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QUARTERLY LABOUR COST INDEX IN PUBLIC EDUCATION

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ABSTRACT

Since 2003 Istat has been carrying out feasibility studies for the extension of the quarterly Labour Cost Index (LCI) to the NACE Rev.1. economic activity sections L, M, N and O, as required by the Council Regulation (EC) No 450/2003.

This Final Report analyses the feasibility of the Labour Cost Index compilation in section M (Education).

In particular, it focusses on the public sector of this section and includes: the definition of the universe of the public institutions; the exploration of the available infra-annual administrative sources (the Employees Payrolls Database for the School area and the CINECA for the Universities) and of their data quality problems, and the comparison with the Annual Account benchmark data; the analysis of the National Accounts quarterly estimation experimental method with a particular attention to overcome its limitations.

Furthermore, some preliminary aggregate results, obtained by a combination of the two administrative sources, are presented and compared to the quarterly National Accounts estimates.

Finally, two different scenarios for section M quarterly LCI compilation are defined, respectively in the short and the long run.

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1. INTRODUCTION

In order to comply with the LCI Regulation requirements, Istat has been carrying out feasibility studies for the LCI[2] construction in the Nace Rev. 1. economic activity sections L to O.

The feasibility study on section L was completed in July 2003, that on section M is the object of this Final Report, while that on sections N and O will be completed within the end of 2005.

Similarly to the LCI-OROS data for the economic activity sections C-K, which are based on INPS administrative source, Istat has chosen to use infra-annual administrative sources also for the construction of a quarterly LCI in sections L to O. As a matter of fact, the Italian law (art. 58 of the Decree by Law 165/2001) compels the Ministry of Economy to collect both short and long-term data on the wages and labour costs of civil servants, and the way chosen by the Ministry to comply to this obligation is mainly based on the exploitation of administrative archives. In this respect, Istat plays a user role more than a producer one.

To this end, Istat has been making a significant effort in order to achieve agreements with the institutions managing the administrative sources relevant to the LCI purposes. These agreements aim at acquiring and analysing the data, and at establishing a full and continuous cooperation between Istat and the other involved institutions for a regular data transmission.

As far as section M is concerned, a partnership agreement between Istat and the General Account Department of the Ministry of Economy, which manages the Employees Payrolls Database, has been recently signed. The cooperation has significantly improved with respect to the past months and more up-to-date data have been transmitted.

Furthermore, an informal agreement has been reached with the CINECA consortium (Interuniversity Consortium of North Eastern Italy for Automatic Calculation), which has allowed us to acquire data on Universities for the years 2002 and 2003.

This report includes the task of exploration of the available infra-annual administrative sources and supplies some preliminary proposals for the LCI construction in the short-run.

In particular, Chapter 2 defines the universe of the public institutions in section M.

Chapter 3 analyses the Employees Payrolls Database quality problems in terms of non sampling errors and makes a comparison with the Annual Account benchmark data. Furthermore, the monthly profile of the interest variables derived from this source is described. A similar preliminary analysis is also presented for the newly acquired CINECA data.

Subsequently, the National Accounts quarterly estimation experimental method is analysed in depth in Chapter 4, with a particular attention to overcome its limitations.

Finally, in Chapter 5 some preliminary figures resulting from a combination of the Employees Payrolls Database and CINECA data and their comparison to the quarterly National Accounts estimates are presented. Moreover, two different scenarios for the LCI construction, respectively in the short and the long-run, are defined, together with a description of the steps necessary to realize the short-run scenario.

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[2] The Regulation (EC) No 450/2003 defines the Labour Cost Index (LCI) as the Laspeyres index of labour costs per hour worked. The fixed-weighted aggregate index is obtained by the combination of elementary economic activity section indexes with weights given by the total annual labour costs. The numerator of the elementary indexes includes wages and salaries and employers' social contributions plus taxes paid by the employer less subsidies received by the employer (see Regulation EC No 1726/1999 for the definition of the abovementioned labour cost components). The hours worked at the denominator are defined by the Council Regulation (EC) No 223/96 of 25 June 1996 on the European system of national and regional accounts in the Community.

2. LIST OF PUBLIC INSTITUTIONS IN SECTION M

In M economic activity section both private firms and public institutions operate, often with very different rules and regulations.

This project intends to focus on the public sector of this section[3], while other projects will be devoted to the private sector as well as to the combination of statistical information referring to the two sectors.

In the following, the complete list of the public institutions whose main economic activity is classified among those of section M will be defined.

Firstly, ESA95 General Government Sector (S.13) institutional units with employees belonging to the School or University collective bargaining areas have been considered. These units have been drawn from the Annual Account (see Prospect 2.1).

In particular, the National Olympic Committee and the Astronomic Observatories have been excluded from the list, since their main economic activities are classified respectively into sections O and K. For the remaining institutional units it has been assumed that all the employees belonging to School or University areas carried out activities classified among those of section M. This is obviously an approximation. In fact, on the one hand the employees in School or University areas do not necessarily carry out section M activities (for example the administrative and technical staff). On the other hand, the employees belonging to areas different from School or University could carry out section M activities (such as the nursery school teachers belonging to Regions and Local Institutions area).

Furthermore, S.13 institutional units which have no employees in the School or University collective bargaining areas but whose main economic activity is classified among those of section M have also been included in the list (that is, National School of Cinema and Institute for Training in Economy and Policy of Rural Development).

Prospect 2.2 shows the complete list of public institutions in section M, in the framework of ESA95-S.13 sector. In particular, for each unit it shows the ATECO 2002 economic category (or group) and the number of employees on both December 31st 2000 and 2002. On these dates, section M public employment reached around 1,242,000 and 1,260,000 units and was concentrated in the Ministry of Education (around 90%) and in the Universities (around 10%).

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[3] On the basis of the last Census of Industry and Services the public sector covers around 90% of the overall employment of this section.

Prospect 2.1 - Institutional units with employees in School and/or University collective bargaining areas from the Annual Account

INSTITUTIONAL UNITS	School	University
Ministry of Economy and Finance	x	
Ministry of Defence	x	x
Ministry of Education	x	
Municipalities	x	
Astronomic observatories		x
Other university education institutes		x
National Institute of Social Insurance for Civil Servants	x	
National Olympic Committee	x	
Provinces	x	
Trento autonomous provinces	x	
Universities		x

Prospect 2.2 - Institutional units in both in ESA95-S.13 and NACE Rev. 1.1 section M and their employees at December 31st 2000 and 2002

SUBSECTOR	CLASSES	PUBLIC ADMINISTRATIONS	INSTITUTIONAL UNITS	COLLECTIVE BARGAINING AREA	Main economic activity category or group	Employees at 31 December 2000	Employees at 31 December 2002	Percentage on total of M 2000	Percentage on total of M 2002
S.1311		**Central government**		**TOTAL**		**1,126,752**	**1,128,144**	**90.72**	**89.56**
	S.1311.1	**State government and constitutional organs**		**TOTAL**		**1,126,752**	**1,128,144**	**90.72**	**89.56**
		Ministries and Prime Minister's Office							
			MINISTRY OF DEFENCE						
				SCHOOL	80.2	44	42	0.00	0.00
				UNIVERSITY	80.3	43	39	0.00	0.00
			MINISTRY OF PUBLIC EDUCATION						
				SCHOOL	80.1; 80.2	1,126,664	1,128,062	90.71	89.55
			MINISTRY OF FINANCE						
				SCHOOL	80.2	1	1	0.00	0.00
	S.1311.2	**Units responsible for business regulation or for producing economic services**				-	-	-	-
		Units responsible for producing economic services							
			NATIONAL SCHOOL OF CINEMA		80.30.3	-	-	-	-
	S.1311.3	**Units providing welfare, entertainment and cultural services**				-	-	-	-
		Units providing cultural services							
			INSTITUTE FOR TRAINING IN ECONOMY AND POLICY OF RURAL DEVELOPMENT		80.30.3	-	-	-	-
S.1313		**Local Government**		**TOTAL**		**115,236**	**131,484**	**9.28**	**10.44**
	S.1313.1	**Territorial units**		**TOTAL**		**3,809**	**2,717**	**0.31**	**0.22**
		Trento autonomous province							
				SCHOOL	80.1; 80.2	782	-	-	-
		Provinces							
				SCHOOL	80.2	258	152	0.02	0.01
		Municipalities							
				SCHOOL	80.1; 80.2	2,769	2,565	0.22	0.20
	S.1313.4	**Units providing welfare, entertainment and cultural services**		**TOTAL**		**111,427**	**128,767**	**8.97**	**10.22**
		Universities and other university educational institutes		**UNIVERSITY**	80.30.1;80.30.2	111,427	128,767	8.97	10.22
S.1314		**Social security funds**		**TOTAL**		**23**	**39**	**0.00**	**0.00**
			NATIONAL INSTITUTE OF SOCIAL INSURANCE FOR CIVIL SERVANTS (INPDAP)						
				SCHOOL	80.2	23	39	0.00	0.00
				TOTAL SECTION M		**1,242,011**	**1,259,667**	**100**	**100**

3. EXISTING SOURCES FOR SECTION M PUBLIC SECTOR

For the purpose of the LCI construction in sections L-O, Istat has chosen to examine the existing administrative sources instead of designing a regular survey. The use of administrative data allows to avoid introducing a new heavy statistical burden on institutional units and to reduce the cost for the statistical service. The new LCI-OROS data on sections C-K are a good example of an extensive and innovative use of administrative data for current short-term statistics.

In particular, in section M, two administrative sources, managed by the General Account Department of the Ministry of Economy and Finance (from now on, GAD) and by CINECA, are currently available which cover, respectively, the School and the University areas (see the analysis of the target population in chapter 2). In the last months Istat has been making a strong effort to reinforce and launch the cooperation with the abovementioned Institutions in order to assess the quality of the two sources and their usability for the LCI purposes. A partnership agreement has recently been signed with the GAD: as a consequence, the degree of cooperation has improved in the last months. The collaboration with CINECA is not regulated by a formal agreement, but in the near future the GAD and the Ministry of Education, University and Research (which supervises the CINECA activities) are planning to sign a new agreement and, within its framework, the GAD commits itself to provide Istat the data transmitted by CINECA.

In the following, a description of the main characteristics of the two sources is presented. Furthermore, a comparison is made between data of these sources and the benchmark ones provided by the Annual Account of the GAD.

3.1. Annual Account as a benchmark source

The Annual Account provides since 1992, for all the General Government collective bargaining areas, the overall annual amount of both fixed and additional wage components. In particular, in the fixed components the following items (broken down by collective bargaining area, institutional unit and job position) are specified: wage, cost of living allowance, seniority wage, year-end bonuses, arrears related to previous years, family allowance, recoveries due to absences, delays, strikes, etc., as well as other allowances paid on a regular basis. In the additional components are separately considered: the expenditure for overtime, other allowances not paid on a regular basis and arrears related to previous years for these components.

Furthermore, the Annual Account provides overall annual information on the employer's social contributions regarding fixed and additional wage components, the regional tax on productive activities, and the expenditures for the Socially Useful Workers and workers recruited with temporary contracts. Moreover, the number of payrolls paid each year is also provided, as well as the personnel working on the last day of the reference year. The Annual Account also contains many other variables which are not of interest to our study, such as the number of part-time employees, employees who started or finished working in the reference year, the geographical distribution by region of the employees and the education degrees of the employees. It is useful to remind, however, that the Annual Account does not provide any infra-annual information.

Starting from 2001, the data transmission from the public institutions to the GAD has been done by electronic means using the SICO information system. It mainly consists in a Web site of the GAD where the institutions reference persons can authenticate and fill in a set of forms containing information about personnel, wage elements and all the other data required by the GAD, which will be subsequently processed and published in the Annual Account.

The coverage of the Annual Account in terms of personnel at the last day of the reference year and in terms of wages and labour cost for the General Government employees is around

100%. As far as the coverage in terms of Nace Rev. 1.1 sectors is concerned, the Annual Account covers the whole of section L (which includes only public institutions) and the whole of the public institutions in sections K, M, N and O.

For the sake of clarity, in Table 3.1 we show, for the year 2000 Annual Account, the collective bargaining areas involved, the consistency in terms of personnel and the weight of the single bargaining areas in terms of personnel and fixed costs.

Table 3.1: Level of personnel and composition in terms of personnel and fixed costs by collective bargaining area – Annual Account 2000

Collective bargaining area	Personnel 31.12.2000	Personnel composition (%)	Fixed costs composition (%)
MINISTRIES	274,220	7.6	7.2
AUTONOMOUS COMPANIES	43,886	1.2	1.1
SCHOOL	1,130,541	31.2	30.8
POLICE CORPS	333,571	9.2	9.8
ARMED FORCES	248,768	6.9	4.7
MAGISTRACY	10,072	0.3	1.1
DIPLOMATIC CAREERS	960	0.0	0.1
PREFECTS CAREERS	1,617	0.0	0.1
NON ECONOMICAL PUBLIC INSTITUTIONS	65,672	1.8	1.8
UNIVERSITY	112,322	3.1	5.0
REGIONS AND LOCAL INSTITUTIONS	673,465	18.6	14.2
MUNICIPALITIES SECRETARIES	5,395	0.1	0.3
NATIONAL HEALTH SERVICE	704,010	19.4	23.1
RESEARCH INSTITUTIONS	18,547	0.5	0.7
GENERAL GOVERNMENT SECTOR	**3,623,046**	**100**	**100**

Among other things, it is used by the GAD to calculate the average per capita monthly amount of the expenditure variables. The Annual Account is made available every year with a delay of about 15-18 months after the end of the reference year. For example, the Annual Account 2003 is available since May 2005.

