NA, the number of self-employed is fixed at zero in industries, where the production value in the household sector (S.14) is equal to zero, to comply with the definition of employment as a productive activity, ESA 1995 par. 11.11. Self-employed in industries with a zero-position is in the NA distributed to the other industries. 230000 Mfr. of refined petroleum products etc. and 670000 Activities auxiliary to finance are industries where this paragraph are used.

No. 10 Partnerships

According to ESA 1995 par. 11.13.e, employees comprise owners of corporations and quasi-corporations, provided that the owner is employed in the corporation. In the NA employed persons with partnerships are relocated from self-employed to employees, although the remuneration cannot be distinguished, classified as compensation and relocated. The total number of employed persons will not deviate from the WTA, although the distribution between employees and self-employed will differ. In practice approximately 25,000 persons, less than 1 percent of the total, shift from self-employed to employees.

No. 11 Consistency with the WTA

Until this point there is still consistency with the WTA^{vi} although relocations have taken place within the private sector as well as within the general government sector. In the following it is presented how use of alternative sources and corrections for both residence and for informal work imply that total employment in the NA differs from that of the WTA.

No. 12 Alternative sources to private employees

In specific industries alternative or additional sources are chosen to calculate private compensation of employees. The choice of industries in which to apply alternative sources than the WTA is based on how the functional part of the NA is compiled and information from here is incorporated. The corrections implied by the use of alternative sources also result in corrections either implicitly or explicitly in employees and hours worked outside the general government. From this point the total employment in the NA deviates from the WTA.

An example of an industry, where alternative sources are applied is 450000 Construction in order to take the seasonal conditions and division in sub-groups into account. The table above illustrates that the correction due to appliance of alternative sources is in the neighbourhood of minus 10,000 persons.

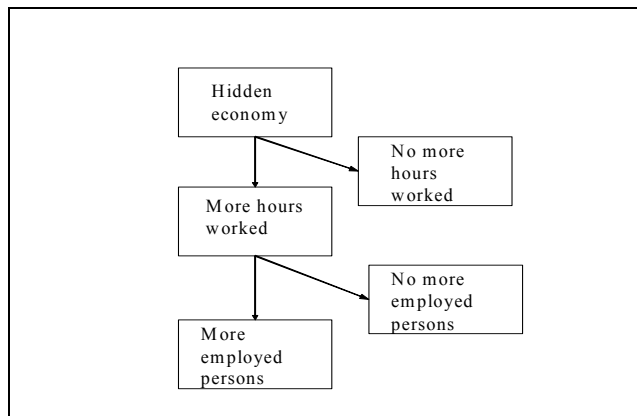
No. 13 Hidden economy

A supplement of persons and/or hours is made in the specific industries, in which the functional part of the NA makes an addition for hidden activity to the economic activity. The industries in question are identified and quantified by a Danish benchmark study from 1992 replicated in 2004.

^{vi} with the only exception of a minor supplement to the employment in general government

In the NA it is considered when making corrections for hidden activity, whether adjustments in the industries for which supplement to turnover for the hidden work is compiled in the final NA, must be made in employment and/or hours worked in accordance with the principle illustrated in the figure below. It is emphasized that for each individual case, it depends on a specific assessment of the various types.

Figure 1 Hidden economy



When hidden economy does not give rise to hours worked in the case of, e.g. understatement of figures (VAT evasion) or tips, hidden employment is not adjusted. In the industries where hidden economy results in hours worked, but not in more employed persons, e.g. when an employed skilled craftsman or a motor mechanic performs hidden work, adjustments of only black hours are to be made.

Hidden activity performed by persons, who are not already regarded as employed persons, is adjusted in the NA employment.

An explicit supplement of persons informally employed is made in three industries:

1. 524490 Other retail sale, repair work
2. 553009 Restaurants etc.
3. 950000 Private households with employed persons

The supplement adds up to approximately 18,000 employees in 2001.

Regarding the two first-mentioned industries corrections are estimated on the basis of the additional turnover as set out in the National Accounts. Regarding the third industry corrections are estimated by setting compensation of employees equal to the production value, and subsequently calculate employment, thereby adapting employment to the new compensation of employees.

In addition to the supplement of persons due to hidden activity an explicit supplement is estimated of black hours carried out by persons already employed. In 18 industries^{vii} this supplement of hidden hours only is compiled, and for self-employed 6,5 million black hours are added equivalent to 1,8 percent of the self-employed hours worked in 2001.

No. 14 Correction for residence

In the NA there is made a specific supplement for the employees who contribute to the production but do not reside within the national borders. There is made a specific supplement to employment in accordance with ESA 1995 par. 11.17.f, e in

^{vii} The 18 industries with an explicit supplement of self-employed hours only are as listed: 050000, 158120, 180000, 200000, 222009, 361000, 362060, 502000, 524490, 602223, 602409, 722000, 741200, 747000, 804001, 851209, 920001, and 930009.

610000 Water transport, i.e. non-residents on Danish ships are added. Information is obtained from statistics compiled by the Danish Maritime Authority.

Furthermore a supplement to employment is made for non-residents working in Denmark (The Oresund Region, South Jutland) (ESA 11.17.a, b, e and g). The labour market division has put forward a proposal containing a classification of industries based on the statistics on commuting (5-7,000 persons), but to ensure consistency with the economic part of the NA, it has been decided to estimate the number of non-residents working in Denmark on the basis of the statistics on compensation of employees abroad, which are extracted from the balance of payments, and subsequently divide this by means of average earnings (22,000 persons in 2001). Due to the choice of methodology, the calculation of a supplement for diplomats is included in this number.

No. 15 Special effect

The special effect adjusts persons according to adjustments and relocations of compensation of employees.

This item is partly in the category of alternative sources mentioned in no. 12. In very few industries an alternative source is chosen to compile only compensation of employees and not explicitly employees. In these cases the number of employees from the original source WTA is adjusted according to the adjustment made in compensation of employees.

In the presentation of the detailed transition table above, this item (no. 15) is made up as the residual.

No. 16 Initial results

Descending from the WTA an adjustment of formats and relocation of persons are carried out. Hence supplements are made due to primarily informal work and non-residents working in Denmark. The initial results are scrutinized and may cause further corrections.

No. 17 Manual corrections

Corrections to ensure consistency is undertaken where needed, for instance suggested by the development or level of wage shares in an industry. Corrections can be undertaken for individual industries in order to adapt compensation of employees and employment to the economic aggregates in the NA.

No. 18 Final results

According to the initial results and possibly corrections to ensure consistency the final results are achieved.

2.4 Illustration of transition by industry

Examination of the transition by industry reveals information on the size of the corrections and whether these represent the neutral type or the level-changing type of corrections.

In table 2.2 hours worked are presented. The first column contains hours worked for both employees and self-employed in the WTA, and the fourth column presents hours worked in the NA. In the second column the corrections of the neutral type are estimated. Corrections of the level-changing type are the residual as presented in the third column.

The two types of corrections are described in more detail in the previous paragraph. Below are made some comments to the figures in table 2.2.

From the description in the previous section of corrections made it is expected to find a positive type 1 correction in the industry 553009 Restaurants due to the relocation from the other industries to integrated canteens in 553009 Restaurants. This positive type 1 correction is indeed visible.

In the industries 721009 Computer activities exc. software consultancy and supply and 722000 Software consultancy and supply activity is relocated (due to relocation of activity mentioned in no. 8), thus giving a negative type 1 correction in these industries, whereas 510000 Wholesale except of motor vehicles is the “receiving” industry.

A positive type 1 correction, where 10 million hours are added in the industry 510000 Wholesale except of motor vehicles is seen due to activity relocated *from* amongst others the manufacturing industries cf. no. 7.

Type 2 corrections refer to level-changing corrections, and these are expected to be detected in industries with supplements due to underground or hidden work. In the industries with an explicit supplement of hidden employment the table confirms our expectations in only two out of three cases. There is a positive type 2 correction in as well 524490 Other retail sale, repair work and 950000 Private household with employed persons, while this is not the case in 553009 Restaurants. It seems that, the type 1 correction in this industry is so vast, that type 2 estimated as the residual becomes negative. In the industries with an explicit supplement of hidden hours worked without supplement of hidden persons, e.g. in 524490 Other retail sale, repair work the positive type 2 correction can be confirmed. The type 2 correction in 524490 is 2,5 million hours equivalent to 2,3 percent of the NA-hours.

In the industry 450000 Construction both type 1 and type 2 corrections are negative despite the fact of an explicit supplement of hidden hours in this industry. The reason for this is the use of additional sources to estimate the yearly average employment in this very seasonal sensitive industry. Further analyses will in future determine whether the WTA information of the seasonal pattern is preferred to the method used at present.

The supplement due to residence is only particularly visible as a positive type 2 correction in 610000 Water transport, while in the remaining industries it is almost proportionally spread out and not as visible.

A large number of industries show negative type 2 corrections. These can be caused by the method used in general government. In each industry where the WTA has public hours *and* the NA has not, the table will display a negative type 2 correction (provided that this is not eliminated by another larger *and* positive type 2 correction). An example is in 900020 Refuse collection and sanitation, which according to the WTA includes public activity, while it is a clear cut *private* industry in the NA. This therefore implies a huge reduction in working hours in 900020 and a corresponding addition of hours in public industries.

If the “noise” from the problematic case of the general government was to be eliminated, one could choose to present a table similar to table 2.2 without general government, in other words only with the private hours worked. However in the scope of this paper, presenting the sum of private *and* general government is preferred.

