

# Micro-macro integration: survey data on household income for the estimate of the Italian GDP\*

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## *Abstract*

National accounts statistics are the result of the integration of several data sources. At present, the Italian national accounts use household surveys data for estimating labour units only, not for estimating the monetary aggregates. In this paper we investigate the possibility of using sample data on household income within an independent estimate of the Gross Domestic Product based on the income approach. The aim of this paper is twofold. In the first part we compare household sample data with national accounts trying to assess whether (and to what extent) sample survey data may contribute to the estimate of the Italian GDP. Furthermore we try to actually bring sample income micro data in the estimation process of the Italian NA and measure how the estimate of GDP and its components is affected. Applications are based on the European statistics on income and living conditions and on the Bank of Italy survey on income and wealth.

## *1. Introduction*

As it is well known, Gross Domestic Product (GDP) can be measured according to three different methods: the production (or value added) approach, the expenditure approach and the income approach. Due to the use of different data sources and methods, the three approaches produce different estimates of GDP which are finally reconciled through the building of Input-Output (or Supply and Use) tables.

The three different approaches rely on the use of, as far as possible, independent sources of information. In the Italian national accounts (NA henceforth) however, only the production and expenditure methods lead to exhaustive and independent estimates of GDP. This depends mainly on the insufficient quality of available data sources (Istat (2004)).

The paper addresses the use of sample surveys on households budgets for a better application of the income approach. As of 2004, Italy and other European countries can take advantage of a new and very rich survey, the European statistics on income and living conditions (Eu-silc). Moreover, the Bank of Italy has been carrying out a sample survey on households income and wealth (Shiw) since 1966, at first on a yearly basis, on the odd years only, starting from 1987.

\* This paper was prepared for the 31st General Conference of The International Association for Research in Income and Wealth *St-Gallen, Switzerland, August 22-28, 2010*

The introduction of surveys micro data on households income in the GDP estimation process would allow to analyse income by groups of individuals as well as by household typology. Moreover it would improve reconciliation of micro and macro data on income, which is an essential piece of information for sound micro-founded macroeconomic modelling.

As a first step we assess whether (and to what extent) sample surveys on household income may contribute to the estimate of the Italian GDP. To this end, surveys variables are recoded and harmonized according to national accounting concepts and definitions in order to point out discrepancies or similarities. The aim is to identify the income components for which sample surveys might provide useful information.

As a second step we try to actually bring income micro data in the estimation process of the Italian NA and measure how the estimate of GDP and its components is affected. Two methods are applied. The first is aimed at introducing income micro data in the current GDP estimation process. Particularly we focus on imputed and actual rents as well as on compensation of employees in order to estimate per capita income values to be applied to the existing estimate of NA input labour units. The second method is based on the compilation of an aggregate Social accounting matrix (SAM) where the households accounts are estimated mainly on the basis of income sample survey results. In the paper we compile a SAM for Italy on the basis of balanced NA data. The aim is to show which cells would benefit from Eu-silc and Shiw data..

The rest of the paper is organized as follows. Section 2 analyses the content of the sample surveys on household income in order to estimate the potential coverage of the surveys with respect to GDP. The main finding is that surveys may help estimate up to 60% of GDP, around 70% if we consider GDP net of taxes. Section 3 tries to assess which is the actual contribution of surveys with respect to each GDP category (i.e. compensation of employees, mixed income, operating surplus). The main result is that the surveys seem to provide good quality data at least for compensation of employees. Section 4 introduces some evidence from surveys in the estimate of the Italian GDP.

## ***2. The income approach***

The income approach focuses on income paid and earned by individuals and corporations in the production of goods and services, and can be represented by the following equation:

$$\text{GDP} = \text{WS} + \text{GOS} + \text{GMI} + \text{NIT} \quad (1)$$

Where:

- WS: compensation of employees (wages and salaries and employers' social contributions).
- GOS: gross operating surplus, i.e. the profit generated by corporations and quasi corporations (public and private); it also includes imputed rents of owner-occupied dwellings.
- GMI: gross mixed income, i.e. the operating surplus of unincorporated enterprises owned by households. It also includes actual rents.
- NIT: taxes on production and imports net of any subsidies on production

The following table shows the Italian GDP and its composition for the years 2004-2007.

Table.1 Italian GDP and its composition – years 2004 -2007. Current million euro.

	2004		2005		2006		2007	
	values	(%)	values	(%)	values	(%)	values	(%)
Compensation of employees	536,229	39.1%	581,995	41.0%	608,864	41.0%	631,384	40.9%
Gross mixed income	220,495	16.1%	220,495	15.6%	223,414	15.0%	227,493	14.7%

Gross operating surplus	435,764	31.7%	435,764	30.7%	447,099	30.1%	474,330	30.7%
Taxes on production and imports net of subsidies	179,787	13.1%	179,787	12.7%	206,000	13.9%	211,708	13.7%
Gross domestic product	1,372,275	100.0%	1,418,041	100.0%	1,485,377	100.0%	1,544,915	100.0%

Istat, NA, July 2009 version

The largest part of the Italian GDP consists of compensation of employees, followed by the operating surplus, the mixed income and the net indirect taxes. In the observed years the weight of mixed income and operating surplus slightly decreases in favour compensation of employees and taxes.