Due to its thorough information, the Annual Account is not only the natural candidate to represent the annual benchmark of quarterly estimates on total wage, labour cost and employment, but it is also useful to assess the quality of the infra-annual sources of information available.

In this study on the LCI construction in section M, it will be used to analyse how the School and University areas are covered by the infra-annual sources in terms of personnel and interest variables which allow to define the LCI. Moreover, it can be used to evaluate the quality of each interest variable. Indeed, if a variable is correctly recorded in each month, its annual amount should be close to that of the Annual Account.

3.2. Employees Payroll Database

The Employees Payroll Database (from now on, EPD) is the main administrative source currently available for the LCI construction in section M.

EPD data are monthly collected by the GAD through the transmission of information from various General Government IT systems responsible for payrolls management.

This archive covers a large share of all General Government Sector (around 1.6 million of units, which represent around 43% of all GGS) and, being based on payrolls, it provides detailed information on both the occupational status of each employee and his/her income.

The information on income includes: fixed wages components; allowances; recoveries; employer's social contributions; employee's social contributions. The additional wage components paid on an irregular basis (i.e., overtime expenditures) using different payrolls from those of the fixed wage components are excluded.

The income components collected are split into the elementary items. For example, in the case of the fixed expenditures, the amount of salary, year-end bonus, cost of living allowance, seniority wage, arrears related to the previous and the current year is specified.

Data on the occupational status of the employees allow to identify: the institution and the collective bargaining area to which they belong; their job position, the type of employment contract (open-ended or fixed-term), the working time regime (full-time or part-time) and so on.

The EPD data transmission to Istat is still at an initial stage. All the aspects related to it (transmission techniques, variables to be provided, level of breakdown, record layout, timeliness etc.) are still to be defined. They will be established in the next months within the framework of the agreement between Istat and GAD. Meanwhile, data are provided by means of experimental Excel files which contain the whole set of variables defining the employee income. Data are transmitted broken down by job position and not at an individual level.

3.2.1. Data quality problems

This section deals with the data quality problems of the EPD in terms of non sampling errors. The main problems concern:
- the under coverage of the General Government Sector;
- the variables coverage;
- the variables content;
- the classification of the economic activity.

The EPD data do not cover all the General Government Sector (GGS). GGS collective bargaining areas considered are: Ministries, Autonomous Companies, Universities, School, Magistracy, Prefects Career, Diplomatic Corps, Police Corps, Research institutes, Non-economic public institutions. Regions and Local Institutions, National Health Service and the Armed Forces areas, which represents around 45% of all the GGS, are excluded. Furthermore, the coverage of each area is not exhaustive and varies strongly depending on the area. With the exception of the Prefects Career where an over coverage is observed (see Table 3.2), Diplomatic Corps, School and Magistracy areas show a percentage of coverage over 90% (and equal to 100% in the first area). In particular, in the School area the short and occasional temporary teachers are not taken into account, since their expenditures are directly managed at local level by each school (see Prospect **3.1**). The Autonomous Companies, Police Corps and Ministries areas are significantly covered too. While the University, Non-economic public institutions and the Research institutes areas are almost not covered.

Table 3.2: Employees Payrolls Database coverage of the General Government Sector in terms of payrolls by collective bargaining area - year 2000

Collective bargaining area	Annual Account	Employees Payrolls Database	Coverage (%)
AUTONOMOUS COMPANIES	518,325	357,520	69.0
POLICE CORPS	4,016,449	2,580,616	64.3
RESEARCH INSTITUTIONS	221,986	28,305	12.8
MAGISTRACY	120,802	114,034	94.4
MINISTRIES	3,271,095	2,674,507	81.8
DIPLOMATIC CORPS	10,953	10,953	100
PREFECT CAREER	19,001	23,143	121.8
NON ECONOMIC PUBLIC INSTITUTIONS	759,648	3,918	0.5
SCHOOLS	12,933,928	12,400,214	95.9
UNIVERSITIES	1,342,774	345	0.0
ARMED FORCES	3,164,459	-	-
REGIONS AND LOCAL INSTITUTIONS	7,330,424	-	-
MUNICIPALITIES SECRETARIES	64,146	-	-
NATIONAL HEALTH SERVICE	8,350,332	-	-
GENERAL GOVERNMENT SECTOR	**42,124,322**	**18,193,555**	**43.2**

Note: since the 13th pay (year-end-bonus) is not paid in an additional payroll, the number of employees can be approximated by the annual amounts of payrolls divided by 12.

Also the coverage of the interest variables is not exhaustive with reference to the LCI Regulation requirements. The hours actually worked variable is not collected by the EPD. The only information provided in terms of labour input is the monthly number of payrolls, that is the number of employees who have received the salary in each month. Being included also the payrolls paid to employees temporarily absent from work (for example, for sick or maternity leave), the number of payrolls measures the actual number of employees. However, the greater the short-term variability of the employment (high turnover), the less accurate the approximation of employment with the number of payrolls.

EPD data allow to measure the other three variables requested by the LCI Regulation: total wage, employer's social contribution and labour cost. However, some differences arise between the LCI statistical concepts and definitions (as stated in the Regulation) and the variables deriving from the EPD. As it has already been mentioned, the EPD does not provide information on the additional wage components, such as overtime payments, which have to be included in the total wages (see Annex II to EC Regulation No 1726/1999). Moreover, as regards taxes paid and subsidies received by the employer, respectively to be added and subtracted to the employer's social contributions, they are not collected in the EPD due to the fact that these have no meaning for public institutions. Finally, total labour cost should also include the vocational training cost paid by the employer and other expenditures (recruitment costs and working clothes provided by the employer), which are also not recorded in the EPD. It is worth noting that amongst the missing information the additional wage components are the most significant, and these should be reconstructed using the annual benchmark (while the other missing information is not available even at an annual level). Therefore, it seems that EPD data may be used for the purpose of the LCI production.

Prospect 3.1 - Employees Payrolls Database coverage within each General Government Sector area

Ministries	Comprises management and graded staff (economic areas/positions) excluding civilian employees in the Ministry of Defence, UNEP staff (Uffici notifiche esecuzioni e protesti - Office for serving notice of protest for non-payment) and staff working in the Notary Archives Division (Ministry of Justice), staff in the Tax Consultation and Inspection Service (Ministry of Finance) and clerks in the State Auditors' Office.
School	Comprises directors, teachers and non-teaching staff with open-ended and closed-ended contracts (yearly and non-yearly) in Teachers' Training Colleges, high schools specialising in classical and scientific studies, technical colleges, nursery and infant schools, middle schools, conservatories and academies. Staff with closed-ended contracts are managed by the Treasury IT system since academic year '96 – '97, whereas teachers and other non-teaching staff who moved to the Autonomous Provinces of Trento and Bolzano were no longer taken into account in academic year '97 – '98 in compliance with the Legislative Decrees 433 and 434 of July 24th 1996. ATA (Auxiliary-Technical-Administrative) staff that were transferred to the State by Local Authorities were also included as of 2000 in compliance with Article 8, Law 124 of 3/5/99. Short and occasional temporary teaching jobs are excluded.
Autonomous companies	Comprises management and graded staff in the Fire Service and AIMA (since April 1997). AIMA (Azienda di Stato per gli interventi sul mercato agricolo - State Agency responsible for projects regarding the agricultural market) was purged and wound up in compliance with the Legislative Decree 165 of 27 May 1999 and replaced by AGEA (Agenzia per le erogazioni in agricoltura - Agency responsible for disbursements in agriculture) as of 16 October 2000 (Legislative Decree 188 of 15/6/2000).
Research institutes	Comprises management and graded staff in the National Health Service, Experimental Stations for Industry (reorganised in compliance with the Legislative Decree 540 of 29 October 1999) and Institutes for Experimentation in Agriculture.
Universities	Currently comprising solely staff in the Ministries of Defence, Public Education and Agricultural Policies with "University" contracts. However, integration with the University IT System (CINECA) is planned in agreement with the Ministry of Universities and Scientific Research. This integration will involve all management and graded staff in Universities (annual data have been acquired since 2000).
Non-economic institutions	Currently comprises solely employees from the former National Body of Cellulose and Paper.
Magistracy	Comprising staff in the ordinary Magistracy, the State Council and Regional Administrative Courts and the General State Bar.
Prefects career	Comprising management and graded staff following prefects career and a large number of staff from the Ministry of Justice, which receive the same remuneration (547 units in 2000, 550 units in 1999, 507 units in 1998, 355 units 1997 and 288 units in 1996). First class Prefects and Prefects are included as management of the Ministry of Internal Affairs ("Ministries" segment) since 1998.
Diplomatic corps	Comprising management and graded staff in the diplomatic corps.
Police corps	Comprising management and graded/ranked staff in the Tax Police Penitentiary Police and State Police.

The last quality problem we would like to focus our attention on, regards the classification of the economic activity. In the EPD no information is provided on the kind of economic activity of each employee. However, the information on the employee collective bargaining area is available, which allows to identify the main economic activity of each institutional unit. Following this approach we have defined the target population and, for example, attributed to section M all employees of the Ministry of Public Education covered by the School contract (see chapter 2). Even if the assumption on which this approach is based is reasonable, it has to be noted that nothing ensures that the whole of employees of a certain unit and area are devoted to the main economic activity of the unit. Considering the Ministry of Education, for example, there are two factors affecting the proposed assumption:

- employees belonging to the School area whose economic activity is not classified amongst those of section M (such as a share of the School administrative and technical staff);
- employees belonging to areas different from the School one whose economic activity is classified amongst those of section M (such as the nursery school teachers belonging to the Regions and Local Institutions area).

To achieve a better approximation and a more accurate definition of the target population, the information on the collective bargaining areas should be compared also to that on job positions. Furthermore, the activities relevant to each job position should be analysed in depth.

3.2.2. Check of the data quality: a comparison with the Annual Account benchmark data

In order to evaluate the quality of the EPD data, a comparison has been made with the benchmark data of the Annual Account on the interest variables.

It is worth noting that, with the exception of the additional wage components, the monthly and annual sources contain the same components of total wages and labour cost. Therefore, the discrepancies between the two sources can not be imputed to different definitions of the interest variables. The comparison has been made for the years 2000, 2002 and 2003. Data for the year 2001 have not yet been transmitted by the GAD due to the presence, up to now, of unsolvable IT problems, which strongly affect the reliability of the data.

In the first two tables, the analysis of the 2003 data broken down by job position is presented. The same analysis for the years 2000 and 2002 has already been carried out in the Intermediate Report.

Table 3.3 shows the comparison between the two sources on the number of employees, which has been derived in both sources from the annual amount of payrolls. These have been divided by the number of months so to produce an estimate of the average monthly employment. Both the composition and the total level of employees of the two sources are very similar (on average the percentage difference is equal to -0.6%). However, the overall difference is not significant due to the great heterogeneity amongst the job positions. The largest discrepancy is observed for temporary teachers who, as already mentioned, are not taken into account in the EPD archive due to the fact that their wages are mostly paid at local level, directly by the schools. The under-coverage of the temporary teachers, however, has a very small impact on the overall difference due to their weight. A significant undercoverage can also be observed for the fixed term teaching staff (-9%), who represents a fairly large share of the total employees (around 9%). These two main underestimates are balanced by the overcoverage of teaching and administrative staff with open ended contracts (whose weights are, respectively, 65% and 17%).

In terms of total wage components (Table 3.4), as expected, the largest differences arise in the allowances and additional components (on average –27%), since the EPD archive does not collect information on the additional expenditures paid on an irregular basis. The fixed wage

components are close to the benchmark data (on average the difference is –6%) and contribute to produce (due to their weight) most of the overall difference in terms of the total wage (-7,5%). The employer's social contributions have not been taken into account in this table due to the fact that these are provided by the benchmark source only at a macro level, by institutional unit.

The results just described for the year 2003, together with those for the years 2000 and 2002, show that the EPD data have significant quality problems, which especially arise when the analysis is carried out at a broken down level (both with reference to an analysis by job position and by wage component).