Table 2.2 Overview of transition at industry level – Year 2000

Industry		Working Time Account ¹	1. Level-neutral corrections	2. Level-changing corrections	National Account
		Hours			
011009	Agriculture	110 384 214	- 370 678	-6 482 661	103 530 875
011209	Horticulture, orchards etc.	17 249 190	- 62 654	449 907	17 636 443
014001	Agricultural services; landscape gardeners etc. (market)	15 191 835	- 41 856	270 112	15 420 091
014002	Agricultural services; landscape gardeners etc. (other non-market)	1 730 223		- 366 446	1 363 777
020000	Forestry	7 435 608	- 20 317	200 373	7 615 664
050000	Fishing	8 850 371	- 17 803	305 823	9 138 391
110000	Extr. of oil and natural gas	2 291 329	- 2 894	- 32 102	2 256 333
140009	Extr. of gravel and clay etc.	3 202 361	9 768	- 49 646	3 162 483
151000	Production etc. of meat and meat products	34 938 556	46 434	- 270 319	34 714 671
152000	Processing and preserving of fish and fish products	10 163 732	80 948	- 449 088	9 795 592
153000	Processing and preserving of fruit and vegetables	4 096 272	29 632	- 192 125	3 933 779
154000	Mfr. of vegetable and animal oils and fats	1 376 862	7 191	- 48 280	1 335 773
155000	Mfr. of dairy products	16 365 673	163 388	-1 068 978	15 460 083
156009	Mfr. of starch, chocolate and sugar products	18 338 619	15 228	- 13 401	18 340 446
158109	Mfr. of bread, cakes and biscuits	7 276 911	7 822	- 34 849	7 249 884
158120	Baker's shops	16 204 611	-1 016 561	667 354	15 855 404
158300	Manufacture of sugar	1 864 117	21 544	- 160 414	1 725 247
159000	Manufacture of beverages	10 300 481	29 908	- 147 231	10 183 158
160000	Manufacture of tobacco products	1 988 836	1 136	6 955	1 996 927
170000	Mfr. of textiles	13 802 277	- 5 534	97 716	13 894 459
180000	Mfr. of wearing apparel	7 974 239	9 796	42 163	8 026 198
190000	Mfr. of leather and footwear	2 523 687	119 666	- 580 081	2 063 272
200000	Mfr. of wood and wood products	25 968 239	- 12 277	220 554	26 176 516
210000	Mfr. of pulp, paper and paper products	14 413 958	1 642	33 734	14 449 334
221200	Publishing of newspapers	16 942 110	- 41 583	542 041	17 442 568
221309	Publishing activities, excluding newspapers	21 062 859	- 33 270	272 284	21 301 873
222009	Printing activities	27 418 039	- 36 646	364 890	27 746 283
230000	Mfr. of refined petroleum products etc.	1 032 758	- 68	10 342	1 043 052
241109	Mfr. of industrial gases and inorganic basic chemicals	1 198 712	19 119	- 150 483	1 067 348
241209	Mfr. of dyes, pigments and organic basic chemicals	8 082 941	- 5 610	-2 715 604	5 361 727
241500	Manufacture of fertilizers	812 803	5 436	- 45 845	772 394
241617	Mfr. of plastics and synthetic rubber	1 010 940	1 344	- 4 390	1 007 894
242000	Manufacture of pesticides and other agro-chemical products	1 511 369	- 2 324	25 929	1 534 974
243000	Mfr. of paints, varnishes and similar coatings, printing ink and mastics	4 383 685	24 812	- 150 407	4 258 090
244000	Mfr. of pharmaceuticals etc.	19 000 137	- 11 470	308 051	19 296 718
245070	Mfr. of detergents and other chemical products	9 495 299	54 611	- 340 936	9 208 974
251122	Mfr. of rubber products and plastic packing goods etc.	16 102 695	15 967	- 67 828	16 050 834
252300	Mfr. of builders ware of plastic	3 364 583	2 569	- 3 429	3 363 723
252400	Manufacture of other plastic products n.e.c.	15 859 021	2 693	80 287	15 942 001
261126	Mfr. of glass and ceramic goods etc.	10 688 722	- 12 930	-1 310 083	9 365 709
263053	Mfr. of cement, bricks, tiles, flags etc.	2 790 137	2 807	- 8 140	2 784 804
266080	Mfr. of concrete, cement, asphalt and rockwool products	21 597 805	22 599	- 83 242	21 537 162
271000	Mfr. of basic iron and steel and of ferro alloys	2 359 326	- 4 724	34 024	2 388 626
272030	First processing of iron and steel	6 977 211	8 059	- 53 667	6 931 603
274000	Mfr. of basic non-ferrous metals	2 834 644	- 4	18 735	2 853 375
275000	Casting of metal products	3 992 103	4 266	- 11 088	3 985 281
281009	Mfr. of building materials of metal	46 157 030	- 37 182	315 237	46 435 085
286009	Mfr. of various metal products	29 705 125	22 884	- 156 739	29 571 270
291000	Mfr. of marine engines and compressors	35 378 153	30 750	- 1 257	35 407 646
292000	Mfr. of ovens and cold-storage plants	34 536 338	32 943	- 163 798	34 405 483
293000	Mfr. of agricultural machinery	9 440 609	8 324	- 53 987	9 394 946
294009	Mfr. of machinery for industries	27 792 216	- 1 770	75 793	27 866 239
297000	Mfr. of domestic appliances	6 790 895	38 062	- 211 450	6 617 507
300000	Mfr. of office machinery and computers	2 988 762	- 3 092	56 574	3 042 244
310000	Mfr. of other electrical machinery and apparatus	31 814 347	11 379	33 420	31 859 146
320000	Mfr. of radio and communication equipment	19 799 432	18 000	- 84 460	19 732 972
330000	Mfr. of medical and optical instruments	25 336 443	6 066	17 259	25 359 768
340000	Manufacture of motor vehicles etc.	12 358 948	546	30 066	12 389 560
351000	Building and repairing of ships and boats	11 646 031	- 10 459	79 313	11 714 885
352050	Mfr. of transport equipment excl. ships, motor vehicles etc.	3 644 013	5 807	- 21 110	3 628 710
361000	Mfr. of furniture	38 400 185	- 28 046	462 839	38 834 978
362060	Mfr. of toys, gold and silver articles etc.	12 947 805	88 358	- 493 625	12 542 538
370000	Recycling of waste and scrap	683 919	3 328	- 24 404	662 843
401000	Production and distribution of electricity	15 532 162	- 20 771	-1 977 773	13 533 618
402000	Manufacture and distribution of gas	2 208 170	- 2 948	85 675	2 290 897
403000	Steam and hot water supply	3 262 161	- 8 368	1 886 796	5 140 589
410000	Collection and distribution of water	3 502 843	- 10 390	1 295 697	4 788 150
450000	Construction	302 311 951	-2 009 084	-9 601 184	290 701 683
501009	Sale of motor vehicles and motorcycles	57 274 270	-9 014 844	- 398 042	47 861 384
502000	Maintenance and repair of motor vehicles	34 137 939	15 426 852	-6 219 519	43 345 272
505000	Retail sale of automotive fuel	14 175 687	-5 305 461	2 862 577	11 732 803
510000	Wholesale except of motor vehicles	275 260 501	10 688 295	-5 680 320	280 268 476
521090	Retail trade of food	81 037 037	6 187 320	1 692 731	88 917 088
522990	Department stores	30 945 909	- 119 396	477 685	31 304 198
523000	Re. sale of phar. goods, cosmetic art.	12 139 058	- 31 439	- 94 447	12 013 172
524190	Re. sale of clothing and footwear	34 385 082	- 123 049	180 038	34 442 071
524490	Other retail sale, repair work	104 810 318	- 307 711	2 493 868	106 996 475
551009	Hotels	29 335 053	- 106 280	555 920	29 784 693

¹: Preliminary version

Table 2.2 Overview of transition at industry level – Year 2000

(continued)

Industry	Working Time Account ¹	1. Level-neutral corrections	2. Level-changing corrections	National Account
		Hours		
553009 Restaurants	86 704 933	13 046 167	-7 701 437	92 049 663
601000 Transport via railways	15 421 705	- 21 276	174 539	15 574 968
602100 Other scheduled passenger land transport	22 308 525	- 46 859	100 029	22 361 695
602223 Taxi operation and coach services	27 982 318	- 71 862	893 477	28 803 933
602409 Freight transport by road and via pipelines	67 833 888	- 140 547	3 187 795	70 881 136
610000 Water transport	26 961 515	- 58 178	7 821 844	34 725 181
620000 Air transport	19 624 667	- 655 446	- 1 753 081	17 216 140
631130 Cargo handling, harbours etc., travel agencies	28 466 615	- 53 789	1 741 800	30 154 626
634000 Activities of other transport agencies	21 418 825	- 40 157	801 757	22 180 425
640000 Post and telecommunications	85 178 251	- 185 621	- 208 717	84 783 913
651000 Financial institutions	66 560 352	- 103 455	1 687 114	68 144 011
652000 Mortgage credit institutions	16 910 802	- 23 657	206 191	17 093 336
660102 Life insurance and pension funding	3 442 923	- 5 350	414 743	3 852 316
660300 Non-life insurance	21 348 673	- 29 269	2 092 728	23 412 132
670000 Activities auxiliary to finance	6 036 058	- 7 771	- 95 283	5 933 004
701109 Real estate agents etc.	15 444 769	- 33 191	265 781	15 677 359
702009 Dwellings	29 803 025	- 73 158	102 550	29 832 417
702040 Letting of non-residential buildings	11 184 895	- 25 965	- 46 396	11 112 534
710000 Renting of transport equipment and machinery	10 401 542	460 796	- 15 914	10 846 424
721009 Computer activities exc. software consultancy and supply	14 577 333	- 2 190 680	1 948 605	14 335 258
722000 Software consultancy and supply	52 265 160	- 5 811 549	7 900 477	54 354 088
730001 Research and development (market)	6 148 348	- 7 559	- 631 396	5 509 393
730002 Research and development (other non-market)	11 464 660		225 157	11 689 817
741100 Legal activities	16 704 340	- 36 206	188 353	16 856 487
741200 Accounting, book-keeping, auditing	31 573 528	- 54 399	599 220	32 118 349
742009 Consulting engineers, architects	65 408 807	- 189 059	2 928 550	68 148 298
744000 Advertising	20 817 335	- 121 198	507 702	21 203 839
747000 Building-cleaning activities	65 953 053	- 168 682	- 9 199 999	56 584 372
748009 Other business activities	88 126 340	- 233 516	4 017 946	91 910 770
751100 General (overall) public service activities	102 559 789		3 388 432	105 948 221
751209 Administration of public sectors exc. for business	32 295 198		8 883 487	41 178 685
751300 Regulation of and contribution to more efficient operation of business	18 558 055		3 888 170	22 446 225
752001 Defence, police and administration of justice (market)	10 125 030	- 21 020	1 108 858	11 212 868
752002 Defence, police and administration of justice (other non-market)	95 572 199		- 7 563 598	88 008 601
801000 Primary education	141 087 232		- 3 627 719	137 459 513
802000 Secondary education	66 858 681		- 1 311 609	65 547 072
803000 Higher education	41 929 761		2 838 076	44 767 837
804001 Adult and other education (market)	7 290 415	- 16 464	543 109	7 817 060
804002 Adult and other education (other non-market)	38 458 441		10 063 417	48 521 858
851100 Hospital activities	135 956 356	- 1 875	- 6 069 709	129 884 772
851209 Medical, dental and veterinary activities	66 079 903	- 98 320	1 936 217	67 917 800
853109 Social institutions etc. for children	208 901 343		- 1 346 234	207 555 109
853209 Social institutions etc. for adults	226 501 031	- 22 115	- 1 084 370	225 394 546
900010 Sewage removal and purifying plants	3 925 522	- 9 863	1 446 377	5 362 036
900020 Refuse collection and sanitation	26 072 545	- 11 179	- 20 406 117	5 655 249
900030 Refuse dumps and refuse disposal plants	3 403 218	- 6 355	5 444	3 402 307
910000 Activities of membership organizations	73 469 868	- 97 110	984 735	74 357 493
920001 Recreational, cultural, sporting activities (market)	54 919 394	- 129 887	2 598 193	57 387 700
920002 Recreational, cultural, sporting activities (other non-market)	23 451 846		- 683 933	22 767 913
930009 Other service activities	34 192 276	- 100 961	880 895	34 972 210
950000 Private households with employed persons	1 296 347	- 66 069	15 042 322	16 272 600
Total	4 271 881 693	2 352 009	6 198 462	4 294 339 741