We wonder whether it is possible (and to what extent) to estimate the GDP components on the basis of the households budgets surveys.

Obviously surveys could contribute to estimate only the part of GDP concerning households as payers or earners.

In principle surveys should cover 100% of compensation of employees since this kind of income is earned exclusively by households.

Households are also engaged in production as owners of unincorporated enterprises. Profits/losses from such activity are defined as mixed income in National Accounts. Therefore surveys could help estimating the part of mixed income which households withdraw from the enterprise for their needs. This aggregate accounts for around 82% of gross mixed income (about 13% of GDP), according to the Italian NA statistics of the last five years<sup>1</sup>.

Furthermore, households disposable income includes imputed rents of owner-occupied dwellings. In national accounting, such earning is recorded as a component (about 15%) of gross operating surplus, i.e. around 5% of GDP. Summarising, surveys might help estimate up to 60% of GDP, around 70% if we consider GDP net of taxes.

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### ***3. How much do survey microdata fit NA in Italy?***

Before thinking of any method for integrating surveys microdata in NA, it is essential to verify how much this information fits NA estimates.

For this purpose, we try to estimate the GDP components on the basis of survey data. Particularly, we consider the Bank of Italy survey on income and wealth (Shiw)<sup>2</sup> and the European statistics on income and living conditions (Eu-silc)<sup>3</sup>. The year 2006 is the most recent for which Shiw and Eu-silc results can be compared.

The surveys variables have been fully harmonized to NA with respect both to the observed population and to the content of each income component (Coli, Tartamella (2008)).

Shiw and Eusilc collect data on the different types of income earned by the interviewed person: labour income, capital income and income from transfers. Income is asked net of taxes and social contributions.

The main difference with respect to NA is about the definition of self-employed income: in surveys self employed income is earned by those declaring themselves as self employed (employer, own account worker, family worker) regardless of the legal status of the firm where they work. NA, instead, record self employed as:

<sup>1</sup> In the Italian NA the Household sector is split into two sub-sectors, namely Producer Households and Consumer Households. Particularly Produce household include non financial unincorporated enterprises with 5 or less employees and unincorporated auxiliary financial activities with no employees. In the Allocation of primary income account, a quota of mixed income moves from Producer households to Consumer households. This income is supposed to be used by households for consumption and saving.

<sup>2</sup> Shiw data can be downloaded from the Bank of Italy web site

<sup>3</sup> IT-SILC XUDB 2007 - May 2009

1. Mixed income from Producer households (see footnote 1)
2. Withdrawals from quasi-corporations, i.e. compensation of self employed working in corporations that “keep a complete set of accounts and have no independent legal status. However, they have an economic financial behaviour that is different from that of they owners and similar to that of corporations” (ESA95 §2.13f)
3. Withdrawals from corporations, i.e. compensation of self employed working in corporations.

The Shiw survey collects income data at a finer detail, thus allowing more interesting comparisons. For example the coverage of the mixed income component can be evaluated only for the Shiw. In fact, in order to identify Producer households, i.e. households generating mixed income (see footnote 1), surveys are required to record both the size and legal status of the enterprise whom the self employed belongs. Up to 2008, Eu-silc does not collect this information thus not allowing to disentangle mixed income from other kind of self employed income. For this reason the NA Eu-silc comparison is made for the self-employed income component as a whole which is computed as to include income withdrawn by households both from Producer households (the mixed income share) and from the Corporation sector.

Results are then compared with national accounts<sup>4</sup> in Tables 1 and 2.

Both surveys sensibly underrate self employed income. On the contrary both surveys overestimate the gross operating surplus (i.e. imputed rents of owner-occupied dwellings) with respect to NA. The reason may be an overestimated number of dwellings and/or imputed rents. Surveys probably overrate the stock of dwellings since, for fiscal reasons, owners may declare an imputed rent on a dwelling that is actually let. Moreover, surveys estimate imputed rents as the amount of money that the owners expect to pay for renting their own house, which may be biased, e.g. reflecting only current market prices, whereas most dwellings are rent according to earlier and cheaper contracts. On the contrary NA estimate imputed rents using the figure on actually paid rents from the household sample surveys. Fiscal reasons often probably urge people not to declare the real amount of received/paid rents. As a consequence NA imputed rents may be underestimated.

Wage and salaries is the best covered income source, especially by Eu-silc which records a value even larger than NA (about 101%).

Table 2 Households income components in NA and Shiw: a comparison - Italy, 2006 current million euros -

	2006		
	National accounts (Household sector)	Shiw *	Shiw/NA
Wages and salaries net of social contributions paid by employees	327,837	295,508	90.14%
Mixed income quota assigned to households, net of social contribution paid by self employed	146,550	87,263	59.54%
Gross operating surplus	102,245	140,131	137.05%

\* Income estimates are grossed up using the survey sampling weights.

