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**Analyzing the Distribution of Income: How to Account for the Underground Economy  
in the Household Income Micro Datasets**

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## **Analyzing the Distribution of Income: How to Account for the Underground Economy in the Household Income Micro Datasets**

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**Abstract** In statistically developed countries information on households economic behaviour is provided by several data sources. National accounts (NAs) describe the economic performance of households from a macro perspective allowing economists to understand relationships between income, consumption and saving within a consistent and integrated framework. On the other hand, sample surveys on households budgets provide insight on the economic behaviour of single families but are not able to capture all the income components estimated by NAs. In Italy, surveys strongly underestimate self-employed and property income. In fact interviewed people often under-report (or not report at all) income exactly as they do with fiscal authorities. This paper is finalized to propose a method for imputing “hidden” income to the Italian Silc households’ income, using the NAs statistics as benchmark. Subsequently income inequalities indicators are calculated on Silc un-imputed and imputed data.

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## 1. Non Observed Economy

The increasing use of national accounts statistics as the basis for levying contribution and distributing subsidies in Europe has required Member States to ensure the “exhaustiveness” of their Gross Domestic Product (GDP) estimates. The production boundary, on which Gross Domestic Product (GDP) is defined, includes all production actually destined for the market be it legal or illegal (as long as these activities are willingly engaged by buyers and sellers). The estimate of the so called non-observed economy is one of the major challenge for official statisticians in charge of pursuing the GDP exhaustiveness.

According to the definition in the OECD Handbook, Non Observed Economy (NOE) includes all the economic activities which should be included in GDP but which cannot be measured by available data sources (OECD, 2002). Non Observed Economy encompasses the following components: i) underground or hidden production: activities that are legal but deliberately concealed from public authorities in order to avoid paying tax (e.g. VAT or income tax) or social security contribution; ii) informal activities: legal production activities characterized by a low level of organization; iii) illegal economy: activities which are forbidden by law or which become illegal when carried out by unauthorised persons; iv) activities omitted due to deficiencies in the basic data collection system (statistic underground).

In 2005-2006, the UNECE secretariat carried out a survey of countries practices in estimating non-observed economy in national accounts (UNECE, 2008). Forty-five countries answered the questionnaire, providing details on the estimation methods currently used. Countries used a wide variety of methods for estimating underground production. The various techniques spanned the three main approaches: production approach, expenditure approach and income approach. Within these three main categories the following methods can be mentioned: the labour input method, the commodity flow method, balancing input-output and supply-and-use tables, other reconciliation methods (e.g. comparison of theoretical VAT and actual VAT, theoretical income tax and actual income tax). The UNECE survey shows that the size of the adjustments for the non-observed economy varies widely across countries. In general, adjustments made using the expenditure approach are lower than those made using the production and income approach. This probably indicates a better coverage of the data sources used to estimate production and income.

NAs provide estimates of the GDP stemming from non-observed economy but they do not allow to measure its impact on income distribution. On the other hand, households budgets sample surveys as well as administrative registers are not able to capture hidden economy since interviewed people tend to under-report earned income exactly as they do with fiscal authorities. In countries with high rates of hidden GDP, inequality indicators based on households income surveys data are probably distorted. This is the reason why countries more often use households consumption (instead of income) micro data to calculate poverty and inequalities indicators. However there is evidence that households surveys under-estimate consumption expenditure with respect to NAs as well (Coli, Tartamella 2008).

In the following section we propose a method to impute “hidden income” to the EU-Silc<sup>1</sup> records. The application refers Italy, for the year 2008.

## 2 Hidden income in NA and self-employment incomes in Households accounts

In this section we propose a method to impute income stemming from underground economy to the Eu-Silc households income. The application concerns the Italian households for the year 2008.

The Italian method for estimating underground production assumes that hidden economy stems mainly from: i) the use of non-registered labour ii) the under-reporting of turnover, due to the under-reporting of legal production and/or over-reporting intermediate costs.