¹: Preliminary version

3. Compilation of labour productivity based on two different sets of labour accounts

As seen in section 2, working hours in labour accounts preliminary version and in the national accounts differ due to the different framework they are compiled in. In this section compilation of labour productivity with the two sets of labour input will be presented. The purpose is to investigate what impact a change of denominator has on the result.

Analyses of productivity growth are often divided into two categories. First, the most common way of compiling labour productivity:

$$\Delta LP = \frac{\Delta VA}{\Delta H} \quad (1)$$

where ΔLP is the percentage change in labour productivity, ΔVA is the percentage change in Gross value added between two periods and ΔH is the percentage change in number of working hours between two periods.

The second way to analyse these set of data are in level:

$$LP_t = \frac{VA_t}{H_t} \quad (2)$$

where VA_t is the Gross value added in period t and H_t is the actual number of working hours in period t .

The focus of this paper is working hours and the consequences of differences in working hours. Both equation (1) and (2) can be affected of differences in the number of working hours. Adaptations of national accounts definitions to the WTA and NA are not similar from period to period and hence it is expected that labour productivity with the two sets of working hours will differ both in growth rates and in levels.

3.1 Labour productivity – growth rates

In this section labour productivity following equation 1 based on the two sets of working hours are presented for the period 1995 to 2003. The data are divided into the most detailed level (six digit level) Danish national accounts working hours is available at.

The labour productivity compilations are based on Gross value added in 2000 fixed prices. The left side of the table shows labour productivity based on labour accounts and on the right side the compilations are done with the national accounts working hours. For both series yearly average growth rates are shown and the differences between these are presented far right. The main focus is on the average growth rates while some noise in the year to year growth rates can be reduced by doing this. Nevertheless the purpose of this paper is not to discuss uncertainty in compilation of productivity measures in general, but to quantify disparities between the two datasets.

Table 3.1 shows that the average labour productivity for the total economy is reduced 0.2 percent point as a consequence of the adaptation of the national accounts definitions. A look at the yearly growth rates shows that these can differ a lot. For example growth rates in 2003 differ -1.3 percent points and in 2001 has the sign changed from plus to minus. For the total economy the conclusion is that for the

average growth rate the choice of denominator is of lesser importance, but a look at the yearly growth rates shows that disparities can be of major importance for productivity conclusions.

A look at the industries shows significant disparities for both yearly growth rates and average growth rates. The growth rates at industry level are influenced in single years and at the average growth rates. Among the biggest differences (in actual hours) are 011009 Agriculture, 610000 Water transport, 804002 adult and other education and 900020 Refuse collection and sanitation.

Even though 011009 Agriculture is altered significantly the average growth rates is not changed, but growth rates in single years differ in some years significantly. The reason why agriculture is altered is that alternative national accounts sources are used (see section 2 revision point 12) in stead of the WTA, however in this case the influence of a significant alteration is modest. A similar correction is done for 110000 Extraction of oil and natural gas, but in this case it has major implications for the labour productivity growth rates. Both single year's growth rates and average growth rates are considerably changed as a consequence of the revisions.

Working hours in industry 610000 Water transport are increased significantly due to non residence workers at Danish ships; see point 14 in chapter 2.2 for further information. Because of the increase in working hours labour productivity growth rates are reduced significantly, but still labour productivity in Water transport is very high.

Industries including activities from general government are also based on the use of additional sources. Because wages and salaries in the national account differ from what is compiled in the labour statistics a similar revision is made of the working hours. This implicates that working hours in 804002 Adult and other education (other non market) are increased significantly, and the average growth rate is reduced from 4.4 % to -2.7%. Another industry which is affected of general government data is 900020 Refuse collection and sanitation. According to the WTA nearly 5/6 of the working hours in this industry is performed in general government, but per convention general government cannot be placed in this industry; see point 3 in chapter 2.2 for further information. Therefore 5/6 of the working hours are moved to other industries which include general government. Naturally the comprehensive transfers of working hours affect the labour productivity especially at yearly basis, but also the average growth rate is reduced from -4.8 % to -8.8 %.

In the secondary industries revisions are common due to the use of additional sources. One of the reasons is to ensure consistency between the industrial classification of employment and the economical part of the national accounts; see point 7 in chapter 2.2 for further information. It implicates that working hours in these industries in many cases are revised significantly, and therefore the labour productivity growth rates are modified significantly. Examples could be 501009 Sale of motor vehicles and distribution of water and 502000 Maintenance and repair of motorcycles where growth rates differ between the two data sets, primarily at the yearly growth rates.

The overall result of these compilations seems to be that productivity growth rates are influenced by the choice of working hours at both aggregate and detailed level. The use of average growth rates seems to reduce the influence, but cannot eliminate the effect.