<sup>4</sup> In order to compare data correctly it is necessary to estimate NA labor income components net of taxes and social contributions. In order to compute net figures we used fiscal records about declared incomes. Actually, it would be preferable to estimate net income through a micro-simulation model which would also allow to analyse the distribution of net income among different household groups.

Table 3 Households income components in NA and Eusilc: a comparison - Italy, 2006 current million euros -

	2006		
	National accounts (Household sector)	Eu-Silc	Eu-Silc/NA
Wages and salaries net of social contributions paid by employees	327,837	332,585	101.45%
Self employed income	248,227	140,952	59.95%
Gross operating surplus	102,245	121,744	119.07%

\* Income estimates are grossed up using the survey sampling weights.

Eu-silc provides a better coverage with respect to NA values, in particular for wage and salaries. We remind that Eu-Silc is not simply a survey but a system of integrated statistics on income and living conditions. In particular Istat uses administrative data in order to support the editing and imputation processes of the Eu-silc survey (see Consolini P. 2009)<sup>5</sup>. The integration of sample and administrative data probably helps recovering some income thus improving the quality of data. Mixed income however continues to be significantly underestimated. As it is well known Mixed income is the income component most strongly affected by the underground economy (see Coli A., Tartamella F. 2008)

#### ***4. The impact of income microdata on the estimate of the Italian GDP***

In this section we think critically about the use of surveys data in the GDP estimation process. At first (§ 4.1) we analyse compensation of income and gross operating surplus in more detail and try estimating NA macro variables on the basis of Eu-silc data. Next we try to envisage how to incorporate survey data in the balancing process which leads to the GDP estimate (§ 4.2).

#### **4.1 Analysis of Gross operating surplus and Compensation of employees**

In the following we focus on gross operating surplus (and specifically on imputed rents) and on compensation of employees, in order to: i) evaluate how survey data on household income may contribute to the estimate of the corresponding NA macro aggregates; ii) analyse the distribution of compensation of employees and imputed rents among groups of households, in the NA macro context.

##### *4.1.1 Imputed rents*

In the Italian NA, the Consumer households (see footnote 1) gross operating surplus results from the following activities:

- i) own account production of housing services by owner occupied (imputed rents less intermediate costs);
- ii) own-account production of agricultural products,
- iii) own- account maintenance of dwellings.

Shiw and Eu-silc surveys may contribute to estimate imputed rents only, which however account for the larger part of the NA gross operating surplus (more than 98%).

The Italian NA use already information derived from households survey and Census to estimate imputed rents, therefore it is straightforward to replicate the same methodology using survey data on household income.

In particular Istat combines paid rents derived from the Household Budgets Survey (HBS henceforth) and the stock of dwellings derived from the Census (and update yearly). Dwelling are grouped into strata taking into accounts those characteristics that have an impact on rents market

<sup>5</sup> Administrative and survey units are linked using the “exact match” technique. For details on methods and results see Consolini 2009.

prices, like the dimension or the location of the dwelling. NA imputed rents are obtained multiplying stratum average rents by the stock of dwellings in the stratum.

We have applied the same methodology using Eu-Silc and Shiw instead of HBS paid rents. Dwellings have been clustered on the basis of available information with the purpose of obtaining average rents significantly different from stratum to stratum and a sufficient number of households in each layer<sup>6</sup>.

For Eu-silc we selected the following stratification variables: spaciousness (in four class of square meters), degree of urbanisation (in two classes: densely populated area, other areas), geographic area (North, Centre, South), availability of a private box.

For Shiw we selected the following stratification variables: spaciousness (in four class of square meters), degree of urbanisation (in two classes: areas up to 50000 inhabitants, other areas), geographic area (North and Centre, South), year of edification (up to 1960, after 1960).

Available information in the surveys diverge not only in terms of dwelling characteristics: while Shiw collects information on all owned dwellings (in accordance with NA), Eu-silc considers residence houses only. In principle only the Shiw provides complete information on imputed rents.

Survey data also allow to compute the intermediate costs associated to imputed rents (mainly Fisim on mortgages), so that it is possible to calculate the amount of Gross operating surplus due to imputed rents. Table 4 shows results.

Table 4 Gross operating surplus and imputed rents, Italy, 2006 current million euros.

	National Accounts (households)	Shiw*	Eu-silc*
Imputed rents	106,264	87,019	98,584
Gross operating surplus	102,245	85,646	96,770

\* Sample estimates are grossed up using the survey sampling weights.

In this table we compare NA and surveys estimates of imputed rents and gross operating surplus. We observe a general better fit of the new survey-based estimates with respect to the ones showed in table 2 and 3. Eu-silc in particular seems to provide a good coverage (over 94%) with respect to the NA aggregate.

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<sup>6</sup> In order to have a sufficient number of households per layer we have pooled the datasets of three subsequent surveys: 2005, 2006 and 2007 for Eusilc and 2004, 2006, 2008 for Shiw.