The methodology used to estimate *non-registered labour* relies on the integration of several sources and it is based on the comparison of supply (population census, labour force survey) and demand (census on enterprises and other administrative records) sources of employment made at the maximum level of detail (Nace, region, status in employment). This leads to the estimation of the following six main components of employment, disaggregated by economic activity:

- registered main jobs,
- non registered jobs,
- multiple registered jobs,
- multiple non registered jobs,
- other non registered jobs,
- foreign workers

The estimate of underground economy computed through *reevaluation of turnover*, instead, uniquely relies on business surveys (and business administrative record – profits and losses accounts). It is based on the analysis of total of costs and receipts declared by the enterprises, following A. Franz (1985). The net result obtained is compared with the compensation of employees: if it is lower than the firm is classified as “under-declaring” and its receipts are revalued. The underlying hypothesis is that net enterprise income should guarantee to self employed a remuneration not lower than the compensation of an employees working in the same economic activity field and with analogous working time<sup>2</sup>. If the economic flows are not coherent with this hypothesis, it is assumed that the self employed did not declare all entries or pushed up the intermediate costs. Those enterprises found in this condition are identified as under declaring and therefore are subject to revaluation (a more detailed explanation of the method is described in the appendix).

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<sup>1</sup> European Union Statistics on Income and Living Conditions

<sup>2</sup> In fact, if the self employed should be in a position to earn less than an employees with the same characteristics, then the hypothesis is that he/she would prefer to modify his/her occupational status from self-employed to employees, to increase his/her income.

The Value added derived from the methodologies used to guarantee the exhaustiveness of Gross domestic product enters in the flows of the allocation of primary incomes distributed to households. In fact, the revaluation of value added to account for underground economy mainly impacts on small enterprises: non-registered full time equivalents units (FTEUs) are concentrated in enterprises with 1-19 workers and at the same way most of the revaluation operated on turnover (or reduction of declared costs) takes place in enterprises in the same class size. Nearly all self-employed work in these enterprises. Therefore the value added generated by underground economy is devoted to financing the enterprises or is distributed to consumer households, mainly through *self-employment income*.

The Italian economic system is characterized by a relevant presence of small enterprises: in 2009, 95% of market enterprises in Industry, construction and services sectors employ less than ten workers. Moreover self-employed account for 28% in terms of FTEUs and just less than 25% in terms of persons employed. Productive units classified in the household sector generate more than 20% of the total value added. To better interpret households generation and use of income, Italian NA estimates a full sequence of accounts for producer households separate from the one estimated for consumer households, i.e. households seen in their function of consumption and saving<sup>1</sup>.

Consumer households account of primary income displays the three flows of income remunerating self-employment activities and distributed to the household for consumption and saving, according to the sector or subsector where the self-employed works:

- A. Share of mixed income distributed to consumer households
- B. Withdrawals from the income of quasi-corporations (D422)
- C. Other income distributed from corporations (D423)

The first flow is the remuneration of self-employed working in producer household sector<sup>2</sup>: the enterprises classified in this sector are characterized by the absence of a net separation between the firm and its owner(s)<sup>3</sup>. To guarantee the firm development and therefore the future sustainability to household consumption and saving, not all mixed income is transferred to the household, as it is necessary to keep in the firm disposal what is necessary to replace capital consumption, to pay interest on loans taken out to finance the market activity, to pay rents for land used for agricultural production and taxes which accrue to the enterprise. The share of mixed income transferred to consumer households accounts for about 16% of their primary income.

The operational definition chosen to select the productive units to be classified as producer households, letting the remaining units in the corporation sector, implies the

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<sup>1</sup> The distinction, between Producer and Consumer Households not only allows to better interpret the productive and distributive flows of the two sub-sectors, but especially to better represent households saving and investment rates: the accumulation of saving is, in fact, a typical function of households as consumer units. The compilation of two separate set of accounts for the two sub-sectors is based on the assumption that the assets of enterprises classified as Producer Households only include financial and non financial assets and liabilities which are functional to market activities.

<sup>2</sup> For firms operating in all sector of economic activities excluding financial services: unincorporated enterprises employing up to 5 employees, for firms operating in financial services employees: unincorporated enterprises with no employees.