Table 3.3: Number and composition of employees by job position: Employees Payrolls Database vs Annual Account – Ministry of Education 2003

Job position	Annual Account		Employees Payrolls Database		Difference (%)
	Absolute frequency	Percentage frequency	Absolute frequency	Percentage frequency	
MANAGERS	8,154	0.7	8,525	0.8	4.5
OPEN-ENDED TEACHING STAFF	713,650	63.9	719,749	64.9	0.9
OPEN-ENDED ADMINISTRATIVE AND TECHNICAL STAFF	182,920	16.4	185,733	16.7	1.5
RELIGION TEACHING STAFF	24,093	2.2	23,591	2.1	-2.1
FIXED-TERM TEACHING STAFF	110,773	9.9	100,901	9.1	-8.9
FIXED-TERM ADMINISTRATIVE AND TECHNICAL STAFF	70,432	6.3	69,395	6.3	-1.5
TEMPORARY TEACHERS	6,144	0.6	1,896	0.2	-69.1
MINISTRY OF EDUCATION	**1,116,166**	**100**	**1,109,789**	**100**	**-0.6**

Table 3.4: Per capita total wage and its components by job position: Employees Payrolls Database vs Annual Account – Ministry of Education 2003

Job position	Fixed wages components			Allowances and additional wage components			Total wages		
	Annual Account (euros)	Employees Payrolls Database (euros)	Difference (%)	Annual Account (euros)	Employees Payrolls Database (euros)	Difference (%)	Annual Account (euros)	Employees Payrolls Database (euros)	Difference (%)
MANAGERS	3,324	3,319	-0.1	1,164	1,160	-0.3	4,488	4,480	-0.2
OPEN-ENDED TEACHING STAFF	2,125	2,021	-4.9	258	200	-22.3	2,383	2,221	-6.8
OPEN-ENDED ADMINISTRATIVE AND TECHNICAL STAFF	1,692	1,463	-13.5	104	4	-96.3	1,796	1,467	-18.3
RELIGION TEACHING STAFF	1,728	1,622	-6.1	150	151	0.4	1,878	1,773	-5.6
FIXED-TERM TEACHING STAFF	2,940	2,767	-5.9	308	268	-13.1	3,248	3,035	-6.6
FIXED-TERM ADMINISTRATIVE AND TECHNICAL STAFF	2,309	2,214	-4.1	53	1	-98.8	2,363	2,214	-6.3
TEMPORARY TEACHERS	616	1,162	88.7	28	100	252.8	644	1,263	95.9
MINISTRY OF EDUCATION	**1,919**	**1,814**	**-5.5**	**210**	**154**	**-26.5**	**2,129**	**1,969**	**-7.5**

In the following, in order to provide an overview of the EPD data, we focus on the time series of the interest variables, which will be considered only at a macro level.

In the two last years the differences between the annual and the monthly sources are smaller than those observed in the year 2000 (Table 3.5). This is not true for total labour cost,

due to the impact of employer's social contributions, which are heavily overestimated in the year 2000 and underestimated in 2002 and 2003. Hence, the latter variable in 2000 partially balances and in 2002 and 2003 worsens the underestimate of total wages. Furthermore, in the last two years the differences between the two sources are quite similar (the spread between the two differences is around one percentage point for the total wage, two points and a half for the employer's social contributions and only 0.1 for the labour cost).

The abovementioned evidence seems to show that, despite the limits of the analysis due to the very short series considered, in the last years the quality of the EPD data has been improving. Moreover they seem to be affected by a systematic error.

The impact of this error is partly balanced when the annual change is considered. As shown in Table 3.6, the EPD source gives somehow more reliable information on the annual trend (2003-2002) of the interest variables. However, if the changes are measured on more than one year, respectively on two and three years, the spread between the two sources significantly increases. This is due to the fact that the EPD changes are affected not only by the actual trend of the interest variables but also by the different quality of this archive in the years compared. As just mentioned, starting from the 2002 the EPD archive seems to show some improvements in terms of data quality.

Table 3.5: Per capita labour cost and its components: Employees Payrolls Database vs Annual Account – Ministry of Education, years 2000, 2002 and 2003

	Annual Account (euros)			Employees Payrolls Database (euros)			Difference (%)		
	2000	**2002**	**2003**	**2000**	**2002**	**2003**	**2000**	**2002**	**2003**
Number of employees	1,073,745	1,095,784	1,116,166	1,033,324	1,100,342	1,109,790	-3.8	0.4	-0.6
Total wages	**1,921**	**2,012**	**2,129**	**1,681**	**1,879**	**1,969**	**-12.5**	**-6.6**	**-7.5**
Employer's social contributions	**545**	**577**	**640**	**649**	**519**	**592**	**19.0**	**-10.1**	**-7.5**
Contributive rate	28	28.7	30.1	38.6	27.6	30.1			
Labour cost	**2,467**	**2,590**	**2,769**	**2,330**	**2,398**	**2,561**	**-5.5**	**-7.4**	**-7.5**

Table 3.6: Percentage annual changes of the per capita labour cost components: Employees Payrolls Database vs Annual Account – Ministry of Education

	Annual Account (a)			Employees Payrolls Database (b)			Difference (b-a)		
	2003 / 2000	**2002 / 2000**	**2003 / 2002**	**2003 / 2000**	**2002 / 2000**	**2003 / 2002**	**2003 / 2000**	**2002 / 2000**	**2003 / 2002**
Number of payrolls	4.0	2.1	1.9	7.4	6.5	0.9	3.4	4.4	-1.0
Total wages	10.8	4.7	5.8	17.1	11.7	4.8	6.3	7.0	-1.0
Employer's social contributions	17.5	5.9	10.9	-8.7	-20.0	14.1	-26.2	-25.9	3.1
Contributive rate	6.0	1.1	4.9	-22.1	-28.4	8.9	-28.1	-29.5	4.0
Labour cost	**12.3**	**5.0**	**6.9**	**9.9**	**2.9**	**6.8**	**-2.4**	**-2.1**	**-0.1**

3.2.3. *The monthly profile of the interest variables*

To conclude the overview on the EPD data, the analysis has been extended to examining the monthly evolution of the interest variables. In this case, no benchmark data are available since the only infra annual information is that provided by the quarterly National Accounts concerning section M as a whole. Therefore, in section 4.1 below, the National Accounts estimates will be used as a benchmark for our results on section M, which derive from a combination of the EPD and CINECA data.

As shown in Figures 3.1-3.4 the monthly evolution of the level of employment in the year 2000 (thicker and continuous line), with the exception of the month-to-month changes of July and November (respectively -7% and –5%), is more stable than that in the other two years.

In the year 2002 a decrease (of around one third) can be observed in the month of June, which depends on the fact that the payrolls of the primary school teachers have not been uploaded in the EPD archive. This problem has been temporarily corrected applying the month-to-month change of June observed in the year 2000 to the level of employment of May 2002. The annual data presented in the previous results already include this correction.

The 2003 monthly data show a decrease in the month of July (around 8%), similar to that of the years 2000 and 2002 (corrected data). This should be related to the fact that the school year ends in early June and, as a consequence, a share of fixed term contracts for teaching and administrative staff end. Moreover, in the same year, a significant increase (around 10%) shows in the month of August. This is due to the fact that in this month the new contract for the School collective bargaining area has been signed, which has implied the payments of arrears of the years 2002 and 2003. Therefore, the number of payrolls of the month of August includes also the payrolls paid to staff not working anymore but receiving arrears.

The effects of the new contract show also in Figures 3.2-3.4

The annual and monthly analysis have highlighted the quality problems of the EPD data to be faced and solved in order to use these source for the LCI purposes. To this end Istat has just signed a partnership agreement with the GAD, which manages this archive. Even if it takes up time to achieve a consolidated and full integration, the cooperation between the two institutions has been significantly improved. Thus, from our point of view, there is a good chance of improving the quality and usability of the EPD for the LCI purpose. But, there is a trade-off between accuracy and timeliness: better results from the EPD could require at least one or two years.

Figure 3.1: Number of employees from the Employees Payrolls Database – monthly data on Ministry of Education 2003

Figure 3.2: Per capita total wages from the Employees Payrolls Database - monthly data on Ministry of Education 2003 *(euros)*

——— 2000   ——— 2002   ·········· 2002 corrected data   ——■— 2003

Figure 3.3: Per capita employer's social contribution from the Employees Payrolls Database - monthly data on Ministry of Education 2003 *(euros)*
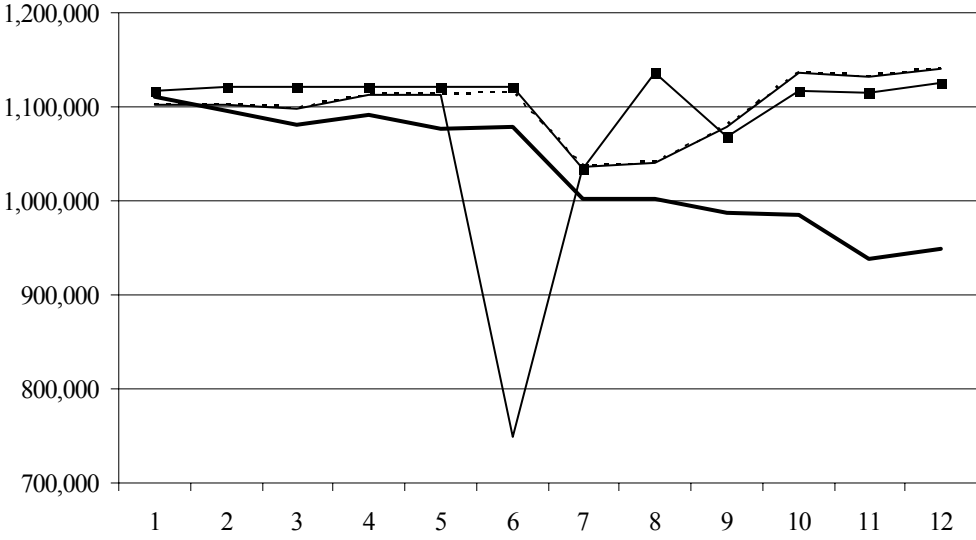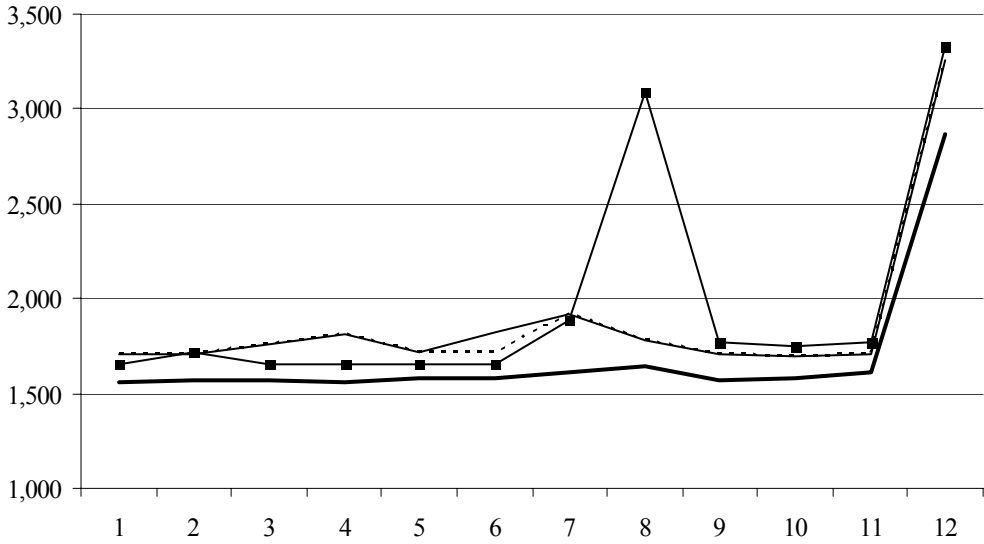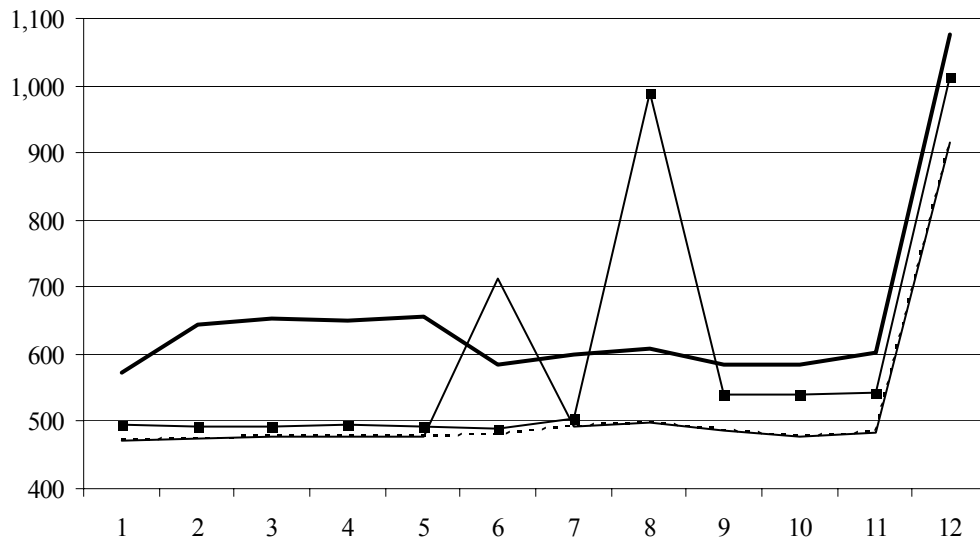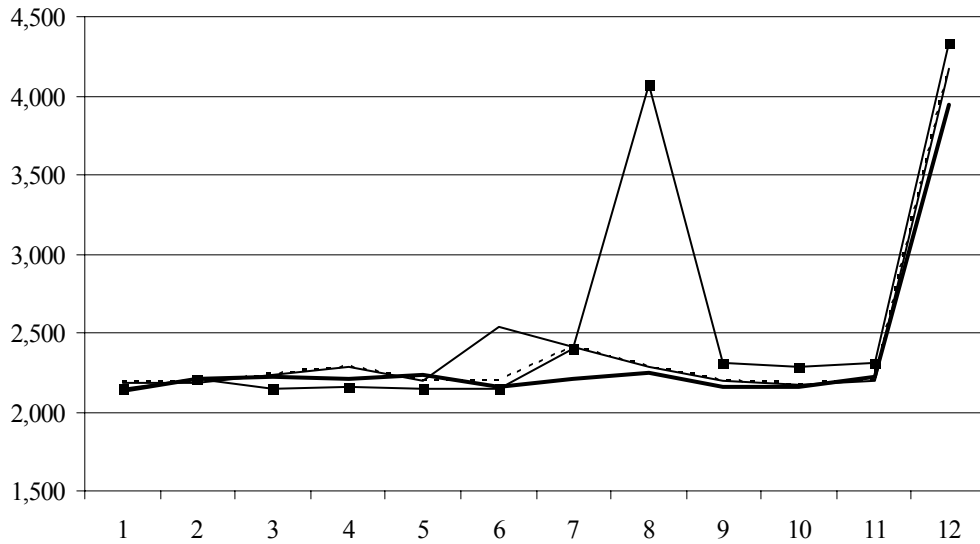

Figure 3.4: Per capita labour cost from the Employees Payrolls Database - monthly data on Ministry of Education 2003 *(euros)*

2000   2002   2002 corrected data   2003

3.3. CINECA data for Universities

CINECA, established in 1969 by the Ministry of Education, University and Research as a consortium of Universities, is the Interuniversity Consortium of North Eastern Italy for Automatic Calculation, composed of 24 Italian universities: Bari, Bologna, Camerino, Catania, Ferrara, Firenze, Insubria, Macerata, Messina, Milano Bicocca, Modena e Reggio Emilia, Padova, Parma, Pavia, Pisa, Politecnico di Bari, Politecnica delle Marche (Ancona), Salerno, Siena, Trento, Trieste, Udine, Urbino, Venezia, Verona and the National Research Council (CNR in Italian). It works under the supervision of the Ministry of Education, University and Research (MIUR in Italian), and today is the largest Italian centre of calculus.