Table 5: Distribution of GOS by type of households

Household typology		A = GOS quota	B= population quota	A/B
Number of households components aged less than 18	0	76.1	73.0	1.04
	1	13.2	14.9	0.88
	2	9.3	10.2	0.90
	3 and more	1.4	1.9	0.77
Number of households components aged less than 35	0	52.8	49.3	1.07
	1	21.6	21.8	0.99
	2	19.0	19.8	0.96
	3	5.3	7.1	0.74
	4 and more	1.3	2.0	0.65
Number of households components between 35 and 64 years	0	34.8	35.0	0.99
	1	26.3	28.3	0.93
	2	37.8	35.7	1.06
	3 and more	1.0	0.9	1.08
Number of households components aged more than 64 years	0	57.2	62.7	0.91
	1	27.3	24.8	1.10
	2 and more	15.4	12.5	1.23
Number of households components	1	27.1	29.2	0.93
	2	29.4	27.2	1.08
	3	21.0	20.7	1.02
	4	17.9	17.7	1.01
	5	3.9	4.3	0.90
	6 and more	0.7	0.9	0.80
Age of reference person	less than 35	7.6	10.2	0.75
	35-50	26.5	28.2	0.94
	50-65	28.1	26.2	1.07
	65-75	17.9	16.8	1.07
	more than 75	19.9	18.6	1.07
1 component, aged less than 35		2.4	3.7	0.65
1 component, between 35 and 65		5.2	7.1	0.73
1 component, aged more than 65		19.5	18.3	1.06
2 adults with no children, aged less than 35		1.5	2.4	0.63
2 adults with no children, between 35 and 65		3.5	3.6	0.96
2 adults with no children, aged more than 65		18.8	15.3	1.23
2 adults, with 1 child		17.8	17.6	1.01
2 adults, 2 children		16.6	16.4	1.01
2 adults, more than 2 children		3.3	3.7	0.89
other households		11.3	11.7	0.97
Incomes quintiles	1	16.4	20.1	0.82
	2	16.7	19.5	0.86
	3	19.5	20.2	0.96
	4	21.6	20.0	1.08
	5	25.8	20.2	1.28
Residence area	north	52.1	48.3	1.08
	centre	24.7	19.7	1.26
	south	23.1	32.1	0.72

Households GOS contributes to 6,9% of GDP. Using Eu-silc it is possible to analyse which type of households mainly contributes to GOS and therefore to GDP.

In table 5 we analyse the so far estimated GOS by household typologies.

Households are grouped taking in consideration age-related variables and the household income level. The GOS quota of each group is compared with the population quota (in terms of number of

households). Whenever the GOS and population quota are equal, income is equally distributed among the households groups.

It is worth stressing how the contribution to GOS is mainly a matter of age and income level. The presence of aged components increases the likelihood of detaining a higher quota of GOS; the same happens for households belonging to the highest quintiles.

#### *4.1.1 Compensation of employees*

NA calculate compensation of employees as the sum of wages and salaries, employers' social contributions (actual and imputed), employees social contributions and taxes. On the other hand surveys collect data on wages and salaries net of taxes and employees social contribution.

In order to compare NA and survey figures is then necessary to focus on wage and salaries whose definition is approximately the same in both the sources. Tables 2 and 3 compare wages and salaries net of employees social contributions and taxes. Surprisingly, Eu-silc almost perfectly matches the NA aggregated value as if the survey were able to detect not registered workers income<sup>7</sup>.

In the following we deepen the analysis of wages and salaries in order to understand which elements affect the comparability among surveys and NA.

An in-depth analysis is shown in Table 6 and 7 which analyse employees and remuneration per capita values by economic activity.

Analysis by economic activity, though extremely interesting, is affected by the not so accurate estimate of the economic activity variable which often shows a consistent number of missing values in surveys. For what concerns Eu-silc moreover, the economic activity variable is collected with respect to the interview year whereas information on income applies to the year before. As a consequence the distribution of income by economic activity has been estimated only on a subset of sampled employees, namely the ones who declare not having changed job in the previous 12 months. This is obviously an approximation.

We observe a general better fit of Eu-silc estimates to national accounts data. Absolute differences computed for economic sector are on average smaller with respect to Shiw, both for per capita values, number of employees and wages and salaries.

The main point about the employees distributions is that surveys record lower weights for Services, in favor of Industry. The difference is particularly evident for the "Other services for business activities" where NA record almost 10% of employees whereas Shiw and Eu-silc account for respectively 4% and 6%. The "Other services: public administration, health etc" category is an exception. This is not a surprise since this sector is only marginally effected by non registered employment, which on the contrary affects strongly the other services activities. Generally we notice milder differences between Eu-silc and NA employee distributions, Eu-silc providing a sort of average distribution between the Shiw and NA.

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<sup>7</sup> In fact NA estimates include compensation of non registered workers which we do not expect to be completely detected by surveys.



Table 6 Employees by Economic activity, Italy, 2006

Economic activity (NACE Rev. 1 classification)	National accounts	Shiw	Eusilc*
Agriculture	2.9%	4.7%	2.7%
Industry	30.2%	35.4%	33.4%
- Industry (without construction)	23.5%	28.4%	26.8%
- Construction	6.7%	7.0%	6.6%
Services	66.9%	59.8%	63.8%
- Trade, hotel and restaurants	14.8%	11.7%	12.7%
- Transport storage and comm.	5.6%	4.6%	5.7%
- Financial intermediation	2.9%	3.4%	3.3%
- Other services for business activities	9.7%	3.8%	5.9%
- Other services (Public admin., education, etc)	33.8%	36.3%	36.1%
<b>Total economy</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

\* The economic activity refers to the current year (see text for details on the method used to calculate distributions)

Table 7 Per capita values of wages and salaries\* (ws) by economic activity, Italy, 2006 current euros .