Table 3.1 Labour productivity based on to different sets of working hours

Industry	Working Time Account									National Accounts									Yearly average difference (pct. point)
	1996	1997	1998	1999	2000	2001	2002	2003	Yearly avg.	1996	1997	1998	1999	2000	2001	2002	2003	Yearly avg.	
	Annual percentage change																		
011009	10.8	6.4	7.5	1.1	10.3	-6.3	-5.6	11.1	4.9	12.9	5.8	8.3	2.4	9.9	-5.4	-6.6	14.2	4.9	0.1
011209	-8.9	12.6	-0.9	-5.3	-7.8	-10.0	-10.8	26.2	-1.3	-9.2	11.8	-1.3	-5.4	-7.2	-11.2	-11.0	31.3	-1.2	0.1
014001	-2.9	8.4	-4.8	-1.1	8.6	18.6	-11.1	20.6	4.6	-2.9	7.9	-4.9	-0.7	9.1	18.0	-10.9	15.6	3.4	-1.2
014002	9.1	-10.7	2.0	-11.8	12.2	12.3	6.0	16.5	4.6	11.3	-6.8	-0.4	2.2	1.7	10.8	20.8	5.9	5.4	0.8
020000	-2.4	12.9	0.7	2.5	-19.5	35.5	-4.8	12.5	4.1	-2.4	10.4	1.4	2.4	-20.4	36.0	-5.0	15.7	3.7	-0.4
050000	-10.3	23.5	2.0	5.6	-7.5	7.8	-18.1	-25.8	-3.5	-9.3	23.3	-2.9	11.6	-7.9	7.0	-18.3	-25.3	-3.9	-0.4
110000	21.7	16.0	-10.3	27.3	12.8	-17.1	-37.3	-19.8	-3.0	21.3	8.5	-9.5	18.7	12.1	-13.5	32.9	-5.8	7.0	10.0
140009	13.6	1.9	-4.5	-6.3	3.4	2.0	15.3	12.4	5.2	13.5	0.8	-3.2	-5.7	4.9	1.4	15.2	1.1	3.3	-1.9
151000	-4.3	1.6	22.2	16.6	-20.1	16.6	-1.0	-19.4	0.4	-4.8	2.7	20.7	17.5	-18.3	15.7	-1.3	-22.7	0.0	-0.4
152000	8.8	3.5	-19.4	10.7	-13.1	-18.1	-2.2	5.2	-3.3	7.9	4.3	-17.6	12.6	-14.6	-18.6	1.0	9.0	-2.8	0.5
153000	26.7	17.5	-9.9	-15.7	12.9	-5.2	92.4	-14.2	12.5	27.4	17.6	-10.6	-15.0	15.9	-8.0	96.4	-17.8	8.8	-3.7
154000	9.4	103.0	-12.1	-38.4	162.2	19.9	-5.7	-15.7	25.0	7.9	111.9	-12.6	-37.8	164.4	15.3	-6.0	-13.3	15.1	-9.9
155000	1.9	10.4	-11.2	-6.7	22.1	-7.6	5.7	104.9	16.0	2.2	10.5	-15.3	-5.4	15.7	-8.8	0.2	97.1	8.2	-7.7
156009	0.5	7.7	6.5	6.7	-18.4	14.0	-0.4	-11.0	0.2	-1.0	7.7	6.7	7.5	-18.3	13.4	0.2	-7.1	0.7	0.5
158109	-3.7	9.6	-6.5	4.6	-1.7	12.2	-8.6	-0.8	0.4	-1.3	6.3	-6.7	5.4	-0.7	10.8	-8.1	1.3	0.7	0.3
158120	-3.7	6.9	-4.0	-4.4	-1.0	-0.5	20.3	2.3	1.8	-3.2	7.0	-4.2	-4.0	0.3	-0.6	20.4	3.3	2.1	0.3
158300	-11.8	-6.6	32.3	-11.7	50.0	-0.5	53.0	-14.2	11.1	-11.0	-0.7	28.1	-10.4	57.7	3.0	54.7	18.0	14.8	3.7
159000	-20.4	26.9	-5.1	-16.8	-13.2	-2.2	15.9	11.8	-1.5	-21.1	26.3	-5.6	-16.1	-12.1	-2.8	15.7	18.5	-1.0	0.6
160000	4.2	8.5	-15.8	-0.3	-13.3	0.6	0.1	-6.0	-2.8	3.9	8.2	-15.7	0.7	-12.9	-0.1	-1.2	-3.4	-2.9	-0.1
170000	0.9	3.0	3.5	7.1	1.7	-4.0	7.1	8.8	3.9	1.1	2.6	3.9	7.8	1.6	-4.6	6.9	9.4	3.5	-0.4
180000	16.0	4.1	-4.7	-2.7	-5.3	9.5	7.6	-5.5	2.2	14.7	4.8	-5.2	-1.9	-4.8	9.4	6.1	0.7	2.8	0.5
190000	-25.8	38.9	-7.9	9.4	14.8	-41.2	89.6	-15.7	1.5	-11.5	45.2	-6.7	9.7	13.2	-34.7	28.4	-6.9	1.9	0.4
200000	-15.9	18.6	-3.2	-2.0	1.6	0.1	2.7	10.9	1.2	-17.2	19.2	-3.3	-1.2	2.4	-0.5	2.5	9.0	0.9	-0.3
210000	15.8	21.2	0.9	9.1	7.3	-5.6	4.0	4.8	8.8	12.8	21.5	0.5	9.9	8.4	-6.8	3.9	4.3	6.5	-2.3
221200	-1.9	-1.1	-6.0	4.9	6.6	-0.2	-15.7	10.5	-0.6	-3.6	-1.5	-6.0	4.7	7.4	-1.8	-15.7	10.1	-1.1	-0.5
221309	-5.8	-2.2	-2.3	-6.4	16.2	-1.3	-11.1	10.4	-0.6	-5.8	-3.2	-2.0	-7.5	17.4	-2.1	-14.5	-1.3	-2.7	-2.1
222009	3.6	6.5	-3.6	-0.6	-5.4	-3.8	3.1	8.9	1.0	2.2	6.2	-3.6	-0.4	-4.6	-4.6	2.8	5.6	0.4	-0.6
230000	-46.4	-27.7	228.7	-47.6	-49.2	-12.2	20.0	-2.6	-8.1	-44.4	-36.1	231.3	-47.2	-49.9	-13.1	20.3	-34.8	-17.6	-9.5
241109	-5.2	-5.0	-3.4	-17.5	5.5	-10.7	11.6	29.8	-0.3	-12.7	1.7	-1.1	-15.8	6.7	-1.3	0.9	24.8	-0.2	0.0
241209	0.2	59.9	-15.2	13.6	-54.5	49.1	41.8	9.6	7.8	29.9	23.1	-15.1	-5.7	-15.6	-4.7	43.4	10.8	6.4	-1.5
241500	57.5	10.2	-28.8	83.5	-29.4	-10.7	303.7	-13.6	49.9	49.7	22.8	-29.1	89.5	-33.0	-10.7	304.3	-13.2	22.8	-27.1
241617	-9.7	36.9	16.2	-32.5	46.9	5.6	71.4	49.2	35.5	-10.3	39.5	14.8	-32.4	48.5	5.6	61.6	40.4	16.8	-18.8
242000 ¹	-5.9	-16.0	5.5	-9.6	17.0	0.1	-34.9	76.6	0.2	-8.8	-3.5	4.9	-9.3	18.1	-0.1	-34.8	60.4	0.4	-0.2
243000	-2.1	-1.9	4.2	-13.2	-12.1	-23.6	8.8	-17.8	-6.0	-4.6	1.2	5.3	-12.5	-12.7	-25.1	9.5	-18.9	-7.9	-1.9
244000	-0.1	21.1	8.9	37.3	25.9	-7.6	-28.8	-7.7	4.8	-0.2	21.6	9.4	37.3	25.6	-8.2	-28.3	-4.7	4.6	-0.1
245070	9.8	33.8	-12.6	-2.5	-6.9	7.9	-7.1	-21.6	-1.0	9.0	32.1	-11.7	-1.6	-6.4	7.4	-0.5	-24.1	-0.6	0.4
251122	4.0	4.0	-7.0	-3.3	4.4	-7.6	15.5	-4.4	0.5	3.5	4.1	-7.1	-2.9	6.0	-8.8	15.5	-3.8	0.6	0.1
252300	-4.0	3.9	-4.0	3.2	-2.4	-5.6	4.3	-4.1	-1.1	-4.1	4.6	-4.3	4.1	-1.6	-6.5	3.5	-4.6	-1.2	-0.1
252400	-2.2	4.1	-0.1	7.3	-2.6	-9.4	7.8	-3.4	0.0	-2.8	4.0	-0.1	7.8	-1.8	-10.9	8.1	-5.1	-0.3	-0.3
261126	9.8	6.7	-15.3	-6.0	-26.7	7.2	25.5	1.0	-0.9	9.4	6.9	-15.6	-2.9	-17.1	-3.5	20.2	1.1	-0.9	0.0
263053	5.7	2.4	5.5	-5.9	7.2	-9.7	-4.6	-1.0	-0.2	5.6	2.5	5.3	-5.1	8.3	-11.3	-3.5	-1.7	-0.2	0.0
266080	-2.5	5.4	-1.4	8.7	7.0	-14.8	8.7	1.6	1.4	-3.3	5.3	-1.0	9.2	7.3	-15.4	9.3	8.1	2.1	0.8
271000	57.8	64.3	0.7	-59.1	39.4	29.9	21.7	57.2	33.7	58.4	63.1	1.0	-58.9	40.0	28.6	54.2	156.1	28.9	-4.8
272030	-13.9	-16.3	-4.7	-0.9	-11.0	17.2	53.1	19.8	3.8	-14.7	-15.6	-5.2	-0.3	-9.6	16.1	53.8	41.7	5.7	1.9
274000	11.0	18.0	-0.8	2.9	-7.6	-20.0	58.1	8.4	8.7	7.9	18.1	-1.1	3.2	-6.1	-21.5	58.2	13.1	7.0	-1.7
275000	-21.7	-3.0	-10.6	-16.8	-21.4	-4.9	73.4	16.2	-1.9	-5.6	16.3	-2.1	10.0	-20.3	-6.6	74.6	-13.3	3.7	-6.0
281009	-3.7	-0.9	0.0	-2.3	2.8	6.2	-2.9	4.6	0.4	-6.1	-0.9	0.2	-1.8	3.7	5.3	-3.1	5.4	0.3	-0.2
286009	-3.6	5.7	3.9	-0.8	8.9	-4.3	14.2	3.1	3.6	-7.5	6.0	4.6	-0.2	9.6	-5.0	14.5	6.0	3.3	-0.4
291000	-7.2	22.4	-13.6	-5.6	6.3	1.6	-1.2	3.7	0.3	-9.7	22.7	-13.9	-5.1	6.7	1.0	-1.3	3.9	0.0	-0.3
292000	-16.0	3.2	-6.1	-8.5	4.7	0.5	3.4	-0.8	-2.5	-20.1	4.4	-6.4	-7.9	5.4	-0.1	3.1	-1.1	-3.2	-0.7
293000	5.9	-5.7	16.1	-24.5	23.6	-23.2	34.0	3.8	2.0	5.2	-4.4	14.9	-24.2	24.7	-23.8	33.6	10.9	2.7	0.7
294009	-12.6	3.4	1.8	-3.3	7.3	-1.5	5.6	11.8	1.4	-13.3	3.9	1.9	-3.1	8.0	-2.1	5.5	9.7	1.1	-0.3
297000	4.4	3.7	4.2	-1.1	3.5	-7.2	33.5	11.7	7.5	3.3	4.8	4.2	-0.2	5.8	-9.0	33.0	7.9	5.7	-1.8
300000	121.2	47.0	17.1	35.1	4.2	26.9	-3.2	4.9	73.8	122.7	47.5	16.2	35.7	2.2	26.6	-0.3	-13.0	24.6	-49.2
310000	-7.8	-1.9	-1.3	-8.6	20.8	-1.2	-24.9	-3.3	-3.7	-8.6	-1.5	-1.8	-8.2	21.7	-2.1	-25.0	-0.8	-4.0	-0.4
320000	7.0	10.2	-8.5	8.0	-9.9	21.5	11.7	1.3	5.5	5.4	11.4	-8.6	8.3	-9.4	19.6	12.2	14.2	6.2	0.6
330000	-1.8	6.1	11.8	2.6	7.0	8.2	-8.4	-0.4	3.3	-2.4	5.7	12.2	2.9	8.0	7.2	-8.6	2.4	3.3	0.0
340000	-9.6	35.2	-1.7	-1.8	-4.6	4.6	19.0	35.0	11.1	-11.3	36.4	-2.2	-1.1	-4.0	4.1	15.3	48.7	9.1	-2.1
351000	-5.9	-43.2	50.1	1.8	-14.1	3.0	-31.8	174.0	4.4	-6.3	-43.2	50.6	2.5	-13.3	1.8	-35.0	133.4	1.2	-3.2
352050	2.7	-6.2	-24.9	2.8	42.6	21.7	14.5	-17.0	2.8	1.2	-5.9	-25.2	3.3	43.9	20.7	13.9	-14.9	2.7	-0.1
361000	-1.3	0.0	-2.4	-1.4	3.4	-2.6	-0.3	8.3	0.4	-2.0	0.3	-2.6	-1.0	4.3	-2.8	-0.5	8.8	0.5	0.1
362060	-3.4	5.0	-18.5	21.4	-11.4	-2.9	3.8	-24.3	-4.0	-4.6	3.6	-16.1	17.9	-10.8	-1.9	8.0	-21.3	-3.9	0.1
370000	-251.8	-291.8	-95.8	1399.9	74.5	7.8	-1.1	-0.8	29.9	-263.0	-300.1	-96.0	1470.4	63.8	5.3	-1.8	-14.8	14.6	-15.2
401000	12.1	-0.2	-2.8	15.1	10.1	12.6	-15.9	-12.2	1.8	11.3	-0.2	-6.6	16.8	3.7	13.3	-12.3	-12.0	1.2	-0.6
402000	6.3	9.6	3.1	24.8	10.9	2.5	-28.1	-41.4	-3.5	14.5	12.6	5.2	32.8	-3.3	17.9	-21.3	-27.2	2.0	5.6
403000	14.6	1.4	1.7	-3.6	-5.1	-5.1	-9.5	9.1	0.2	12.7	0.0	-1.2	-1.5	-5.1	13.8	4.8	13.2	4.3	4.2
410000	7.8	-10.9	-22.3	4.3	2.2	-10.4	-30.7	2.2	-6.2	-4.3	-7.4	-27.3	3.8	0.2	0.0	-26.8	0.5	-8.4	-2.3
450000	5.1	-8.5	4.2	1.4	-4.7	-5.9	0.6	2.2	-0.8	6.9	-8.5	4.1	0.8	-4.6	-5.3	-0.5	3.5	-0.6	0.2
501009	-2.4	-8.0	10.4	-2.3	-0.9	15.0	3.1	-6.6	0.8	0.3	-15.0								