The Consortium activities cover various aspects of the Information and Communication Technology. They can be divided in two large categories, one concerning the institutional organizations and the other, more general, related to the services linked to the technological transfer in scientific computing for the public and private academic research.

In particular, its institutional role comprises the realization of managerial systems and services to support the universities and the MIUR.

The systems developed by CINECA for the University administrations include the management of the careers and the wages of the universities staff, and the integrated financial and economic accounting.

For MIUR, CINECA realizes complex information systems which allow the interaction between the various offices of the Ministry, its advising organs and the national academic system. The objective of these systems is to support the decentralization of the activities, guaranteeing, however, the maintenance of the highest standards of quality in all the phases of the process.

The core of the ministerial information system manages the national archives of the teaching staff and of the researchers working in the Italian Universities.

Among the managerial services implemented by CINECA, the most relevant to our study is called Careers and Wages of the Universities (CSA in Italian). The information system for the management of Careers and Wages of University started in 1990 and provides the legal and economic management of the university staff. The CSA is composed of two basic forms: one for the management of the legal data of the staff, and the other for the economic elaborations of wages and of fiscal certifications.

Data are requested monthly to the single university and the information is supplied with the minimal level of aggregation, corresponding to the job position. The CSA involves 60 Italian universities and 14 astronomical observatories for a total of 1,709,896 payrolls. Data are collected through a computerized procedure that allows the universities to transmit the data directly to a purposely dedicated web site, http://dalia.cineca.it. The database Dalia/CINECA, updated monthly by the Universities, contains the amount of expenditures for the staff and the distribution of the job positions.

The data transmitted by the universities are of a legal and of an economic nature, and refer both to the staff with a fixed-term and with an open-ended contract.

The information in the economic payroll section comprises: fixed wage, possibly comprising allowances and additional payments when paid in the same payrolls and with funds drawn from the same budget; allowances and additional components paid using different payrolls from those used for fixed wage components, various withholding taxes, with the exception of trade union, social security and revenue deductions, which are recorded in the other sections.

As far as the coverage in terms of wage components is concerned, the CINECA source includes all total wage fixed components, arrears and the additional components settled with the same payroll of the fixed ones.

The information in the legal payroll section comprises: all the legal information (taxpayer identification number, denomination, address) of the institution which transmit the data and also the legal information of the single employee of the institution (collective bargaining area, type of contract of employment, job position).

3.3.1. *Check of the data quality: a comparison with the Annual Account benchmark*

In Table 3.7 the average monthly amount of employees of CINECA and of the Annual Account for 2003 are compared separately for each university. Upon examination of the data, it can be noticed that CINECA data overcover those of the Annual Account. As a whole, the average monthly amount of payrolls[4] in the Annual Account is 109,939 while for CINECA is 142,491 with an overestimate by CINECA of 29.6%. This difference is found even if the number of universities taken into consideration by the two sources is the same.

In Table 3.8 one can observe that the overcoverage is due to the fact that CINECA data include some job positions (social useful workers, *lettori di scambio*, staff with unclassified job positions, staff with temporary contracts) not found in the Annual Account. Excluding from CINECA the job positions not present in the Annual Account, the comparison between the two sources for each university notably improves. Referring to per capita variables, the percentage differences on the per capita fixed and additional wage components decrease by about 10 percentage points, while the difference on per capita allowances decreases by about 15 points.

In Table 3.9 for 2002 and 2003, the Annual Account and CINECA data are compared. Our analysis is quite limited because we have not at our disposal a long series of data, indeed only two years.

Furthermore, the variables examined, are considered in an aggregate form, as far as the job positions and the expenditure items are concerned. In particular, for 2002 the difference between the Annual Account and CINECA in the number of employees is 5.4% and in 2003 is 6.5%; for the economic variables the differences are almost unchanged between 2002 and 2003 (about 5-6 %), except for the employer's social contributions whose difference, while retaining the same order of magnitude, changes sign.

To summarize, the comparison on the percentage changes highlights that the error, which seems to be systematic in the two years compared (same order of magnitude and same sign, with one exception), could probably be considered of a structural nature.

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[4] The average monthly amount of taxpayers identification numbers has been obtained dividing by 12 the annual amount. The values obtained represent a proxy of the employees.

Table 3.7: Number and composition of employees by University: CINECA vs Annual Account – year 2003

University	Annual Account		CINECA		Difference (%)
	Absolute frequency	Percentage frequency	Absolute frequency	Percentage frequency	
SCUOLA INTERNAZIONALE SUPERIORE DI STUDI AVANZATI	117	0.1	359	0.3	207.2
UNIVERSITA' DEGLI STUDI DI UDINE	1,093	1.0	2,203	1.5	101.6
UNIVERSITA' DEGLI STUDI DI BERGAMO	315	0.3	608	0.4	92.8
UNIVERSITA' DEGLI STUDI DEL PIEMONTE ORIENTALE -AMEDEO AVOGADRO-	547	0.5	135	0.1	-75.4
UNIVERSITA' DEGLI STUDI DI PADOVA	3,950	3.6	6,982	4.9	76.8
UNIVERSITA' DEGLI STUDI DI VERONA	1,084	1.0	1,899	1.3	75.2
POLITECNICO DI TORINO	1,385	1.3	2,385	1.7	72.2
UNIVERSITA' DEGLI STUDI DI FOGGIA	468	0.4	799	0.6	70.9
SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO 'S. ANNA' - PISA	145	0.1	246	0.2	68.8
UNIVERSITA' DEGLI STUDI DI LECCE	1,146	1.0	1,866	1.3	62.9
UNIVERSITA' DEGLI STUDI DI FERRARA	1,180	1.1	1,914	1.3	62.3
SCUOLA NORMALE SUPERIORE DI PISA	293	0.3	467	0.3	59.6
UNIVERSITA' ITALIANA PER STRANIERI DI PERUGIA	216	0.2	339	0.2	56.9
UNIVERSITA' AGLI STUDI DI MILANO - BICOCCA	1,045	1.0	1,608	1.1	53.9
UNIVERSITA' DEGLI STUDI DI PAVIA	2,068	1.9	3,130	2.2	51.4
UNIVERSITA' DEGLI STUDI DI MODENA	1,260	1.1	1,903	1.3	51.0
UNIVERSITA' DEGLI STUDI DEL MOLISE IN CAMPOBASSO	386	0.4	579	0.4	50.3
UNIVERSITA' DEGLI STUDI DI COSENZA	1,343	1.2	1,956	1.4	45.6
UNIVERSITA' DEGLI STUDI DI POTENZA	597	0.5	860	0.6	44.2
UNIVERSITA' IUAV DI VENEZIA	492	0.4	3,150	2.2	540.7
UNIVERSITA' DEGLI STUDI DI BARI	3,734	3.4	5,331	3.7	42.8
TERZA UNIVERSITA' DI ROMA	1,285	1.2	1,832	1.3	42.5
UNIVERSITA' DEGLI STUDI DI TORINO	3,633	3.3	5,144	3.6	41.6
UNIVERSITA' DEGLI STUDI DI MILANO	4,250	3.9	6,003	4.2	41.2
UNIVERSITA' DEGLI STUDI DI GENOVA	2,969	2.7	4,187	2.9	41.0
UNIVERSITA' PER STRANIERI DI SIENA	132	0.1	184	0.1	39.3
UNIVERSITA' DEGLI STUDI DI PERUGIA	2,471	2.2	3,427	2.4	38.7
UNIVERSITA' DEGLI STUDI DI TERAMO	373	0.3	515	0.4	38.2
UNIVERSITA' DEGLI STUDI DI CAGLIARI	2,364	2.2	3,258	2.3	37.8
UNIVERSITA' DEGLI STUDI DI VENEZIA	1,054	1.0	1,443	1.0	36.9
UNIVERSITA' DEGLI STUDI DI BRESCIA	848	0.8	1,157	0.8	36.5
POLITECNICO DI MILANO	1,999	1.8	2,674	1.9	33.7
UNIVERSITA' DEGLI STUDI DI CATANIA	2,981	2.7	3,982	2.8	33.6
UNIVERSITA' DEGLI STUDI DI CAMERINO	595	0.5	781	0.5	31.2
UNIVERSITA' DEGLI STUDI 'G. D'ANNUNZIO' DI CHIETI	983	0.9	1,276	0.9	29.8
UNIVERSITA' POLITECNICA DELLE MARCHE	1,009	0.9	1,309	0.9	29.7
UNIVERSITA' DEGLI STUDI DI INSUBRIA - VARESE	501	0.5	447	0.3	-10.8
UNIVERSITA' DEGLI STUDI DI MESSINA	3,537	3.2	4,435	3.1	25.4
POLITECNICO DI BARI	678	0.6	840	0.6	24.0
UNIVERSITA' DEGLI STUDI DI PARMA	2,060	1.9	2,548	1.8	23.7
UNIVERSITA' DEGLI STUDI DI TRIESTE	1,930	1.8	2,344	1.6	21.4
UNIVERSITA' DEGLI STUDI DI TRENTO	915	0.8	1,111	0.8	21.4
UNIVERSITA' DEGLI STUDI DI NAPOLI L'ORIENTALE	604	0.5	705	0.5	16.8
UNIVERSITA' DEGLI STUDI DI PISA	3,589	3.3	4,340	3.0	20.9
UNIVERSITA' DEGLI STUDI DI ROMA 'LA SAPIENZA'	10,181	9.3	12,265	8.6	20.5
UNIVERSITA' DEGLI STUDI DI NAPOLI PARTHENOPE	371	0.3	1,014	0.7	173.1
UNIVERSITA' DEGLI STUDI DI SASSARI	1,280	1.2	1,496	1.0	16.8
UNIVERSITA' DEGLI STUDI DI CASSINO	623	0.6	717	0.5	15.0
UNIVERSITA' DEGLI STUDI DI SIENA	1,867	1.7	2,143	1.5	14.8
UNIVERSITA' DEGLI STUDI DI VITERBO	623	0.6	708	0.5	13.7
UNIVERSITA' DEGLI STUDI DEL SANNIO	252	0.2	285	0.2	12.7
UNIVERSITA' DEGLI STUDI DI PALERMO	4,445	4.0	4,993	3.5	12.3
UNIVERSITA' DEGLI STUDI DI L'AQUILA	1,126	1.0	1,251	0.9	11.2
UNIVERSITA' DEGLI STUDI DI BOLOGNA	5,592	5.1	6,149	4.3	10.0
UNIVERSITA' DEGLI STUDI DI FIRENZE	3,953	3.6	4,317	3.0	9.2
UNIVERSITA' DEGLI STUDI DI CATANZARO 'MAGNA GRAECIA'	307	0.3	335	0.2	8.9
UNIVERSITA' DEGLI STUDI DI REGGIO CALABRIA	467	0.4	504	0.4	7.9
SECONDA UNIVERSITA' DEGLI STUDI DI NAPOLI	2,951	2.7	730	0.5	-75.2
UNIVERSITA' DEGLI STUDI DI MACERATA	393	0.4	418	0.3	6.2
UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II	7,735	7.0	7,929	5.6	2.5
ISTITUTO UNIVERSITARIO SCIENZE MOTORIE	132	0.1	640	0.4	385.1
UNIVERSITA' DEGLI STUDI DI ROMA 2 - TOR VERGATA	2,123	1.9	2,125	1.5	0.1
UNIVERSITA' DEGLI STUDI DI SALERNO	1,897	1.7	1,812	1.3	-4.5
TOTAL	**109,939**	**100**	**142,491**	**100**	**29.6**

Table 3.8: Per capita labour cost and its components by job position: CINECA vs Annual Account – University area 2003