Economic activity (NACE Rev. 1 classification)	National accounts		Shiw		Eu-silc**		
	WS	WS	Lower 95% limit	Upper 95% limit	WS	Lower 95% limit	Upper 95% limit
Agriculture	11,254	10,928	10,197	11,659	10,096	9,424	10,769
Industry	16,619	15,751	15,434	16,069	18,268	17,995	18,541
Industry (without construction)	17,351	15,975	15,620	16,330	18,781	18,474	19,088
Construction	14,067	14,849	14,144	15,554	16,180	15,607	16,754
Services	18,087	16,880	16,576	17,183	19,456	19,217	19,696
Trade, hotel and restaurants	16,761	13,427	13,006	13,848	15,287	14,929	15,645
Transport storage and comm.	25,613	17,936	17,155	18,716	20,855	19,952	21,758
Financial intermediation	30,985	26,713	24,197	29,229	27,460	26,268	28,652
Other services for business activities	16,522	16,271	15,272	17,270	17,979	17,178	18,780
Other services (Public admin., education, etc)	16,764	17,010	16,650	17,369	20,209	19,889	20,530
<b>Total economy</b>	<b>17,444</b>	<b>16,199</b>	<b>15,979</b>	<b>16,418</b>	<b>18,802</b>	<b>18,621</b>	<b>18,984</b>

\*Net of current taxes and employees social contributions; \*\* The economic activity refers to the current year (see text for details on the method used to calculate distributions)

Coming to wage and salaries per capita values, we notice lower values in the Shiw for every category with the only exception of Construction. On the other side Eu-silc reports higher remunerations even with respect to NA for some activities (Industry and the Other services in particular).

So, while Shiw tends to underestimate both the aggregated level of wages and salaries and the per capita values (except for Construction and Public administration, education and other services), Eu-silc almost perfectly matches the aggregated value of NA wages and salaries but, on average, it records higher remuneration levels.

In the following we analyse the distribution of employees by economic activity taking into account the distinction between registered and non registered employees in NA. Moreover we try to evaluate the degree of coverage of each survey with respect to NA .

Table 8 compare the surveys and NA distributions. with NA employees distribution considering registered and non registered employees\*separately.

Considering the total number of employees only, it appears that Shiw is able to detect some non-registered workers (see Columns 5 and 6) . Eu-silc instead shows a good coverage of the total number of registered employees (Columns 7 and 8).

As already observed, Eu-silc present lots of missing values for the economic activity variable. When including such units, the total number of Eu-silc employees overcomes the total number of NA employees (registered+non registered).

Table 8: Distribution of employees by economic activity considering registered and non registered workers – Italy, 2006.

Economic activity (NACE Rev. 1 classification)	Shiw employees (%)	Eu-silc employees (%)	NA employees (registered+ non-registered) (%)	NA employees		Eu-silc/NA (all)	Eu-silc/NA (registered)		
				(registered only)	Shiw/NA (all)				
Agriculture		4.7	2.7	2.9	2.0	156.0	256.2	85.5	140.5
Industry		35.4	33.4	30.2	32.2	113.1	120.1	97.3	103.4
- Industry (without construction)		28.4	26.8	23.5	25.5	116.7	121.3	99.7	103.7
- Construction		7.0	6.6	6.7	6.6	100.5	115.4	88.9	102.1
Services		59.8	63.8	66.9	65.8	86.3	99.1	83.4	95.7
- Trade, hotel and restaurants		11.7	12.7	14.8	14.6	76.4	87.4	79.5	90.9
- Transport storage and comm.		4.6	5.7	5.6	6.0	78.6	83.5	89.9	95.5
- Financial intermediation		3.4	3.3	2.9	3.2	112.9	116.7	99.2	102.5
- Other services for business activities		3.8	5.9	9.7	9.7	38.1	43.1	53.2	60.2
- Other services (Public admin., education, etc)		36.3	36.1	33.8	32.4	103.5	122.3	91.3	107.9
<b>Total economy</b>		<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>96.5</b>	<b>109.0</b>	<b>87.7</b>	<b>99.1</b>

Differences between surveys and NA can be due to the following reasons:

- i) NA compute the annual average of employees, whereas surveys estimate the number of employees at the moment of the year. As a consequence seasonal activities could be over-represented or under-represented according to the period when the person is interviewed. This could explain particularly the divergence in Agriculture.
- ii) Surveys likely do not detect all secondary activities. This could explain why, also when considering registered position only, trade, hotel and restaurant and services for business activities result to be under represented by surveys. Often secondary jobs are performed in this kind of activities.
- iii) Finally, the consistent divergence for the Other services for business activities sector can be explained considering that NA classifies here employees working for temporary employment agencies (about 10%). On the contrary in surveys we expect that these workers classify themselves according to the economic activity of the enterprise where they actually work.