Table 3.1 Labour productivity based on to different sets of working hours (continued)

Industry	Working Time Account									National Account									Yearly average difference (pct. point)
	1996	1997	1998	1999	2000	2001	2002	2003	Yearly avg.	1996	1997	1998	1999	2000	2001	2002	2003	Yearly avg.	
	Annual percentage change																		
553009	-7.7	1.1	-3.7	2.7	-15.0	2.4	-0.5	0.6	-2.5	-7.8	0.8	-3.5	2.6	-14.5	1.5	-0.5	-1.9	-3.1	-0.6
601000	-1.3	9.9	-3.5	-29.3	11.3	22.3	4.2	-0.5	0.6	-1.5	9.9	-3.6	-29.0	11.8	21.8	4.1	4.1	1.1	0.5
602100	12.0	-15.8	-4.2	51.5	1.3	17.8	-15.3	11.7	6.8	11.4	-15.8	-4.5	52.1	2.5	16.6	-15.4	7.1	5.0	-1.9
602223	-16.0	4.5	3.1	6.9	-9.2	1.0	10.9	0.7	-0.1	-15.8	4.7	3.3	7.4	-8.9	0.3	10.7	-8.1	-1.2	-1.1
602409	-6.5	0.1	-0.2	4.4	-2.7	1.5	2.2	0.0	-0.2	-6.9	-0.6	-1.0	4.0	-1.8	0.3	2.2	-0.1	-0.5	-0.3
610000	43.5	16.5	-34.0	99.1	27.9	13.6	5.3	26.2	19.8	38.9	14.8	-35.1	95.5	26.0	10.1	4.5	17.3	16.7	-3.1
620000	4.2	-13.1	15.0	19.6	1.6	13.3	20.3	-11.5	5.4	8.7	-14.4	10.5	17.3	0.0	9.9	13.0	-11.3	3.6	-1.8
631130	-3.2	-6.5	-8.7	14.2	7.3	-13.2	2.4	0.3	-1.3	-2.2	-8.6	-9.5	15.8	8.2	-13.7	1.0	-1.3	-1.7	-0.4
634000	-3.8	-5.4	-5.9	-0.5	14.8	-9.8	0.8	-3.1	-1.8	-3.2	-5.7	-6.0	-1.5	16.2	-10.7	4.1	-2.4	-1.4	0.4
640000	14.0	4.1	-1.5	2.0	1.3	13.1	-9.6	20.0	5.0	13.7	3.6	-1.9	2.4	2.0	10.1	-9.7	13.5	4.0	-1.1
651000	2.1	15.6	14.7	-0.9	5.2	7.1	-2.3	6.3	5.8	2.0	15.8	14.3	0.2	6.8	5.6	-2.5	5.4	5.8	0.0
652000	37.8	-5.9	-9.4	-23.1	1.9	10.8	-3.9	-0.9	-0.4	20.9	5.6	-10.2	-23.0	2.9	8.8	-4.2	5.7	0.0	0.4
660102	0.4	-1.8	5.1	17.4	5.6	-10.1	-37.9	68.6	2.4	8.5	-3.8	15.1	56.0	-7.1	-0.4	-48.5	63.2	4.8	2.4
660300	37.0	2.5	7.9	0.1	-8.7	-12.7	8.7	24.9	6.4	26.5	-0.1	6.5	-0.1	-0.4	-12.7	4.5	27.3	5.7	-0.7
670000	-14.5	38.9	-4.0	-2.4	3.1	15.9	-25.7	13.7	1.5	-13.6	38.1	-4.4	-2.5	3.4	14.6	-26.3	18.2	1.8	0.3
701109	-4.8	-4.8	-9.4	-22.0	-17.9	-12.8	-36.8	11.8	-13.1	-4.3	-5.4	-9.1	-22.1	-17.3	-13.2	-36.7	10.2	-13.3	-0.1
702009	-2.0	-2.3	0.7	2.1	6.8	0.6	-3.2	0.4	0.3	-2.4	-3.3	0.3	2.1	7.4	-0.1	-3.2	5.6	0.7	0.4
702040	-5.9	-16.8	1.6	4.6	-5.9	-5.9	-12.8	-4.1	-5.9	-4.9	-18.0	1.6	5.2	-6.2	-5.7	-12.3	2.3	-5.0	0.9
710000	5.3	-13.8	-2.9	-6.3	-4.1	-9.4	7.9	4.3	-2.6	5.5	-14.1	-3.1	-9.7	-3.3	-9.8	7.9	7.3	-2.7	-0.1
721009	-28.0	64.5	-15.7	-3.1	-13.3	-12.9	66.0	5.8	3.2	-13.6	64.6	-15.2	-11.9	-2.7	-10.6	55.8	3.0	5.0	1.8
722000	-2.7	32.7	21.1	1.4	-9.4	16.8	14.8	15.9	10.6	-4.2	32.2	20.5	1.7	-8.4	16.0	13.8	9.1	9.4	-1.2
730001	49.7	-27.9	-5.4	-50.8	35.3	-36.9	61.1	6.4	-3.8	50.0	-30.1	-2.0	-13.5	-8.0	-0.7	-14.8	2.0	-4.3	-0.5
730002	0.7	-4.5	1.8	11.7	2.9	1.8	-0.2	2.1	1.9	3.6	-5.9	4.4	0.4	4.9	1.1	4.4	-7.7	0.5	-1.4
741100	-5.4	-0.9	-0.1	-0.7	5.2	3.4	-1.3	-3.2	-0.4	-5.4	-1.5	0.1	-0.9	5.8	2.8	-1.5	-3.5	-0.6	-0.2
741200	-4.2	2.4	-1.9	-4.3	1.3	-2.7	5.1	-2.2	-0.9	-4.4	2.1	-2.0	-4.0	2.3	-3.4	5.1	-4.3	-1.1	-0.3
742009	0.1	17.0	-16.8	-0.4	-4.5	5.9	-9.3	-2.5	-1.8	-0.9	16.9	-17.9	0.4	-2.7	4.0	-10.8	-3.9	-2.3	-0.6
744000	8.4	-4.7	-2.0	8.5	-17.4	1.7	-26.8	-8.4	-5.8	8.7	-4.7	-1.8	8.5	-17.0	0.9	-27.0	0.1	-4.8	1.0
747000	-4.8	-11.5	1.8	-2.0	-6.8	0.2	2.2	-6.0	-3.5	-8.1	-2.6	0.6	-1.3	-7.0	-0.8	1.9	-2.9	-2.6	0.9
748009	-17.7	3.1	-5.9	-6.1	6.2	-4.3	-10.7	-2.9	-5.0	-18.2	0.2	-3.5	-7.5	7.3	-5.8	-11.6	-4.8	-5.8	-0.7
751100	-1.0	4.9	7.7	7.8	-0.2	2.6	0.5	-4.8	2.1	1.7	1.2	1.3	2.5	3.8	2.6	-2.9	-0.8	1.2	-0.9
751209	6.2	23.6	-1.8	1.5	3.9	-7.1	5.4	0.8	3.8	5.2	-1.0	1.1	4.2	0.8	-23.9	-0.1	-1.1	-2.3	-6.0
751300	4.5	39.6	-10.4	-2.7	-8.2	-0.4	0.4	6.5	2.8	7.5	-9.2	9.6	-1.6	10.5	0.9	1.5	-0.5	2.2	-0.6
752001	11.4	21.4	-10.1	-8.2	-22.9	-0.4	9.4	1.3	-0.6	11.0	20.7	-10.2	-11.8	-22.2	-2.1	8.6	5.7	-0.9	-0.3
752002	3.1	-1.2	-2.6	-0.5	5.1	1.5	0.9	1.9	1.0	2.6	-1.3	-0.6	0.5	6.6	-0.9	3.5	1.5	1.5	0.5
801000	3.0	-3.1	3.9	-0.2	1.3	-2.4	-2.1	3.4	0.4	5.3	-5.0	4.8	0.3	2.8	-3.5	0.8	-1.0	0.5	0.1
802000	0.0	-5.6	0.3	-2.5	5.5	4.8	0.4	1.5	0.5	2.4	-3.4	0.3	0.2	7.1	5.2	-1.4	-0.4	1.2	0.7
803000	6.2	-4.3	4.7	-0.2	1.1	-6.8	5.9	0.1	0.7	0.3	-1.0	0.8	5.0	0.0	-0.1	6.0	2.4	1.7	0.9
804001	-2.2	-4.2	-12.5	-13.0	-18.6	-8.3	-5.7	9.5	-7.2	1.3	-3.8	-11.0	-12.3	-18.1	-8.4	-5.1	12.9	-6.0	1.2
804002	3.1	-4.0	0.6	-8.3	36.4	0.3	7.7	4.5	4.4	4.2	0.2	0.2	1.0	1.5	0.8	1.9	3.6	1.7	-2.7
851100	6.4	0.0	3.0	2.5	1.0	0.4	3.0	1.0	2.1	6.7	0.3	3.5	1.1	3.9	1.3	2.3	-2.8	2.0	-0.1
851209	-0.7	-2.3	0.2	0.7	1.9	0.6	2.3	-0.2	0.3	-1.0	-2.3	0.4	-0.9	2.3	0.0	1.4	-3.2	-0.4	-0.7
853109	3.3	-2.7	-0.4	-1.1	-0.3	-0.4	2.9	-0.2	0.1	2.7	0.1	1.1	-2.4	2.2	-1.1	3.5	-0.7	0.7	0.5
853209	3.9	-6.2	-3.7	-0.6	3.1	2.8	-1.8	1.6	-0.2	0.2	-1.9	-4.3	-1.4	5.7	2.6	0.2	-1.9	-0.2	0.0
900010	-26.1	-10.8	-5.7	-5.3	-0.5	2.5	-11.0	-3.3	-7.9	5.3	-8.3	-8.9	5.4	-5.3	8.2	-5.6	8.5	-0.4	7.6
900020	-4.2	-11.2	3.4	-14.7	1.4	-16.4	12.4	-5.6	-4.8	-19.6	-21.4	6.3	-16.3	-2.9	-25.7	8.4	9.0	-8.8	-4.0
900030	22.4	6.6	5.3	-10.5	-19.4	-17.4	5.4	0.6	-1.7	23.0	6.6	4.8	-9.5	-18.1	-18.7	4.7	-8.9	-2.9	-1.2
910000	-3.4	1.9	3.9	-2.6	-1.5	2.9	1.5	7.9	1.3	-1.2	3.9	2.0	-1.5	0.2	1.1	3.2	-0.2	0.9	-0.4
920001	-4.0	-7.3	-5.1	1.9	-8.0	-4.5	-6.8	6.7	-3.5	-4.3	-7.5	-4.8	1.3	-7.5	-5.0	-6.9	0.5	-4.3	-0.8
920002	-1.3	1.1	0.7	0.4	1.8	-2.7	-8.4	7.2	-0.2	-1.7	1.3	2.8	0.6	4.3	-3.0	0.8	-3.3	0.2	0.4
930009	-4.1	-5.1	0.8	-6.6	-5.3	2.1	3.3	5.0	-1.3	-5.0	-4.3	-2.2	-5.7	-4.7	1.4	3.5	4.9	-1.6	-0.3
950000	-4.0	-3.9	-18.8	-4.2	-7.5	-2.1	-34.2	-15.0	-11.9	0.0	-3.8	-11.2	-3.9	-0.5	-3.2	10.0	-15.0	-3.7	-8.2
Total	1.6	0.3	-0.8	1.4	1.5	0.5	-0.6	3.4	0.9	1.5	0.1	-0.9	1.6	2.4	-0.3	-0.8	2.1	0.7	-0.2