Job position	Fixed wages components			Allowances			Additional wage components			Per capita labour cost		
	Annual Account	CINECA	Difference (%)	Annual Account	CINECA	Difference (%)	Annual Account	CINECA	Difference (%)	Annual Account	CINECA	Difference (%)
PROFESSORS AND RESEARCHERS	**3,629**	**3,595**	**-0.9**	**1,048**	**1,033**	**-1.4**	**183**	**197**	**7.3**	**4,860**	**4,825**	**-0.7**
PROFESSORS	4,259	4,237	-0.5	1,214	1,179	-2.9	199	223	11.8	5,673	5,639	-0.6
RESEARCHERS	2,563	2,513	-2.0	766	787	2.8	156	152	-2.6	3,485	3,452	-1.0
MANAGERS	**9,958**	**9,686**	**-2.7**	**1,745**	**1,532**	**-12.2**	**292**	**246**	**-15.6**	**11,995**	**11,464**	**-4.4**
SENIOR MANAGERS	**3,896**	**4,071**	**4.5**	**2,415**	**2,715**	**12.4**	**306**	**196**	**-36.0**	**6,617**	**6,982**	**5.5**
PERS. RUOLO AD ESAURIMENTO	**7,632**	**0**	**-100.0**	**4,279**	**0**	**-100.0**	**709**	**0**	**-100.0**	**12,619**	**0**	**-100.0**
HIGH PROFESSIONALISM CATEGORIES	**2,279**	**2,023**	**-11.2**	**1,319**	**1,222**	**-7.3**	**171**	**142**	**-16.7**	**3,769**	**3,388**	**-10.1**
NON MANAGER STAFF	**1,634**	**1,472**	**-9.9**	**324**	**347**	**7.1**	**146**	**112**	**-23.0**	**2,104**	**1,931**	**-8.2**
PART TIME PROFESSORS	1,171	1,037	-11.4	35	42	19.9	134	40	-70.1	1,340	1,119	-16.5
D PROFESSIONAL CATEGORIES	1,882	1,675	-11.0	464	478	3.2	197	149	-24.2	2,543	2,303	-9.4
C PROFESSIONAL CATEGORIES	1,598	1,435	-10.2	304	331	9.0	131	103	-21.3	2,033	1,870	-8.0
B PROFESSIONAL CATEGORIES	1,441	1,326	-8.0	214	229	7.3	124	92	-25.6	1,779	1,648	-7.4
TEMPORARY EMPLOYEES	**2,077**	**502**	**-75.8**	**6**	**482**	**8,123.6**	**154**	**23**	**-85.2**	**2,238**	**1,006**	**-55.0**
EMPLOYEES WORKING UNDER CONTRACT	2,626	492	-81.2	2	485	23,786.7	71	22	-68.5	2,698	999	-63.0
MEMBERS OF THE STAFF	1,767	1,564	-11.5	8	143	1,682.2	202	95	-53.1	1,977	1,802	-8.9
SOCIAL USEFUL WORKERS		1,646			290			160			2,096	
LETTORI DI SCAMBIO		2,995			0			0			2,995	
STAFF WITH UNKNOW QUALIFICATION		1,382			87			45			1,514	
FIXED TERM STAFF		492			485			22			999	
UNIVERSITY	**2,672**	**2,218**	**-17.0**	**713**	**604**	**-15.2**	**166**	**132**	**-20.7**	**3,550**	**2,953**	**-16.8**
UNIVERSITY (without the job position not present in the Annual Account)	**2,672**	**2,464**	**-7.8**	**713**	**710**	**-0.4**	**166**	**149**	**-10.1**	**3,550**	**3,323**	**-6.4**

Table 3.9: Per capita labour cost and its components: CINECA vs Annual Account – University area, years 2002 and 2003

	Annual Account		CINECA		Difference (%)	
	2002	**2003**	**2002**	**2003**	**2002**	**2003**
Number of employees	110,083	109,939	116,068	117,055	5.4	6.5
Total wages	**3,408**	**3,550**	**3,239**	**3,323**	**-4.9**	**-6.4**
Employer's social contributions	1,043	1,031	996	1,075	-4.4	4.3
Contributive rate	30.6	29.0	30.8	32.3		
Labour cost	**4,451**	**4,581**	**4,236**	**4,398**	**-4.8**	**-4.0**

In Table 3.10 the annual changes of the Annual Account and the CINECA between 2002 and 2003 are presented. The comparison shows that for all variables, except the per capita employee's social contributions, variations are quite acceptable, even after taking into account the problems of the CINECA source. Indeed, there is a difference of around one or two percentage points between the annual changes implicit in the two sources, except for the employer's social contributions for which the difference is around nine percentage points.

Table 3.10: Percentage annual changes 2003-2002 of the per capita labour cost components: CINECA vs Annual Account – University area

	Annual Account (a)	CINECA (b)	Difference (b-a)
Number of employees	-0.1	0.9	1.0
Total wages	4.2	2.6	-1.6
Employer's social contributions	-1.2	7.9	9.1
Labour cost	**2.9**	**5.1**	**2.2**

To complete the analysis of CINECA data, we have compared the monthly profile of the interest variables in the two years available.

As shown in Figures 3.5-3.8, in both years the dynamics of the interest variables is quite similar. The only peculiar feature is a strong peak recorded in the month of July 2002 and 2003 for the two labour cost components. It is possible to explain this difference with the payments from the universities to employees of a summer bonus, which also affects the amount of employer's social contributions.

These preliminary results show that the quality of CINECA data is quite satisfactory. There still remain some open problems, which we think will be solved when a stronger collaboration will be realised. Indeed, in the last months we have just been able to launch such cooperation and obtain the first data on which to perform this preliminary analysis.

Figure 3.5: Number of employees from CINECA database– monthly data on Universities 2003
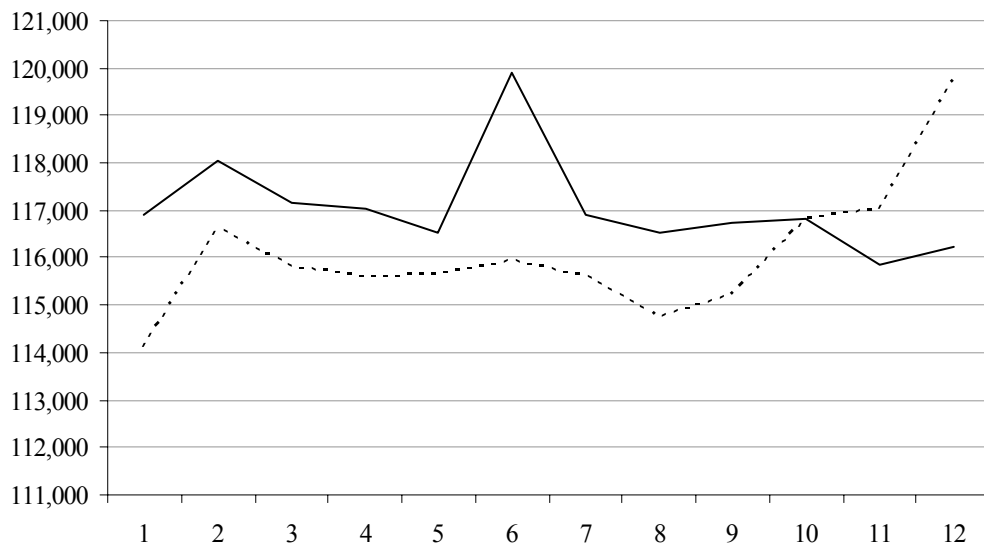
Figure 3.6: Per capita total wages from CINECA database - monthly data on Universities 2003
(euros)

- - - - - 2002   ———— 2003

Figure 3.7: Per capita employer's social contribution from CINECA database - monthly data on Universities 2003 *(euros)*

Figure 3.8: Per capita labour cost from CINECA database - monthly data on Universities 2003 *(euros)*
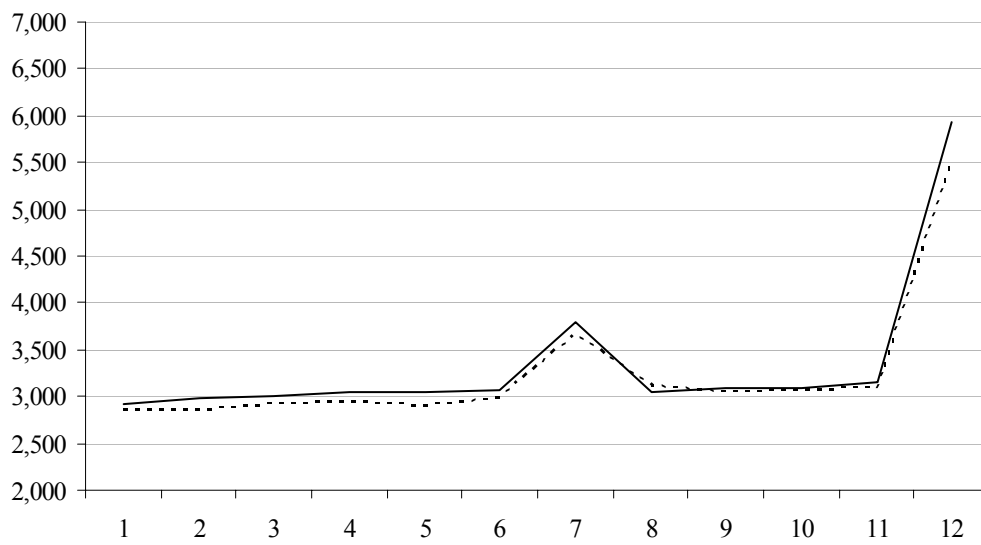
· · · · · 2002   ——— 2003

4. QUARTERLY NATIONAL ACCOUNTS ESTIMATIONS: A GENERAL LOOK AT THE METHODOLOGY

Istat has a long tradition in producing quarterly National Accounts aggregates which are estimated since the mid '80s. At the moment, quarterly estimations for employment (in full-time equivalents), total wages and compensation of employees are produced for six aggregate economic activities with a delay of seventy days after the end of the reference quarter. An aggregate estimation is produced for sections L, M, N and O altogether. Some experimental estimates for the four separate sections are nonetheless available. In the present and the next paragraph we discuss the provisional methodology used to produce the section M estimate. In particular, in this paragraph a general presentation of the benchmarking and annual-to-quarterly temporal disaggregation procedure used by Istat is given.

National Accounts quarterly aggregates are estimated mainly by means of mathematical and/or statistical methods, which use additional information called *reference indicators* (for example, a proxy of the interest variable observed at a quarterly level).

These methods are divided into two sub-sets, depending on the number of stages required to carry out the quarterly estimates and comply with the annual constraints[5]: optimal methods when just one stage is involved and methods of adjustment when they are two. Methods producing quarterly estimates using only the annual constraints are used when additional information is not available.

Istat has chosen the Chow and Lin (Chow and Lin, 1971) optimal method in the Italian version of Barbone, Bodo and Visco (BBV, 1981) when reference indicators are available, otherwise - although rarely - the Denton method is used.

Before applying the BBV procedure an annual preliminary statistical analysis of the data is carried out, in order to assess their ability to explain the phenomenon under analysis. Moreover, the seasonality is studied using the Tramo-Seats package.

The preliminary analysis suggested by the BBV is based on the assumption that there is a linear relationship between the series to be interpolated from annual to quarterly (indicated) and the quarterly series (indicator) and that this relation also applies to the annual level. The preliminary analysis involves two stages: a first stage in which the annual graph of the ratio between indicated and indicator is studied in order to discover any anomalies. A second stage in which the parameters of an annual linear regression model, with the indicated as the dependent variable, are estimated and tests are carried out to verify the data fitting goodness of the model. When the results of the tests are satisfactory and the indicator succeeds in explaining the trend of the annual data, it is assumed that this indicator can also approximate the quarterly series to be estimated.

4.1. Total wages, contributions and compensation of employees quarterly estimations

Quarterly National Accounts estimates of total wages and compensation of employees in sections L-O are still based on an experimental approach, which produces provisional results. In particular, the reference indicators used for sections L-O quarterly estimates derive from the quarterly estimates of the GGS, which are obtained by adding Central and Local Government estimates (see Prospect 4.1).

More specifically, estimates regarding the State (excluding the Armed Forces and Police Corps) are used as an approximation for the Central Government ones, whereas estimates for Regions, Municipalities and Provinces, Universities, National Health Services (Local Health

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[5] The annual constraints are based on the annual National Accounts estimates.

Units, Hospitals and Scientific Admission and Care Institutes) approximate those for Local government.

As far as the State quarterly total wages are concerned, the EPD data are considered to construct the reference indicator, which is obtained by multiplying per capita total wages by the total number of State employees. Per capita total wages are obtained from the ratio between the total amount of wages paid to State employees and the number of payrolls, whereas total employment is obtained from annual data using a mathematical procedure (Denton method of interpolation). The reference indicator used for actual social contributions is obtained by applying the tax rates in force to quarterly total wages estimates, whereas the "expenditures for retired employees", resulting from the Quarterly Report on Cash Flows (QRCF), also produced by GAD, are used as reference indicator for imputed contributions. The State quarterly compensation of employees is obtained by adding quarterly estimates for total wages to both actual and imputed social contributions.

It is worthwhile noting that the EPD data used to construct the reference indicator slightly differ from those showed in section 3.2. In particular, these are provided as an aggregate for the State as a whole without considering the breakdown by collective bargaining areas and job positions.