Given for correct the NA estimate of employees, we try now to measure the impact on GDP due to the use of Eu-silc estimates of wages and salaries (see per capita values in table 7). As shown in table 9 the result is a higher aggregated amount of wages and salaries and a different distribution of wages and salaries among economic activities. In particular, the use of Eu-silc per capita remunerations leads to an increase of wages and salaries (about + 6%) and, indirectly, of GDP (about + 1.5%)

<sup>8</sup> Details on the method used to estimate non registered employees see Calzaroni 2001.

Table 9: Wages and salaries computed combining NA data on employees and Eu-silc data on per capita remuneration

Economic activity (NACE Rev. 1 classification)	Aggregated wages and salaries	new distribution	old NA distribution
Agriculture	5,543.7	1.6	1.9
Industry	103,393.6	29.6	28.8
- Industry (without construction)	82,916.2	23.7	23.4
- Construction	20,477.4	5.9	5.4
Services	240,822.3	68.9	69.3
- Trade, hotel and restaurants	42,504.0	12.2	14.2
- Transport storage and comm.	22,018.7	6.3	8.2
- Financial intermediation	14,924.5	4.3	5.1
- Other services for business activities	32,845.8	9.4	9.2
- Other services (Public admin., education, etc)	128,529.2	36.7	32.5
Total economy	349,759.6	100.0	100.0

In the following we analyse wages and salaries by household typologies assuming again that NA provide the “true” distribution of employees by economic activity. For this purpose it is necessary to re-calibrate the Eu-silc sampling weights so to obtain the correct distribution of employees by economic activity<sup>9</sup>.

Next, households are grouped on the basis of the same classification criteria used for the analysis of GOS (see table 5). Results are shown in table 10.

The last column of table 10 is computed as the ratio between the wage and salaries quota and the population quota (in terms of number of employees) recorded by each household group. Ratios higher than one identify household typologies that more contribute to wage and salaries (and therefore to GDP). Among these we find households whose members are in central age classes, households living in North and Central area and households belonging to higher income quintiles. It is worth noticing that the presence of children does not affect negatively the distribution of wages and salaries among household groups.

The analysis performed so far allows to better understand the linkage between micro and macro and analysing the wages and salaries macro variable by socio-economic groups of households.

<sup>9</sup> After the re-calibration process, Eu-silc wages and salaries total is lower (341,993) and closer to the NA value (see table 3).

Table 10: Distribution of Wages and salaries and employees by household typologies – Italy 2006.

Household typology		A Wages quota	B population quota	A/B
Number of households components aged less than 18	0	57.4	60.7	0.9
	1	23.8	21.8	1.1
	2	16.2	14.9	1.1
	3 and more	2.5	2.6	1.0
Number of households components aged less than 35	0	22.7	26.5	0.9
	1	29.2	30.3	1.0
	2	35.0	29.8	1.2
	3	10.4	10.4	1.0
	4 and more	2.7	3.0	0.9
Number of households components between 35 and 64 years	0	12.3	16.3	0.8
	1	26.3	31.5	0.8
	2	60.0	50.9	1.2
	3 and more	1.4	1.3	1.0
Number of households components aged more than 64 years	0	88.6	85.2	1.0
	1	8.2	10.5	0.8
	2 and more	3.2	4.4	0.7
Number of households components	1	12.1	16.2	0.7
	2	18.8	20.9	0.9
	3	29.2	28.7	1.0
	4	31.5	26.5	1.2
	5	7.1	6.4	1.1
	6 and more	1.3	1.2	1.1
Age of reference person	less than 35	12.6	14.6	0.87
	35-50	42.5	40.6	1.05
	50-65	35.8	32.4	1.11
	65-75	5.9	8.1	0.73
	more than 75	3.2	4.5	0.71
1 component, aged less than 35		2.9	4.5	0.6
1 component, between 35 and 65		8.9	10.7	0.8
1 component, aged more than 65		0.3	0.9	0.4
2 adults with no children, aged less than 35		3.8	3.8	1.0
2 adults with no children, between 35 and 65		9.3	8.7	1.1
2 adults with no children, aged more than 65		0.7	1.6	0.4
2 adults, with 1 child		25.9	25.0	1.0
2 adults, 2 children		29.7	24.9	1.2
2 adults, more than 2 children		6.1	5.5	1.1
other households		12.5	14.4	0.9
Incomes quintiles	1	2.1	6.9	0.3
	2	7.7	14.5	0.5
	3	15.7	21.2	0.7
	4	27.7	27.5	1.0
	5	46.9	29.9	1.6
Residence area	north	52.7	49.1	1.1
	centre	20.8	19.6	1.1
	south	26.5	31.3	0.8

## 4.2 Balancing GDP preliminary estimates in a Social accounting matrix

As it is well known, inconsistent data are an inherent problem in NA, being impossible to directly estimate a balanced system of national accounts. Available information is fragmentary and sometimes

unreliable, furthermore it is necessary to incorporate data from a variety of sources which often provide inconsistent information. Therefore in national accounting it is custom to start with a first set of estimates (initial or raw estimates) and to reconcile such estimates through a matrix balancing.