Note: Due to limited space only industry codes are shown. Information about names and codes for each industry are available in appendix 1.

3.2 Labour productivity – levels

In the previous section it was seen that compilations of labour productivity growth rates were sensitive to the choice of working hours. In this section focus will be at what consequences the choice of dataset has on the compilation of labour productivity levels.

Adaptations of new definitions do not necessarily have a significant affect at the growth rates. If working hours are increased X percent in industry Y in every year it does only have a modest affect on the productivity growth rates and are therefore not necessarily discussed in section 3.1. Nevertheless the order of the most productive industries, measured as Gross value added per hour can change dramatically and it's therefore important also to quantify the impact on the productivity levels.

Table 3.2 shows the levels of labour productivity for each industry and for the total economy. As in section 3.1 compilations are based on gross value added in 2000

fixed prices. The left side of table shows levels based on labour accounts and on the right side the compilations are done with the national accounts working hours. For both series annual yearly average growth rate are shown and the difference between these are presented far right.

A closer look at the table shows that the total has changed -1.4 percent due to the change in working hours. The reduction of the productivity level is not surprisingly, primarily because hours are added due to the adoptions of SNA 1993/ESA 1995 definitions. The hidden economy is one of the main reasons to the reduction of the productivity level, but as mentioned in section 2 several other factors have influence.

Contrary to the total, a difference at industry level seems to be of major importance. The revisions have two significant implications. Firstly, productivity levels for some industries have changed dramatically. Industries such as 11000 Extraction of oil and natural gas, 271000 Manufacturing of basic iron and steel and of ferro alloys, 620000 Air transport, 747000 Building-cleaning activities, 900020 Refuse collection and sanitation are some of the industries which have experienced significant increases in their productivity level. As mentioned in section 2.2 and 3.2 the revisions are made to ensure consistency between working hours and the rest of the national accounts.

Others such as 275000 Casting of metal products, 403000 Steam and hot water supply, 410000 Collection and distribution of water, 610000 Water transport, 660102 Life insurance and pension funding, 900010 Sewage removal and purifying plants have experienced significant decreases in their productivity level. Again revisions are done to secure consistency between working hours and the rest of the national accounts. Several of the industries mentioned above were also mentioned in the previous section. Not surprisingly revisions seem to influence both levels and growth rates and therefore have an effect on either conclusion.

Secondly, the order of industries proving to be the most productive changes due to the revisions of working hours. The five most productive industries are characterized by being very capital intensive and therefore have a very high value added per hours worked. The “members” of this group are unchanged whether it is compiled with labour accounts or national accounts working hours. But the order within this group has changed. 403000 Steam and hot water supply has experienced a reduction in its productivity level at 42 percent due to the change in working hours, this industry is now ranked fifth instead of third.

A look further down the list of the most productive industries shows that a lot of changes have occurred. In the group of the fifth to ten most productive industries according to the national accounts definitions includes only two industries from the same compilation done with the labour accounts working hours.

In the light of these compilations it looks like it does change the productivity level results significantly if a change in data material is made. In this case primarily industries were under influence of the choice of denominator, while the total was not influenced dramatically.