Local government estimates are obtained separately for Regions, Municipalities and Provinces, Universities and Health units. The reference indicator for the quarterly compensation of employees is based on data from the QRCF, with the exception of the Health units whose reference indicator is based on data provided by the Ministry of Health. Quarterly estimates for social contributions are obtained by applying the implicit annual rate of contribution (that is, the ratio between social contributions and total wages) to the previous estimates of compensation of employees.

The last step of the procedure consists in distributing the total wages and compensation of employees of the GGS as a whole amongst the economic activity sections L-O. To this aim, the GGS per capita estimates are multiplied by the quarterly employment of each section and then used as a reference indicators. For section N the estimates of Local Health units and Hospitals are used while for L, M and O those of the GGS excluding the just mentioned institutions.

4.2.   Open issues in experimental estimations

As it has already been mentioned, the method adopted by National Accounts to produce quarterly estimates is still at an experimental stage. Different problems have to be faced and solved in order to improve the accuracy of the estimates.

In particular, one of the main shortcoming of the procedure is represented by the breakdown by section. The approach just described implies that for the three sections L, M and O, the reference indicators of the two interest variables take into account the wage dynamics of the State as a whole and of the Local government excluding Health units (that is, Regions, Municipalities, Provinces, and Universities). Therefore, the infra-annual indicators used do not strictly reflect the wage dynamics of the institutions classified into each economic section. For example, considering section M, the infra-annual indicators reflect the wage dynamics not only of the Ministry of Education and Universities, which are the institutions mainly involved in this section, but also of other institutions (all the other units of the State and Regions, Municipalities and Provinces), whose main economic activities is not classified amongst those of section M. This does not hold for section N, where only the wage dynamics of the Local Health units and Hospitals (which mainly belong to this section) is taken into account in order to produce the reference indicator.

Some problems also arise in the breakdown of the estimates by institutional sector (Enterprises, GGS and Non-profit Institutions Serving Households) within each section.

In sections L and M, reference indicators (and so final estimates) of the two interest variables separately for the abovementioned institutional sectors are not available. Even if the level of the final estimates takes into account all the three sectors thanks to the presence of annual constraints (the annual National Accounts estimates), the infra-annual dynamics of the final estimates only reflects the GGS dynamics since reference indicators are available only for this sector. In sections N and O joint estimates involve GGS and Non-profit Institutions Serving Households. As a consequence, reference indicators and final estimates separately for the private sector are also available.

Prospect 4.1 - National Accounts quarterly estimation method for sections L-O total wages and compensation of employees

Series to be estimated	Reference indicators	Source of the reference indicators	Registration criterion	Estimation method
CENTRAL GOVERNMENT **State (excluding Armed Forces and Police Corps)**				
Quarterly total wages (a)	per capita quarterly total wages x total employees	Employees Payroll Database	Accrual	BBV
Actual quarterly contributions (b)	tax rates in force x (a)	Internal	Accrual	BBV
Imputed quarterly contributions (c)	"expenditures for retired employees"	Quarterly Report on Cash Flows	Cash	BBV
Quarterly income (d)	(a)+(b)+(c)			
LOCAL GOVERNMENT **(Regions, Municipalities and Provinces, Health units, Universities)**				
Quarterly income (e)	"expenditures for employees"	Quarterly Report on Cash Flows	Cash	BBV
Quarterly social contributions (f)	annual rate x (e)	Internal	Cash	
Quarterly total wages (g)	(e)-(f)			
GENERAL GOVERNMENT SECTOR				
Quarterly total wages	(a)+(g)			BBV
Quarterly income	(d)+(e)			BBV
ECONOMIC ACTIVITY SECTIONS **L (general government, defence and social security funds); M (education); O (other public, personal social services)**				
Quarterly income	per capita quarterly income of the General Government (excluding Local Health Units and Hospitals) x quarterly employment of the section			BBV
Quarterly total wages	per capita quarterly total wages of the General Government (excluding Local Health Units and Hospitals) x quarterly employment of the section			BBV
N (health care and social assistance)				
Quarterly income	per capita quarterly income of Local Health Units and Hospitals x quarterly employment of the section			BBV
Quarterly total wages	per capita quarterly total wages of Local Health Units and Hospitals x quarterly employment of the section			BBV

5. PRELIMINARY PROPOSALS FOR THE LCI CONSTRUCTION

At this stage, among the different sources described in the previous chapter, it is possible to single out the ones which can be used in the short and medium run to estimate the LCI in section M:
- the National Accounts quarterly experimental estimations are surely an interesting and promising, although indirect, source which nevertheless requires some data and methodological improvements;
- the integration of the two infra-annual sources available (EPD and CINECA data) which, despite some shortcomings, can be seen as the best candidates as LCI building blocks.

Before studying some characteristics of the two sources in terms of costs and benefits, quality, timeliness and timing of the production process, we will first show how to integrate and improve the EPD and CINECA data, and secondly make a comparison of the latter integrated quarterly sources with the National Accounts quarterly experimental estimates. Subsequently, we will describe two possible scenarios respectively achievable in the short and in the long-run, which concern the LCI methodology. Finally, we will describe the steps to be taken in order to realize the short-run scenario.

5.1. Some preliminary aggregate results on section M using EPD and CINECA data

The exercise that we are proposing concerns quarterly estimates of per capita total wages and labour cost, for the School and the University collective bargaining areas and for section M as a whole.

The years considered are 2002 and 2003, while the year 2000 has not been taken into account since no data are yet available from CINECA. Due to the quality problems of both sources, we restricted our aim to the provision of results by collective bargaining area, regardless of the job position. However, we know that for both sources (see Tables 3.5 and 3.9), a systematic undercoverage with respect to the Annual Account benchmark there still remains when the interest variables are considered at a macro level. This undercoverage, in the EPD case, could mostly depend on the absence of the additional wage components, since the number of employees is almost the same as in the benchmark. As far as CINECA is concerned, the undercoverage in the per capita total wages and labour cost seems to be mainly due to the personnel overcoverage.

We could think to solve the undercoverage problems in the EPD data by introducing one or more correction factors, as shown in the next section.

5.1.1. Correction factors in the EPD data

The use of the correction factors had been widely described in the Final Report for the LCI construction in section L. We want to briefly recall the main features of such approach.

The average per capita quarterly total wages, employer's social contribution, and labour cost for the School collective bargaining area are, respectively, defined as: $\hat{w}_t = \dfrac{\hat{W}_t}{\hat{l}_t}$, $\hat{s}_t = \dfrac{\hat{S}_t}{\hat{l}_t}$

and $\hat{c}_t = \hat{w}_t + \hat{s}_t$, where w indicates the per capita total wages; s the per capita social contributions; c the labour cost; l the number of payrolls which represents a proxy of the number of employees; W and S the overall amounts of total wage and social contributions and t the reference period.

The overall amount of the EPD monthly total wages is corrected in the following way as:

$$\hat{W}_{t,y} = {}^{EPD}W_{t,y} \frac{{}^{AA}W_{2000}}{\sum_{t'=1}^{12} {}^{EPD}W_{t',2000}} \qquad [1]$$

where the index y stands for the year.

Similarly, the correction of overall amount of the monthly social contributions results:

$$\hat{S}_{t,y} = {}^{EPD}S_{t,y} \frac{{}^{AA}S_{2000}}{\sum_{t'=1}^{12} {}^{EPD}S_{t',2000}} \qquad [2]$$

Finally, the overall amount of the monthly employees is corrected as:

$$\hat{l}_{t,y} = {}^{EPD}l_{t,y} \frac{{}^{AA}l_{2000}}{\sum_{t'=1}^{12} {}^{EPD}l_{t',2000}} \qquad [3]$$

It must be noted that, prior to the use of the abovementioned formulas, the data from the EPD have been corrected for the known inconsistencies and download errors. For instance, as already mentioned, the anomalous fall in the number of payrolls in June 2002 has been corrected by replacing its month-to-month change with respect to May with the same change observed in the year 2000 (see section 3.2.3).

In Table 5.1 the EPD interest variables (after applying the correction factors) are compared with the benchmark ones of the Annual Account.

Table 5.1: Employees Payrolls Database interest variables (after applying the correction factors) vs Annual Account– Ministry of Education, years 2002 and 2003

	Annual Account		Employees Payrolls Database		Difference (%)	
	2002	**2003**	**2002**	**2003**	**2002**	**2003**
Number of employees	1,095,784	1,116,166	1,143,355	1,153,172	4.3	3.3
Total wages	**2,012**	**2,129**	**2,193**	**2,298**	**9.0**	**7.9**
Employer's social contributions	**577**	**640**	**553**	**631**	**-4.2**	**-1.4**
Contributive rate	28.7	30.1	25.2	27.5		
Labour cost	**2,590**	**2,769**	**2,746**	**2,929**	**6.0**	**5.8**

As it can be immediately seen, the differences between the benchmark and the monthly source significantly change, both in level and in sign, for all the interest variables, when applying the correction and, with the exception of employer's social contributions, one obtain worse results than before the correction (compare Table 5.1 to Table 3.5). Indeed, one passes from a significant underestimate, which should be expected, to a large overestimate of the benchmark, which does not find any sensible explanation.

Several criticisms to this approach are in order. First, the use of the same correction factor (dating back to 2000) applied to different years (2002 and 2003) does not take into account the fact that the EPD structure has dramatically changed and improved in the latest years and could produce unexpected results. However, it has not been possible to do otherwise, since the EPD data for the year 2001 (which would be used for the construction of the correction factor for 2003) are not available. Moreover, it would not be possible to use the Annual Account 2002 data

for the correction factor for 2003, since, in a realistic situation, they would be available no sooner than in late 2004. Anyway, using a factor, which reflects the differences between the infra-annual source and the benchmark in a previous year, to improve the present year's data, could produce unexpected results. Second, even if one could use different correction factors updated each year, which would seem the most clever choice, the problem of attributing the same annual wage (or personnel) dynamics of previous years to the most recent years would arise, while the problem mentioned in the case of a fixed correction factor would remain.

Due to the results obtained and the abovementioned problems, we have decided not to use the correction factor approach and perform the exercise by just using the EPD and CINECA data as they have been provided, except for the corrections made to the 2002 EPD data in order to adjust the anomalous falls in the month of June.

5.1.2. Comparison with the quarterly benchmark of National Accounts experimental estimations

In the following, we will perform some comparisons between the results of our exercise and the quarterly National Accounts (from now on, NA) estimations for section M. Our results for this section have been obtained by combining the EPD data for the School area and the CINECA data for the University, by using weighed averages with structural weights taken from the Annual Account.

Before analysing the data, it could be useful to make some crucial observations in order to provide possible explanations to the differences found between the NA and the combined EPD and CINECA data (from now on, EPD-CINECA).

It is worthwhile reminding that data from EPD and CINECA sources do not allow us to define the labour cost as stated in the Regulation No 1176/99, due to the absence of some expenditure items (vocational training costs, other expenditures, taxes and subsidies). The definition of what we call labour cost in this report strongly resembles the compensation of employees as calculated by the NA and can be seen as a good approximation of the actual labour cost.

Moreover, the EPD and CINECA data are recorded on the basis of a cash criterion, while the NA data follow the accrual criterion.

Furthermore, while EPD is used both in our exercise and by the NA (although in different breakdown level), the data underlying the construction of the NA reference indicators for the Universities are drawn from the Quarterly Report on Cash Flows (QRCF, see section 4.1), differently from our exercise where the CINECA data are used. The main difference between these two sources, which could influence the comparison, consists in the fact that QRCF data are of anticipatory nature, in the sense that they provide a prevision of the expenditures for the reference quarter, while the CINECA data are consolidated. Another relevant problem is given by the different definition of the variables in the two sources. In the QRCF there is only one expenditure item, called *expenditures for employees*, whose exact relation to the labour cost of the CINECA (which includes fixed components, allowances, additional components and employer's social contributions) is still rather unclear.

Finally, differently from the NA, our definition of section M is based on the employee collective bargaining area more than on his/her actual economic activity. To briefly recall what has already been mentioned in section 3.2.1, two factors make our definition only an approximation:

- employees belonging to School/University area whose economic activity is not classified amongst those of sections M (such as a share of the School administrative and technical staff);

– employees belonging to areas different from School/Universities whose economic activity is classified amongst those of sections M (such as the nursery school teachers belonging to the Regions and Local units area).

As shown in Table 5.2, and as can be seen even better in Figures 5.1- 5.3, the difference between the NA and EPD-CINECA data on the levels of the total wage are almost constant in the first two quarters of both years, while they significantly increase in the third quarters and go almost to zero in the fourth quarters. Moreover, the EPD-CINECA results are systematically larger than those of the NA (on average around 6%). This is somewhat unexpected, since the EPD data do not contain any additional wage components, while in the NA estimates all total wage components are taken into account. A possible explanation could appeal to the two different criteria of recording the payments between NA (accrual) and EPD-CINECA (cash). Indeed, the increase in the EPD-CINECA total wage level in the third quarter 2003 is related to the payment of a large amount of arrears due to renewal of the national labour contract in the School area. The EPD has effectively recorded such payments in August 2003, while the NA could have attributed them to the previous quarters. Nevertheless, in all the previous quarters the EPD-CINECA results are still larger than the NA ones.

As far as the employer's social contributions are concerned, the levels strongly differ between NA and the EPD-CINECA results. This discrepancy is almost around 30% and is rather constant with time. It is due to some additional contributions paid to the Social Security Institute for Civil Servants (INPDAP) included in the NA but not taken into account in the EPD-CINECA.