At the moment the Italian GDP results from a balancing procedure which reconciles preliminary estimates of GDP based mainly on the production and expenditure approaches. Supply and use tables provide the accounting framework for the balancing.

Final estimates must satisfy the following accounting constraints.

- 1) for each economic activity production equals intermediate consumption plus value added;
- 2) for each product, production plus imports must equal the sum of intermediate consumption, exports, final consumption expenditure, gross fixed capital formation.

The Supply and Use scheme allows to comply with the fundamental equations of the accounting framework, monitoring, at the same time, the values of aggregates with a significant economic relevance. In order to balance the Supply and Use tables, about 80 balancing equations have to be satisfied.

The balancing procedure derived from the Stone, Champernowne and Meade method (Stone R. *et al.* 1942), is based on an application of the generalised least squares method that allocates discrepancies on the bases of a variance matrix<sup>10</sup>. Variances are estimated using a priori information on the accuracy of each flow estimate. The quality and completeness of data sources as well as the reliability of the estimation procedure are taken into account for estimating variances: the higher the variance, the larger the potential revision of a flow.

For the time being, none of the flows included in the balancing procedure is estimated using household budget data with the only exception of final consumption which incorporates data from the Istat Survey on Households Budgets (see Istat 2000).

We think that household income data could be incorporated in the balancing procedure using a Social accounting matrix (instead of Supply and Use matrices), as balancing framework.

A SAM is a square matrix where each column-row pair represents the budget account of an economic actor (economic activities, commodities, factors of production, institutions). Columns record expenditure whereas rows record receipts. Each cell presents a payment from the economic actor in column to the economic actor in row. Following the convention of double-entry bookkeeping, total receipts (row total) and expenditure (column total) of each actor must balance.

The structure of a simple SAM is given in table 11.

A SAM can be viewed as an extension of Supply and Use tables (which correspond to the first two column-row pairs of a SAM) aimed at linking production and final uses.

The monetary flow from Factors to Institutions marks the passage from production to final uses. In fact, at this stage, the economic agents receive income (for having provided labor and capital in the production process) necessary to support their consumption and investment.

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<sup>10</sup> See Mantegazza S., Mastrantonio L. (2003)

Table 11 The basic framework of a Social Accounting Matrix

	Expenditure						
Receipts	Commodities	Economic Activities	Factors	Institutions	Rest of the world	Accumulation	Total
Commodities		Intermed. inputs		Final consumption	Exports	Gross capital formation	
Economic Activities	Output at basic prices						
Factors		Value added			Comp. of employees		
Institutions	Indirect taxes on imports and products		Factor income		Capital income and current transfers	Capital transfers	
Rest of the world	Imports		Comp. of employees	Capital income and current transfers		Borrowing/Lending	
Accumulation				Capital transfers and saving	Capital transfers		
Total							

The Italian national account office estimates the remuneration of factors taking into account the producer viewpoint only, i.e using mainly data on production costs. For what concerns General government we can reasonably assume that paid income are accurately estimated since the estimates are based on administrative exhaustive sources and the sector is not affected by underground economy. On the contrary we expect a much greater discrepancy between paid and actually earned income for the production of the other institutional sectors. The use of the SAM as balancing matrix would bring such discrepancies in the balancing process since estimates on paid and earned income would “enter in competition”.

In order to clearly point out the contribution of household income micro data in the NA balancing process, we have built a SAM for Italy, moving from NA available data (see table 12).

With respect to the table 11 more simplified SAM, the Institution account is now subdivided into three sub-accounts entitled to Households, Corporation and General Government (including non profit institutions).

The grey cells record monetary flows whose estimation could benefit from Eu-silc and Shiw information. In fact, these cells record the monetary entries and outlays of households in the primary and secondary distribution of income and in the use of saving.

In particular, for what concerns GDP, Eu-silc and Shiw could provide the preliminary estimates for the cells at the cross between the Factor (column) and Households (row) accounts which record wage and salaries and gross operating surplus according to the receiver perspective.

Table 11 A Social Accounting Matrix which fits National accounts – Italy – 2006 – current million euros -