Table 3.2 Level of labour productivity

based on to different sets of working hours

Industry	Working Time Account											National Account											Yearly average difference
	1995	1996	1997	1998	1999	2000	2001	2002	2003	Yearly Avg.	1995	1996	1997	1998	1999	2000	2001	2002	2003	Yearly Avg.			
	Gross value added (Danish kroner) per hour											(in percent)											
011009	139	154	164	177	179	197	185	174	194	174	144	163	172	186	191	210	199	186	212	185	6.0		
011209	148	134	151	150	142	131	118	105	133	135	146	132	148	146	138	128	114	101	133	132	-2.2		
014001	191	185	201	191	189	205	243	216	261	209	187	182	196	186	185	202	238	212	246	204	-2.5		
014002	229	250	223	228	201	226	253	269	313	244	266	297	276	275	281	286	317	383	406	310	21.4		
020000	166	162	183	184	189	152	206	196	221	184	167	163	180	182	187	149	202	192	222	183	-1.1		
050000	230	206	255	260	275	254	274	224	166	238	221	200	247	240	267	246	263	215	161	229	-4.2		
110000	7 818	9 515	11 035	9 903	12 607	14 222	11 788	7 396	5 930	10 024	9 108	11 050	11 991	10 847	12 879	14 442	12 494	16 598	15 636	12 783	21.6		
140009	301	342	348	332	312	322	329	379	426	343	298	338	341	330	311	326	331	381	385	338	-1.6		
151000	197	189	192	234	273	218	254	252	203	223	194	185	190	229	269	220	254	251	194	220	-1.4		
152000	211	229	237	191	212	184	150	147	155	191	214	231	241	198	223	191	155	157	171	198	3.6		
153000	190	240	282	254	215	242	230	442	379	275	191	243	286	256	218	252	232	456	375	279	1.4		
154000	108	118	240	211	130	341	409	386	325	252	107	115	245	214	133	352	406	381	330	254	0.6		
155000	238	242	268	238	222	271	250	264	542	281	274	280	309	262	248	286	261	262	515	300	6.0		
156009	240	241	259	276	295	240	274	273	243	260	241	239	257	274	294	240	273	273	254	261	0.2		
158109	247	238	260	244	255	251	281	257	255	254	246	243	258	241	253	252	279	256	260	254	0.0		
158120	135	130	140	134	128	127	126	152	155	136	136	131	141	135	129	130	129	155	160	138	1.4		
158300	242	214	200	264	233	350	348	533	458	316	236	210	209	268	240	378	389	603	711	360	12.4		
159000	451	359	456	432	360	312	306	354	396	381	456	359	454	428	360	316	307	355	421	384	0.8		
160000	947	987	1 070	902	899	780	784	785	738	877	934	970	1 050	885	892	776	775	766	740	866	-1.3		
170000	187	189	195	202	216	220	211	226	246	210	185	187	192	199	215	218	208	223	244	208	-1.1		
180000	169	196	204	194	189	179	196	210	199	193	167	191	200	190	187	178	194	206	207	191	-0.8		
190000	195	145	201	185	203	232	137	259	219	197	191	169	245	229	251	284	186	238	222	224	11.9		
200000	213	179	212	205	201	204	205	210	233	207	210	174	207	200	198	203	202	207	225	203	-2.0		
210000	162	187	227	229	250	268	253	263	276	235	163	184	223	224	247	267	249	259	270	232	-1.3		
221200	212	208	206	194	203	217	216	182	201	204	210	202	199	187	196	210	207	174	192	197	-3.5		
221309	238	224	219	214	201	233	230	204	226	221	237	224	216	212	196	230	225	193	190	214	-3.4		
222009	256	265	282	272	270	256	246	254	276	264	254	259	276	266	265	253	241	248	262	258	-2.3		
230000	1 198	642	464	1 526	799	406	357	428	417	693	1 292	718	459	1 520	803	402	350	421	274	693	0.0		
241109	514	487	462	446	368	389	347	387	503	434	553	483	491	486	409	437	431	434	542	474	8.5		
241209	273	274	438	372	422	192	286	406	445	345	268	348	428	364	343	290	276	395	438	350	1.3		
241500	162	255	282	201	368	260	232	937	810	390	166	248	304	216	408	274	244	988	857	412	5.3		
241617	234	211	289	336	227	333	352	603	900	388	232	208	290	333	225	334	353	571	801	372	-4.2		
242000	602	566	475	502	454	531	532	346	612	513	529	482	465	488	443	523	522	340	546	482	-6.0		
243000	263	257	253	263	228	201	153	167	137	214	266	254	257	270	237	207	155	170	138	217	1.5		
244000	310	310	375	408	561	706	652	464	428	468	304	303	368	403	553	695	638	457	436	462	-1.4		
245070	242	266	356	311	303	282	305	283	222	286	249	271	358	316	311	291	313	311	236	295	3.2		
251122	265	275	286	266	257	269	248	287	274	270	261	271	282	262	254	270	246	284	273	267	-1.0		
252300	230	221	230	220	227	222	210	219	210	221	226	217	226	217	226	222	208	215	205	218	-1.4		
252400	245	240	249	249	267	260	236	254	245	250	242	236	245	245	264	259	231	250	237	245	-1.7		
261126	190	208	222	188	177	130	139	175	176	178	186	204	218	184	179	148	143	172	174	179	0.2		
263053	368	389	398	420	395	424	382	365	362	389	362	382	392	413	392	424	376	363	357	385	-1.2		
266080	231	225	237	234	254	272	232	252	256	244	231	223	235	233	254	273	231	252	273	245	0.6		
271000	109	172	282	284	116	162	210	256	402	221	107	169	275	278	114	160	206	317	813	271	18.3		
272030	372	321	268	256	253	226	265	405	485	317	370	315	266	252	251	227	264	406	575	325	2.5		
274000	220	244	288	286	294	272	218	344	373	282	221	239	282	279	288	270	212	336	379	278	-1.3		
275000	279	253	283	289	240	189	180	311	362	265	201	189	220	216	237	189	177	308	267	223	-18.9		
281009	214	206	204	204	199	205	218	211	221	209	215	202	200	200	196	204	214	208	219	206	-1.3		
286009	189	182	193	200	198	216	207	236	244	207	194	179	190	199	198	217	206	236	250	208	0.2		
291000	239	222	272	235	222	236	240	237	245	239	244	220	270	233	221	236	238	235	244	238	-0.4		
292000	292	245	253	237	217	227	229	236	235	241	301	241	251	235	217	228	228	235	233	241	-0.1		
293000	203	215	203	235	178	219	169	226	235	209	202	212	203	233	177	221	168	224	249	210	0.4		
294009	234	205	211	215	208	223	220	232	260	223	232	201	209	213	206	223	218	230	252	220	-1.3		
297000	192	201	208	217	214	222	206	275	307	227	191	197	207	216	215	228	207	276	298	226	-0.4		
300000	56	123	181	212	287	299	379	367	385	255	55	124	182	212	287	294	372	371	323	247	-3.2		
310000	270	249	244	241	220	266	263	197	191	238	269	246	242	238	218	266	260	195	194	236	-0.7		
320000	214	229	252	231	249	225	273	305	309	254	214	226	251	230	249	225	269	302	345	257	1.1		
330000	262	257	273	305	313	335	362	332	330	308	260	254	268	301	310	335	359	328	336	306	-0.7		
340000	189	171	232	228	224	213	223	265	358	234	189	168	229	224	221	213	221	255	379	233	-0.1		
351000	252	238	135	203	206	177	183	125	341	207	248	232	132	198	203	176	179	117	272	195	-5.8		
352050	206	212	199	149	154	219	266	305	253	218	208	210	198	148	153	220	265	302	257	218	-0.1		
361000	225	222	222	217	213	221	215	214	232	220	221	216	217	211	209	218	212	211	229	216	-1.8		
362060	194	187	197	160	195	172	167	174	131	175	204	195	202	169	200	178	175	189	149	184	4.9		
370000	113	-171	328	14	207	361	389	385	381	223	110	-179	359	14	227	372	392	385	328	223	0.1		
401000	413	463	462	449	517	570	641	539	473	503	520	579	578	540	631								

Table 3.2 Level of labour productivity - based on to different sets of working hours

(continued)

Industry	Working Time Account										National Account										Yearly average difference
	1995	1996	1997	1998	1999	2000	2001	2002	2003	Yearly Avg.	1995	1996	1997	1998	1999	2000	2001	2002	2003	Yearly Avg.	
	Gross value added (Danish kroner) per hour																				(in percent)
553009	172	159	161	155	159	135	138	138	138	151	162	149	151	145	149	127	129	129	126	141	-7.0
601000	410	405	445	429	303	338	413	431	429	400	404	398	437	421	299	334	407	424	441	396	-1.0
602100	91	102	86	82	125	126	149	126	141	114	90	101	85	81	123	126	147	124	133	112	-1.8
602223	161	135	141	145	156	141	143	158	159	149	154	130	136	140	151	137	138	152	140	142	-4.9
602409	242	226	226	226	236	229	233	238	238	233	235	219	217	215	224	219	220	225	225	222	-4.7
610000	221	318	370	244	486	622	706	743	938	516	189	263	302	196	383	483	531	555	651	395	-30.8
620000	184	192	166	191	229	233	263	317	281	228	220	239	205	226	265	265	291	329	292	259	11.9
631130	369	358	334	305	349	374	325	333	334	342	348	341	311	282	326	353	305	308	304	320	-7.0
634000	348	335	316	298	296	340	307	309	300	316	334	324	305	287	283	328	293	305	298	306	-3.3
640000	239	273	284	279	285	289	326	295	354	292	240	273	283	278	284	290	319	288	327	287	-1.6
651000	333	341	393	452	447	470	504	493	524	440	318	325	376	430	430	459	485	473	499	422	-4.3
652000	577	795	748	678	522	532	589	566	560	619	579	700	739	663	511	526	572	548	579	602	-2.8
660102	502	504	494	520	610	644	579	359	606	535	330	358	345	397	619	575	573	295	482	442	-21.2
660300	326	446	457	493	494	451	393	427	534	447	307	388	388	413	412	411	359	375	477	392	-13.9
670000	525	449	623	598	584	602	698	518	589	576	532	460	635	607	592	613	702	518	612	586	1.6
701109	350	333	317	287	224	184	160	101	113	230	342	327	309	281	219	181	157	99	110	225	-2.1
702009	2 783	2 728	2 664	2 682	2 738	2 925	2 943	2 847	2 860	2 797	2 812	2 746	2 656	2 664	2 720	2 922	2 919	2 827	2 984	2 805	0.3
702040	2 627	2 471	2 056	2 089	2 184	2 056	1 934	1 686	1 617	2 080	2 646	2 518	2 064	2 205	2 069	1 952	1 711	1 752	2 113	1.5	
710000	538	567	489	475	445	427	386	417	435	464	533	563	483	469	423	409	369	398	428	453	-2.5
721009	320	231	379	320	310	269	234	389	411	318	265	229	377	319	281	273	244	381	392	307	-3.7
722000	166	161	214	259	263	238	278	319	370	252	161	154	204	246	250	229	266	302	330	238	-5.9
730001	296	444	320	303	149	202	127	205	218	252	275	413	289	283	245	225	224	190	194	260	3.1
730002	196	198	189	192	214	220	225	224	229	210	202	209	197	205	206	216	219	228	211	210	0.3
741100	313	296	293	293	291	306	316	312	302	303	310	293	289	289	286	303	312	307	296	298	-1.4
741200	279	268	274	269	257	261	254	267	261	265	273	261	266	261	251	256	248	260	249	258	-2.8
742009	300	300	351	293	291	278	294	267	260	293	287	285	333	273	274	267	278	247	238	276	-6.2
744000	257	278	265	260	282	233	237	174	159	238	250	272	259	254	276	229	231	169	169	234	-1.8
747000	153	146	129	131	129	120	120	123	115	130	169	155	151	152	150	140	139	141	137	148	12.7
748009	270	223	229	216	203	215	206	184	179	214	263	215	216	208	192	206	195	172	164	203	-5.1
751100	197	196	205	221	238	237	244	245	233	224	207	211	213	216	221	230	236	229	227	221	-1.3
751209	246	262	324	318	323	335	311	328	331	309	238	250	247	250	261	263	200	200	198	234	-31.9
751300	533	558	779	698	679	623	620	623	663	642	442	476	432	473	466	515	519	527	524	486	-32.0
752001	256	285	346	311	285	220	219	240	243	267	241	267	322	289	255	199	195	211	223	245	-9.1
752002	219	226	223	217	216	227	231	233	237	226	229	235	232	231	232	247	245	253	257	240	6.0
801000	197	203	197	205	204	207	202	197	204	202	196	207	196	206	206	212	205	206	204	204	1.3
802000	186	186	176	176	172	181	190	191	194	184	174	178	172	172	173	185	195	192	191	181	-1.4
803000	264	280	268	281	281	284	264	280	280	276	252	253	251	253	266	266	265	281	288	264	-4.5
804001	368	360	345	302	262	213	196	185	202	270	320	324	312	277	243	199	182	173	195	247	-9.3
804002	141	145	139	140	128	175	176	189	198	159	129	135	135	135	137	139	140	143	148	138	-15.3
851100	204	218	217	224	230	232	233	240	242	227	209	222	223	231	234	243	246	251	244	234	3.0
851209	245	243	238	238	240	244	246	251	251	244	241	239	233	234	232	237	237	241	233	236	-3.1
853109	145	149	145	145	143	143	142	146	146	145	138	142	142	144	140	143	142	147	146	143	-1.5
853209	169	176	165	159	158	162	167	164	167	165	167	167	164	157	154	163	167	168	164	163	-1.0
900010	1 264	934	834	786	745	741	759	676	654	821	618	651	597	544	573	542	587	554	601	585	-40.4
900020	123	118	105	109	93	94	79	88	83	99	793	637	501	533	446	433	322	349	380	488	79.7
900030	343	420	448	472	422	340	281	296	298	369	334	411	438	459	415	340	276	289	264	358	-2.9
910000	184	178	182	189	184	181	186	189	204	186	173	171	178	181	179	179	181	187	186	179	-3.9
920001	372	357	331	314	320	294	281	262	279	312	357	342	316	301	305	282	267	249	250	296	-5.3
920002	232	229	231	233	234	238	232	212	228	230	228	224	227	234	235	245	238	240	232	234	1.7
930009	187	180	171	172	161	152	155	160	168	167	186	177	169	166	156	149	151	156	164	164	-2.3
950000	1 440	1 382	1 328	1 078	1 032	955	934	615	522	1 032	93	93	90	80	76	76	74	81	69	81	...
Total	253	257	258	256	260	264	265	263	272	261	250	254	254	252	256	262	262	259	265	257	-1.4

Note: Due to limited space only industry codes are shown. Information about names and codes for each industry are available in appendix 1.