Finally, as regards the labour cost, the differences observed for the two labour cost components combine to produce a negative gap (which varies from -10% to -5%) of EPD-CINECA with respect to the NA in all quarters except the third quarter 2003 (where there shows a large overestimate, 9%) for the reasons just explained.

We plan to investigate such problem in the near future in collaboration with NA department.

Table 5.2: EPD-CINECA quarterly results on the interest variables vs National Accounts quarterly estimates in section M – years 2002, 2003

	EPD and CINECA data			National Accounts			Difference *(%)*		
	Total wage	Employer's social contribution	Labour cost	Total wage	Employer's social contribution	Labour cost	Total wage	Employer's social contribution	Labour cost
2002									
I,2002	1,892	538	2,430	1,782	832	2,614	6.2	-35.4	-7.1
II,2002	1,923	543	2,466	1,792	812	2,604	7.3	-33.2	-5.3
III,2002	2,017	570	2,588	1,776	802	2,578	13.6	-28.8	0.4
IV,2002	2,470	714	3,184	2,448	1,086	3,534	0.9	-34.2	-9.9
Montlhy average	**2,079**	**592**	**2,671**	**1,949**	**883**	**2,832**	**6.7**	**-32.9**	**-5.7**
2003									
I,2003	1,863	560	2,422	1,810	857	2,667	2.9	-34.7	-9.2
II,2003	1,861	569	2,430	1,850	869	2,719	0.6	-34.5	-10.6
III,2003	2,419	741	3,160	1,977	922	2,899	22.3	-19.6	9.0
IV,2003	2,543	798	3,342	2,568	1,151	3,719	-1.0	-30.6	-10.1
Montlhy average	**2,169**	**666**	**2,835**	**2,051**	**949**	**3,000**	**5.8**	**-29.8**	**-5.5**

Figure 5.1: EPD-CINECA vs National Accounts quarterly per capita total wages – years 2002, 2003
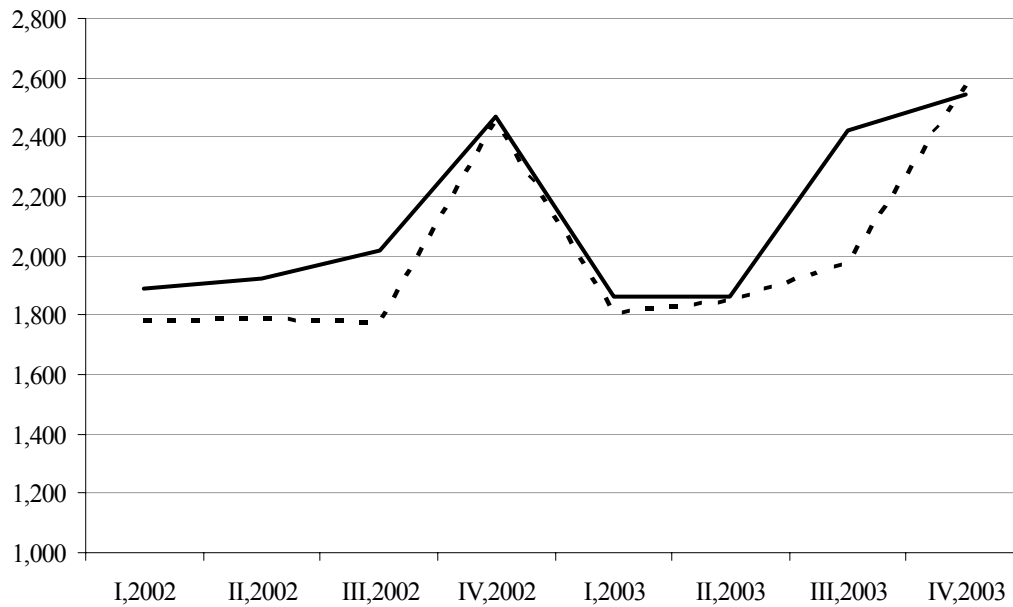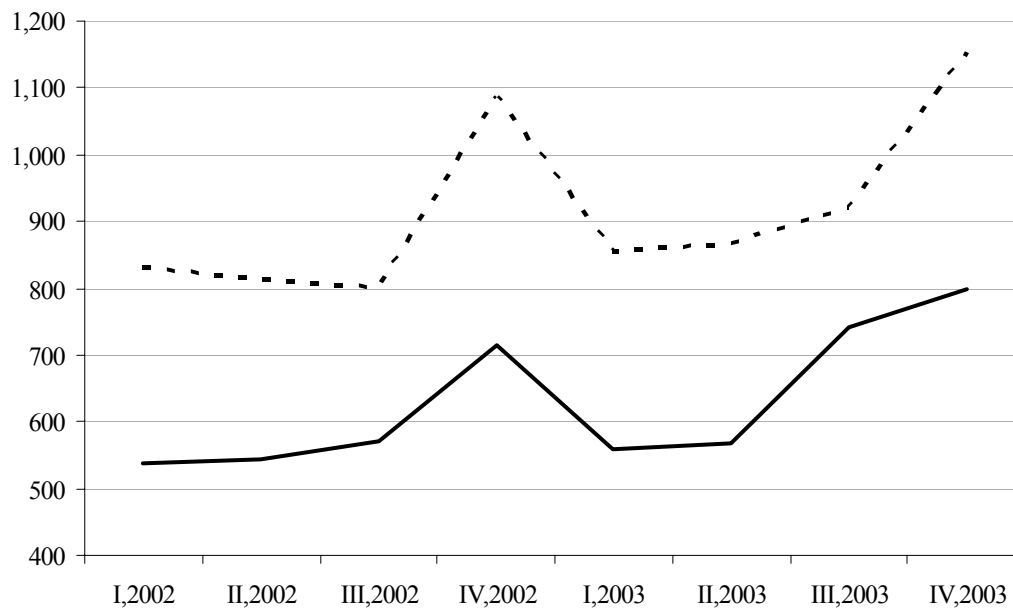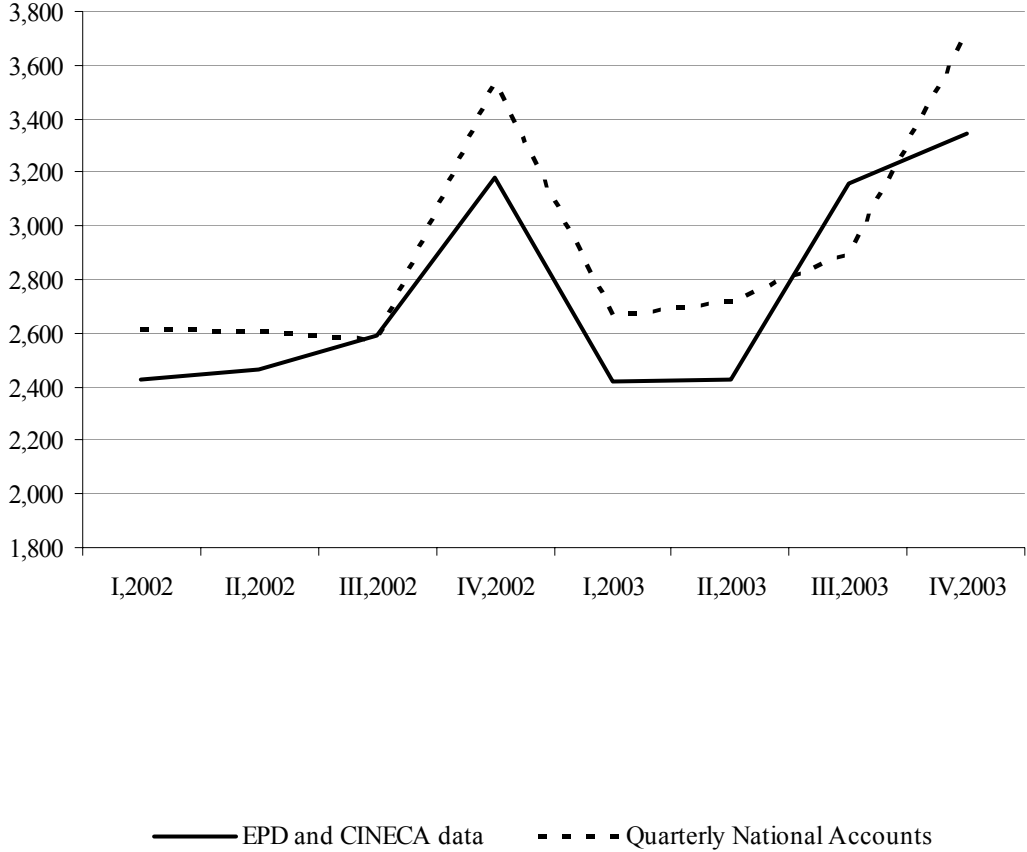*(euros)*

Figure 5.2: EPD-CINECA vs National Accounts quarterly per capita employer's social contributions – years 2002, 2003 *(euros)*

——— EPD and CINECA data   - - - - Quarterly National Accounts

Figure 5.3: EPD-CINECA vs National Accounts quarterly per capita labour costs – years 2002, 2003 *(euros)*

The comparison of the quarter-to-quarter changes (see Figures 5.4-5.6) shows very similar patterns for all the variables and for both sources. Thus, we restrict to consider only the labour cost.

The dynamics of the first two quarters 2003 is very similar between the two estimates, while in the third quarter the EPD-CINECA change is significantly larger than the NA one (because of the recording of the payments of arrears using a cash criterion) and is partially compensated by a subsequent smaller increase in the fourth quarter, so that the changes between the second and the fourth quarters are almost equal. The same reasoning cannot be applied to the 2002 results. In that year, the changes are different in all quarters and there is no compensation between the last two quarters changes. The apparent similarity in the general evolution is simply caused by the payment of the year-end bonus recorded by both sources.

Figure 5.4: EPD-CINECA vs National Accounts quarter-to-quarter changes of per capita total wages – years 2002, 2003 *(euros)*
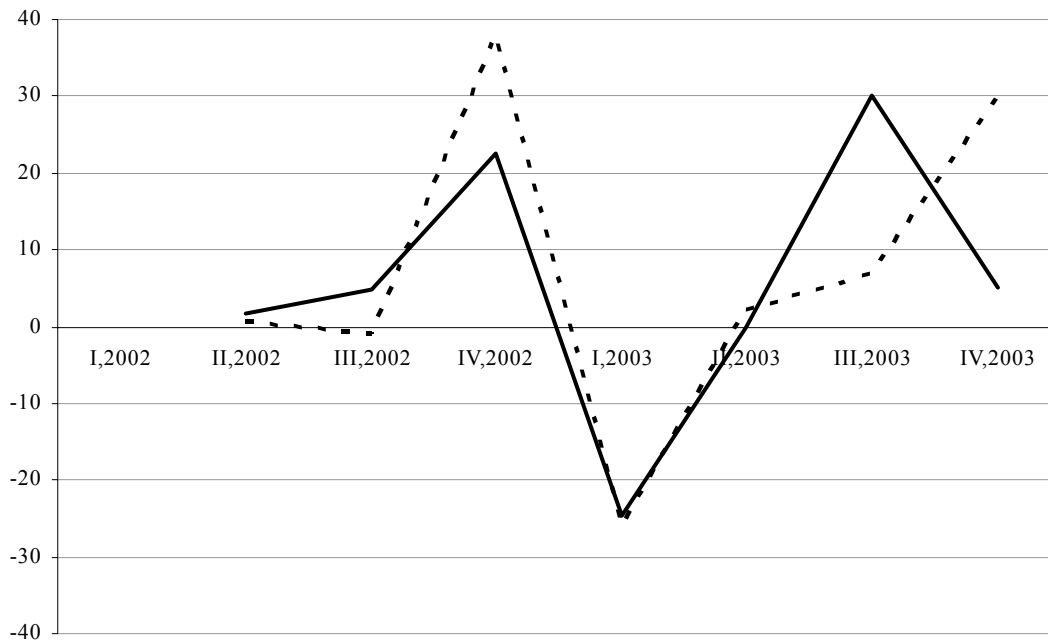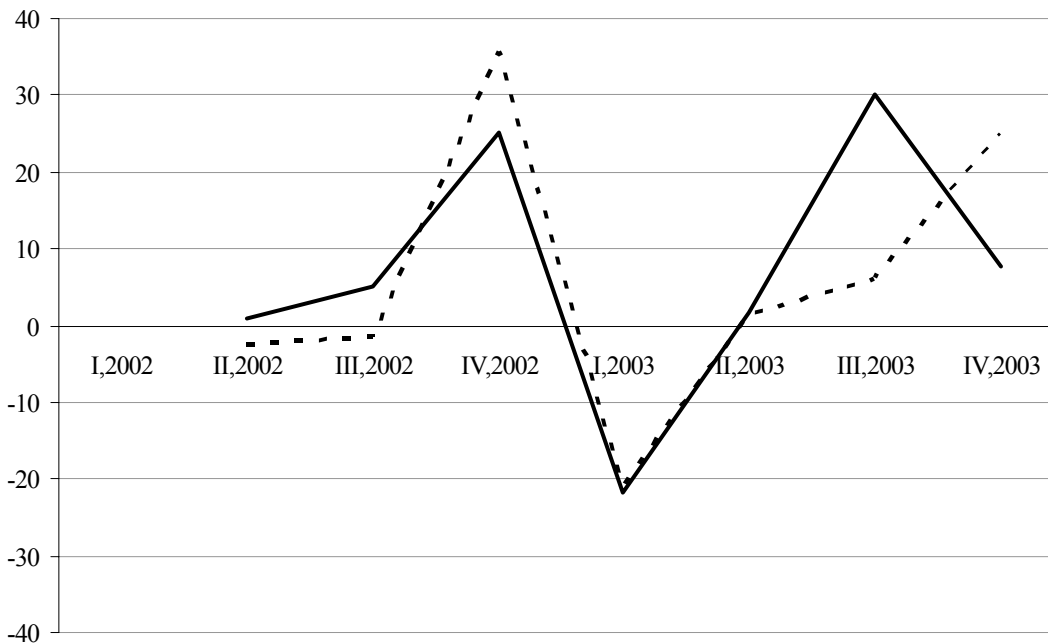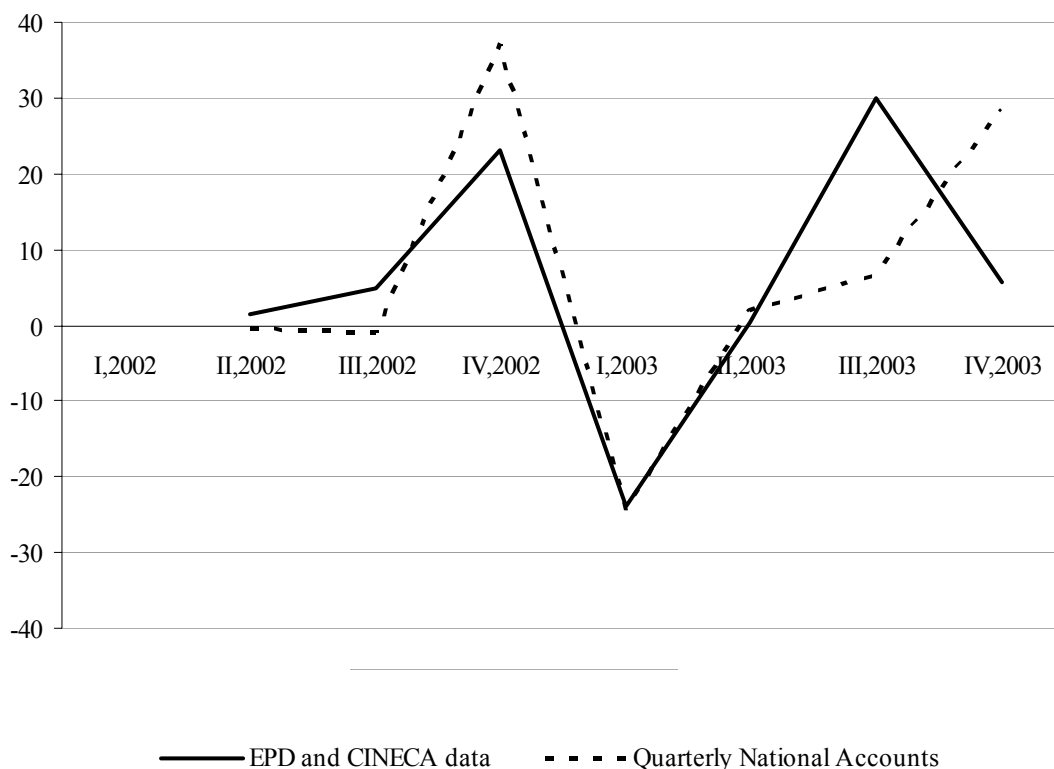