	Commodities (CPA)									Economic activity (NACE)						Factors			Institution				Accumulation	Total						
	Agriculture	Industry without construction	Constr.	Trade, hotel and restaurants	Transport storage and comm.	Financial intermed.	Other services for business activities	Other services (Public admin., education, etc)	Agriculture	Industry without construction	Constr.	Trade, hotel and restaurants	Transport storage and comm.	Financial intermed.	Other services for business activities	Other services (Public admin., education, etc)	Wage and salaries	Gross operating surplus	Net indirect taxes	Households	Corporations	General government, Non profit institution			Rest of the world					
Agriculture									6,600	33,835	68	7,385	476	8	513	606				34,018		327	5,817	752	90,404					
Industry without construction									10,415	568,584	63,073	103,619	44,413	3,058	24,784	39,897				411,808		12,499	342,275	143,605	1,768,031					
Construction									213	7,582	17,614	4,227	6,681	677	6,310	4,455				7,146		542	649	145,207	201,303					
Trade, hotel and restaurants									415	28,195	3,542	32,540	7,736	950	6,259	4,682				116,143		515	10,858	2,916	214,752					
Transport storage and comm.									278	19,466	5,322	24,549	39,973	4,011	12,259	6,900				45,570		3,271	19,299	0	180,899					
Financial intermed.									882	14,390	3,617	10,814	6,061	31,832	10,434	6,514				38,217		0	6,700	0	129,460					
Other services for business activities									530	68,218	17,067	86,053	30,279	13,513	68,034	35,319				135,297		8,107	24,192	27,074	513,683					
Other services (Public admin., education, etc)									196	9,866	1,882	7,753	2,269	614	3,702	26,413				83,569		279,674	4,379	1,505	421,820					
Agriculture	46,358	627	0	623	0	0	3	0																	47,611					
Industry without construction	0	985,477	1,989	24,931	470	0	16,383	597																	1,029,847					
Construction	0	0	183,356	572	29	0	7,871	748																	192,576					
Trade, hotel and restaurants	1,058	36,294	322	421,685	7,095	0	10,598	2,945																	479,997					
Transport storage and comm.	0	1,190	255	3,428	218,412	0	12,729	0																	236,014					
Financial intermed.	0	0	22	0	4	116,695	1,070	0																	117,791					
Other services for business activities	0	4,329	624	4,266	1,215	0	414,938	381																	425,754					
Other services (Public admin., education, etc)	4	2,244	225	1,162	353	0	790	398,834																	403,613					
Wage and salaries									9,197	150,777	33,440	79,405	45,516	33,992	54,785	201,753								1,790	610,654					
gross operating surplus									21,874	116,783	44,393	117,040	49,332	24,605	229,719	66,765									670,512					
net indirect taxes									-2,990	12,150	2,559	6,612	3,279	4,531	8,954	10,310									45,404					
Households																	608,548	325,658		5,481	226,708	275,985	31,248	12,042	1,485,670					
Corporations																		319,499		65,188	122,185	26,955	41,112	35,634	610,573					
General government, Non profit institution																														
	31,863	386,944	13,888	-255,368	-61,926	6,562	23,550	15,084									25,355	48,839		371,272	57,546	5,255	5,074	5,143	679,081					
Rest of the world	11,121	350,926	622	13,453	15,247	6,203	25,751	3,231												2,106		-3,435	10,664	46,593	40,379	1,354	-25,407	498,807		
Accumulation																										161,296	157,542	25,571	4,061	348,470
Total	90,404	1,768,031	201,303	214,752	180,899	129,460	513,683	421,820	47,611	1,029,846	192,576	479,997	236,014	117,791	425,754	403,613	610,654	670,512	45,404	1,485,670	610,573	679,081	498,807	348,470						

Source of data: Istat data from Supply and Use tables and Institutional sectors accounts (see www.istat.it)

## Conclusions

As it is well known NA statistics are the result of the integration of several data sources. At present, sample surveys data on households income are not used as an input for estimating the Italian NA aggregates. This is one of the reason which prevents an independent estimate of GDP on the basis of the so called income approach. Furthermore it is not possible to provide any details on the distribution of income in the NA macro context.

In this paper we have tried to assess whether and to what extent the Bank of Italy survey on households budgets (Shiw) and the European Statistics on Living condition (Eu-silc) might contribute to the estimate of the GDP income components. To this purpose NA and surveys data on compensation of income, mixed income and operating surplus have been fully harmonized and compared.

Our analysis suggests that surveys data (Eu-silc in particular) would provide valuable information especially for the computation of wage and salaries. One of the main finding is that Eu-silc data on wages and salaries perfectly match the NA aggregate. Eu-silc seems to be able to detect not regular workers and their remuneration.

We have then focused on household gross operating surplus and wages and salaries with a twofold purpose: i) obtaining NA-harmonised estimates through the combination of surveys data and NA methodologies; ii) showing the analysis of the macro variables by households typologies in order to point out which households groups contribute more to GDP.

Finally we have tried to envisage how to incorporate survey data in the balancing process which leads to the estimate of the Italian GDP. The idea is to use a Social Accounting Matrix (SAM) instead of Supply and Use tables as balancing framework. In this work we have built a SAM for Italy using already balanced NA data and pointed out the cells for which surveys could provide the preliminary estimates to be balanced.

One of the main finding of the paper is that Eu-silc estimates of wages and salaries match almost perfectly NA macro estimates. The use of Eu-silc data for the estimate of NA wages and salaries would have two main advantages: a more accurate estimate of wages and salaries at least for some categories of employees, the possibility of analysing compensation of labour according to the employee's characteristics and those of her/his household. Furthermore a more intensive use of household income data would enforce the household perspective in NA, in line with the increasing demand of statistics focused on people well being and social progress (see Stiglitz et al., 2009).<sup>11</sup>

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<sup>11</sup> The Commission on the Measurement of Economic Performance and Social Progress suggest to emphasise the household perspective in statistic (see recommendation 2).



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