4 Findings and recommendations

The purpose of this paper was two folded. First, to insight in why hours worked are different in the Labour Force Statistics and in the National Accounts Statistics and second, to quantify how much impact these disparities have on the measurement of productivity.

Chapter 2 showed that a lot of effort is put in to secure consistency between National Accounts and hours worked, therefore a comprehensive number of neutral corrections between industries are made. These are done to secure consistency between a firm's production and the hours worked at industry level. When international productivity comparisons are made, with few exceptions aggregate comparisons are done. A quite significant number of the corrections are therefore never visible in productivity data. However, the forthcoming years it is likely that international productivity comparisons at industry level will be much more common than at present, and therefore corrections like these will see the daylight in international productivity results.

Level changing corrections is the second modification that was presented in chapter 2. These corrections are primarily made to adapt the SNA 1993/ESA 1995 definitions. These does not only have an effect within industries but also at aggregate level. Compared to the reallocations within industries the total number of hours was changed modestly, but nevertheless the average growth rate was revised 0.2 percentage point due to these revisions. With this in mind the importance of using hours worked compiled within the same framework as the value added is obvious. These findings are only based on Danish data and a generalization to an international phenomenon should be done with caution. Even with that in mind it is likely to believe that international productivity comparisons at aggregate level are encumbered with a significant uncertainty because SNA 1993/ESA 1995 defined working hours not is common today.

If international comparisons of productivity at aggregate level are encumbered with a significant uncertainty, analyses at industry level seem difficulty. Chapter 3 showed that industry comparisons of Danish productivity estimates based on Working Time Account data and National Account data differed a lot. Disparities were found in both growth rates and level compilations. If the results from Denmark can be expressive of an international phenomenon it is necessary to treat international productivity analysis at industry level with caution as long as working hours are not consistent with National Accounts data.

In OECD's latest published estimates of productivity (at aggregate level) only twelve of thirty countries were able to deliver working hours based on National Accounts definitions^{viii}. With the Danish findings in mind it is necessary to be cautious when these results are analysed – even though it is only on aggregate data. Future analyses of international productivity results at industry level seem to be difficult as long as National Accounts working hours only are available for a limited number of countries.

In the forthcoming time it seems like there is room for improvements within this area. A lot of work has been done to harmonize Value Added and Purchasing Power Parties. The time has now come where some effort should be put into improvements of harmonisation within National Account consistent working hours estimates. Some work is already ongoing in the Paris group et cetera, but there is room for further initiatives which can enhance the compilations of National Accounts consists working hours in the forthcoming years.

^{viii} OECD (2005)

References

Eurostat, *European System of Accounts. ESA 1995*. Brussels/Luxembourg 1996 (a).

Heurlén, Kamilla, *Hours worked in the Danish National Accounts and employment in the early version of Quarterly National Accounts* EU-report from June 2003 DG Eurostat/e-1 Grant Agreement nr. 200132100006

Lau, Eunice, *WP2.2 International Questionnaire – report on initial findings*, Project: Consistency of employment and earnings statistics in Labour Force Survey and National Accounts for productivity.

Naur, Michèle, *User demands and their consequences for the measurement of working time*. Paper presented on Paris Group Meeting in Lisbon, 29 September – 1 October 2004.

OECD, International comparisons of labour productivity levels – estimates for 2004, July 2005. available on the *OECD website*.

United Nations et al., *System of National Accounts 1993*. Brussels/Luxembourg, New York, Paris, Washington D.C., 1993.

Appendix 1

Overview of industries codes and names

Code	Name	Code	Name
011009	Agriculture	553009	Restaurants
011209	Horticulture, orchards etc.	601000	Transport via railways
014001	Agricultural services; landscape gardeners etc. (market)	602100	Other scheduled passenger land transport
014002	Agricultural services; landscape gardeners etc. (other non-market)	602223	Taxi operation and coach services
020000	Forestry	602409	Freight transport by road and via pipelines
050000	Fishing	610000	Water transport
110000	Extr. of oil and natural gas	620000	Air transport
140009	Extr. of gravel and clay etc.	631130	Cargo handling, harbours etc., travel agencies
151000	Production etc. of meat and meat products	634000	Activities of other transport agencies
152000	Processing and preserving of fish and fish products	640000	Post and telecommunications
153000	Processing and preserving of fruit and vegetables	651000	Financial institutions
154000	Mfr. of vegetable and animal oils and fats	652000	Mortgage credit institutions
155000	Mfr. of dairy products	660102	Life insurance and pension funding
156009	Mfr. of starch, chocolate and sugar products	660300	Non-life insurance
158109	Mfr. of bread, cakes and biscuits	670000	Activities auxiliary to finance
158120	Baker's shops	701109	Real estate agents etc.
158300	Manufacture of sugar	702009	Dwellings
159000	Manufacture of beverages	702040	Letting of non-residential buildings
160000	Manufacture of tobacco products	710000	Renting of transport equipment and machinery
170000	Mfr. of textiles	721009	Computer activities exc. software consultancy and supply
180000	Mfr. of wearing apparel	722000	Software consultancy and supply
190000	Mfr. of leather and footwear	730001	Research and development (market)
200000	Mfr. of wood and wood products	730002	Research and development (other non-market)
210000	Mfr. of pulp, paper and paper products	741100	Legal activities
221200	Publishing of newspapers	741200	Accounting, book-keeping, auditing
221309	Publishing activities, excluding newspapers	742009	Consulting engineers, architects
222009	Printing activities	744000	Advertising
230000	Mfr. of refined petroleum products etc.	747000	Building-cleaning activities
241109	Mfr. of industrial gases and inorganic basic chemicals	748009	Other business activities
241209	Mfr. of dyes, pigments and organic basic chemicals	751100	General (overall) public service activities
241500	Manufacture of fertilizers	751209	Administration of public sectors exc. for business
241617	Mfr. of plastics and synthetic rubber	751300	Regulation of and contribution to more efficient operation of business
242000	Manufacture of pesticides and other agro-chemical products	752001	Defence, police and administration of justice (market)
243000	Mfr. of paints, varnishes and similar coatings, printing ink and mastics	752002	Defence, police and administration of justice (other non-market)
244000	Mfr. of pharmaceuticals etc.	801000	Primary education
245070	Mfr. of detergents and other chemical products	802000	Secondary education
251122	Mfr. of rubber products and plastic packing goods etc.	803000	Higher education
252300	Mfr. of builders ware of plastic	804001	Adult and other education (market)
252400	Manufacture of other plastic products n.e.c.	804002	Adult and other education (other non-market)
261126	Mfr. of glass and ceramic goods etc.	851100	Hospital activities
263053	Mfr. of cement, bricks, tiles, flags etc.	851209	Medical, dental and veterinary activities
266080	Mfr. of concrete, cement, asphalt and rockwool products	853109	Social institutions etc. for children
271000	Mfr. of basic iron and steel and of ferro alloys	853209	Social institutions etc. for adults
272030	First processing of iron and steel	900010	Sewage removal and purifying plants
274000	Mfr. of basic non-ferrous metals	900020	Refuse collection and sanitation
275000	Casting of metal products	900030	Refuse dumps and refuse disposal plants
281009	Mfr. of building materials of metal	910000	Activities of membership organizations
286009	Mfr. of various metal products	920001	Recreational, cultural, sporting activities (market)
291000	Mfr. of marine engines and compressors	920002	Recreational, cultural, sporting activities (other non-market)
292000	Mfr. of ovens and cold-storage plants	930009	Other service activities
293000	Mfr. of agricultural machinery	950000	Private households with employed persons
294009	Mfr. of machinery for industries		
297000	Mfr. of domestic appliances		
300000	Mfr. of office machinery and computers		
310000	Mfr. of other electrical machinery and apparatus		
320000	Mfr. of radio and communication equipment		
330000	Mfr. of medical and optical instruments		
340000	Manufacture of motor vehicles etc.		
351000	Building and repairing of ships and boats		
352050	Mfr. of transport equipment excl. ships, motor vehicles etc.		
361000	Mfr. of furniture		
362060	Mfr. of toys, gold and silver articles etc.		
370000	Recycling of waste and scrap		
401000	Production and distribution of electricity		
402000	Manufacture and distribution of gas		
403000	Steam and hot water supply		
410000	Collection and distribution of water		
450000	Construction		
501009	Sale of motor vehicles and motorcycles		
502000	Maintenance and repair of motor vehicles		
505000	Retail sale of automotive fuel		
510000	Wholesale except of motor vehicles		
521090	Retail trade of food		
522990	Department stores		
523000	Re. sale of phar. goods, cosmetic art.		
524190	Re. sale of clothing and footwear		
524490	Other retail sale, repair work		
551009	Hotels		