Figure 5.5: EPD-CINECA vs National Accounts quarter-to-quarter changes of per capita employer's social contributions – years 2002, 2003 *(euros)*

EPD and CINECA data   Quarterly National Accounts

Figure 5.6: EPD-CINECA vs National Accounts quarter-to-quarter changes of per capita labour costs – years 2002, 2003 *(euros)*

EPD and CINECA data   - - - - Quarterly National Accounts

5.2. A brief cost-benefit evaluation of LCI methodology in the short and the long-run

Summarising what has been discussed in the previous sections, the high costs and the heavy burden on respondents, together with the institutional reasons mentioned in the introductive chapter, prevented Istat from taking into account the hypothesis to design a direct quarterly statistical survey for the production of LCI in section M. The only alternative was to study the availability and quality of administrative sources, which has led to two proposals:

1. the EPD-CINECA could be a primary source for the LCI construction, which hopefully should not need a complex statistical estimation process;
2. the NA primary sources could be integrated with a sophisticated methodology (benchmarking and time breakdown), improved and adapted to the target of producing the LCI.

Both alternatives would need further work and improvements. The main difference between them lies in the organizational and timing aspects. The NA can produce only an aggregate estimation of section M, it is based on a sound methodology which can be further improved, it relies on a long time series which is well established, the transmission of the basic data has been set up long time ago (since 2000) and the actual flows of data are timely and punctual (60 days after the end of the reference quarter). Finally, back data can be easily estimated.

On the contrary, EPD-CINECA data may satisfy many different objectives in terms of job position and bargaining estimates, they do not require a complex methodology, but the EPD and CINECA sources seem not yet very stable and it will take time to assess their suitability and accuracy. The transmission of the basic data should be organized and tested completely from the

beginning. The problems we encountered in the relationship with GAD could persist and some years could be needed in order to get to the target timeliness. Finally, back data are not available.

Thus, although a direct estimation of more broken down variables (by job position and bargaining contract) could be theoretically preferable, an indirect aggregate estimation based on NA source is the only realistic way in the short-run. Practically, there is no alternative: while the LCI-NA production process could be set up in about one year, the EPD-CINECA could take a much longer time. So it seems reasonable to adopt the NA option in the short-run while preparing the way to the direct estimation with EPD-CINECA in the long-run.

5.3.   The target methodology in the short-run

As just described, the short-run scenario should allow us to construct a quarterly Labour Cost Index with good accuracy and timeliness. This would require the use of the NA data as a starting point and imply a phase of experimentation due to the provisional nature of the quarterly NA estimates, which are still susceptible of improvements (see the open problems in the NA estimation method in section 4.2). Actually, the differences arisen between our exercise and the NA estimates would seem to point not only to quality problems of the sources used, to a different definition of the target population, and to a different recording criteria (see section 5.1), but also to the shortcomings of the NA estimation method.

As described in section 4.2, the main open problems concern the breakdown by section and by institutional sector which strictly depend on the way the infra-annual reference indicators are built. Therefore, a possible approach in the short-run could consist in using the NA estimation method as it is (the BBV annual-to-quarterly data procedure), in developing the phase of construction of the infra-annual indicators, and in using the new resulting estimates as a starting point for the LCI construction.

To this end, it seems natural to start a close collaboration with the NA department within whose framework to exploit the results of this feasibility study. In particular, the two main innovations which can be introduced in the construction of the NA reference indicators will consist in:
- − adopting a separated reference indicator for section M, based on EPD data for School and CINECA data for University areas;
- − using a separated reference indicator for the private sector of section M.

As far as the first experimentation is concerned, we would like to recall that the NA reference indicators used for section M quarterly estimates are based on the EPD data of the State as a whole and on the QRCF data of the Local government excluding Health units (that is, Regions, Municipalities, Provinces and Universities). As a consequence, the infra-annual indicators used do not strictly reflect the wage dynamics of the institutions classified into this section only.

The use of the EPD data regarding only the Ministry of Education and of the CINECA ones for the Universities could give better final estimates for the public sector component of this section and produce significant improvements in the breakdown by section.

The quality of such indicator should be checked against the currently used NA indicator, by means of the current analysis preliminary to the application of the BBV procedure (see the beginning of chapter 4).

The indicator we want to propose could be given, as a first approximation, by the combination of the EPD data for the Ministry of Education and of the CINECA data, having used as structural weights the percentage compositions of section M in terms of the two collective bargaining areas. This is precisely what we have done in section 5.1. The results of our

exercise can actually be considered only as an indicator of the quarterly dynamics of the public sector component of section M, since they do not refer to the exact definition of this section.

In the following, in order to improve the breakdown by institutional sector, the use of a separate reference indicator for the private sector of section M, based on INPS data, will be proposed.

5.3.1. A reference indicator for the private sector of section M: INPS data

INPS data are currently used in the OROS survey for producing LCI in sections C to K. The INPS data cover also the population of private firms in section M, as well as N and O. This is because the great majority of public sector units remit the payment of the social contributions for their employees to other Social Securities Institutes (INPDAP). Unfortunately, a part of public institutions remit some contribution to INPS. However, in this case the DM10 form contains only very partial information on employment and labour costs. Those public institutions data must be removed from the rest of INPS data, in order to get to a correct representation of M. This is not a simple task, as is shown in Istat (2002), but it can be done with the help of a combination of few INPS variables and some public institutions registers. Producing regular estimations on section M relative only to businesses or other private units could be feasible in the short-run and it could be used and combined as an indicator in the quarterly time breakdown methodology.

5.4. Hours actually worked quarterly estimates

With respect to the requirements of the LCI Regulation on the hours actually worked, Istat has faced the problem by establishing a Working Group which, up to now, for sections L-O has been able to produce annual estimates updated to the year 2003, following a component approach[6].

As far as the quarterly estimates are concerned, their production is still at an experimental stage: the use of the quarterly data from the Labour Force Survey as reference indicator in the annual to quarterly procedure is being tested.

Hence, the introduction of such variable in the LCI construction can be only thought of in a long-run perspective, while in the short-run we have to limit ourselves to use the quarterly information on the labour input provided by the National Accounts (number of employees, occupied post and full-time equivalent units). This is consistent with the short-run scenario described for the total wage and labour cost variables. Obviously, the final NA estimates, even if improved as just shown, consist in quarterly amounts of the interest variables and not in per capita values, which will be obtained after dividing by the quarterly amount of full-time equivalent units.

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[6] On the basis of this approach, the contractual hours are the benchmark; then the hours components which are not worked (paid or not) are subtracted, while the overtime is added. The method can be summarized as follows:

Haw = Hcon - (Habs+Hhol) - Dpart + Hext

where *Haw* are the hours actually worked; *Hcon* represents the total amount of hours theoretically workable (contractual hours) considering employees as all full-timers and it is obtained from the per capita hours workable by contract multiplied by the annual average employment; *Habs* represents the number of hours actually not worked because of vacations or illness, strikes, leaves (paid or not), etc., and it is obtained by multiplying the days of absence by the hours workable per day; *Hhol* is the number of hours of holidays occurred during the working time in the reference period, and it is obtained by multiplying the days of holiday by the hours workable per day; *Dpart* is the number of hours missed for part-time employment, and it is obtained as the difference between full-time workable hours and the hours worked by part-timers; *Hext* is paid overtime, obtained by dividing the expenditures for overtime by the hourly rate of extra work.

6. CONCLUSIONS AND FUTURE WORK

This Final Report concludes the feasibility study on the LCI production in section M. In particular, it includes the exploration of the available infra-annual administrative sources. Furthermore, a detailed and critical analysis of the National Accounts (NA) estimation method for quarterly total wages and compensation of employees is presented. Finally, two possible scenarios for the LCI construction, respectively in the short and in the long run, are defined, together with a description of the experimentations needed to realize the short run scenario.

The two main administrative sources (EPD for School and CINECA for University) show some quality problems which still prevent us from fully assessing their actual usability for the LCI purposes. As the comparison with the annual benchmark showed, improvements are needed as to the accuracy, which is not yet satisfactory. Moreover, standards for a regular transmission of the data have to be defined which would allow us to create a database of the sources and elaborate automatic programs. Finally, sufficient timeliness in data transmission has still to be attained, since data are provided with a large delay after the end of the reference quarter. These problems could only be solved in collaboration with the institutions which manage the abovementioned sources. To the end of such cooperation, a formal partnership agreement with GAD has been recently signed and an informal working programme with CINECA has been launched. Both these agreements have already permitted us to perform an accurate analysis of these sources. However, the data quality problems will be completely overcome only through a continuous interaction between Istat and the two institutions.

This cooperation represents a priority to which Istat has committed itself since the last two years, but it will take some time to fully realise it. For this reason, we expect to be able to produce the first regular quarterly estimates for section M using the abovementioned sources, with the required accuracy and timeliness, no sooner than in a couple of years.

In a short-run perspective, a natural choice for LCI methodology consists in exploiting the National Accounts final quarterly estimates as a starting point for the LCI construction after improving them through the use of the two EPD and CINECA sources as reference indicators. In particular, the NA annual to quarter procedure could be used as it is, while, if we would like to use specific reference indicators for section M based on a combination of the EPD and CINECA data, further experimentations would be needed to test their introduction in the NA procedure. Moreover, the use of a separate indicator, based on INPS data, for the private sector of section M could also be tested.

The use of the NA estimation method with the two abovementioned innovations will produce quarterly estimates of total wage and compensation of employees. Per capita values of the two interest variables could be obtained by means of the quarterly NA estimates on full-time equivalent units. The quarterly estimates on hours actually worked have still to be carried out and they will be reasonably based on Labour Force Survey data.

In a long-run perspective it should be possible to fully exploit the EPD and CINECA sources to directly produce quarterly LCI estimates and not only reference indicators. It should also be possible to exploit all the information provided, even broken down by job position and collective bargaining area, so to satisfy also the needs of information, widely explained in the Final Report on section L[7], by Italian public institutions and public opinion.

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[7] See Contributi Istat n. 22/2004.

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