<sup>3</sup> The share of mixed income which is distributed to the consumer household is therefore computed by deducting from mixed income: consumption of fixed capital (K1), paid interests (D41PAY), rents (D45PAY), taxes on income (D5) accruing to producer households.

existence of self-employed workers in the corporation sector (about 30% of self-employed), which derogates from ESA95 definitions. This choice rests with the economic features of Italian productive system, where most proprietors of small and medium enterprises do personally work in their firm, regardless its legal status<sup>1</sup>. Self-employed working in this sub-sector of corporation account for about 20% of total self-employed and are remunerated through Withdrawals from the income of quasi-corporations (D422). The remaining self-employed (about 10%) work in small<sup>2</sup> limited liability companies (S.r.l.) or cooperatives, treated by definition as separated entities with respect to their owner, regardless of their size. They are remunerated through the flow Other income distributed from corporations (D423).

To estimate the share of corporation gross operating surplus distributed to households through the flows B and C mentioned above, the same approach of distribution of mixed income is followed: a proxy of profit, net of fixed capital consumption, is estimated for quasi-corporations and small limited liability companies by compiling a complete sequence of accounts for these sub-sectors, where self-employed are concentrated. This is the amount distributed to households, D422 summed to D423 account for 10% of consumer household primary income.

These three flows are recorded among primary incomes of consumer households, namely they are included in property incomes received, contributing to more than 26% of primary income formation.

It is therefore clear as a relevant share of the revaluation of value added coming from underground economy is distributed to households. It is worth stressing that self employment income is not estimated independently (Italy estimates GDP independently from the supply and the offer side, not from income side), its estimate directly derives from value added estimates (conducted at a high level of detail).

Household surveys are not used as input in national accounts, exception made for labour force survey used to estimate FTEUs. In particular, surveys on households income do not enter in the process of national accounts estimates, while they could instead supply useful information about household behavior. Value added (and consequently self employment incomes) estimates are based on information derived from structural business surveys, administrative survey and other data sources, always on enterprises.

Istat survey on household incomes, Eu-Silc, records self employment income, together with any other flow of income received. Using the information of legal form and size of enterprises declared by self employed in the survey, it is possible to classify the declared income in the three A-B-C flows computed in National accounts.

There is also a share of respondents who perceived self employment income but did not declare themselves as self-employed or did not state the legal status or class size or economic activities of the enterprise. They have been classified as working in a firm of the producer household sector, thus receiving mixed income, they are almost 30% of persons receiving self employment income. Some of them declared themselves as employees or retired. They are therefore self-employed as secondary job, but it is not possible to bring them into full time equivalent from the information available. Almost

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<sup>1</sup> In Italy the unincorporated units classified as non-financial quasi-corporations are all unlimited partnerships regardless of their size, together with simpler partnerships and sole proprietorships, provided they have more than five employees. Such enterprises are assumed to be separate entities with respect to their owners; as a consequence, their financial assets and liabilities and their real assets are assets/liabilities of the corporate sector.

<sup>2</sup> Up to 19 persons employed.

one third of them (irrespective from the status in employment declared) get an amount that approaches the average wage of employees.

Istat operates a correction on values declared by households integrating them with fiscal record: a micro linkage is operated between the survey and fiscal records: the higher among declared income and fiscal income is kept as valid (Consolini, 2009). Normally it is assumed that households tend underestimate less their incomes when answering to household survey, than when compiling fiscal declaration or when answering to business surveys. Even if this is true and even integrating the survey with fiscal data, survey records for 2008 just 71% of the income estimated by national accounts.

Table 1 shows the amount of gross self employment income registered by Eu-Silc and the National accounts values. It is especially the flow “Other income distributed from corporation” that fall short the NA value, while mixed income is closer to NA value. It is true that all self employment incomes that could have been not classified in the three flows since the information about legal status is missing or that did not declared themselves as self employed, have been attributed to mixed income (and the revaluation procedure has not been applied on this sub-set of potential self-employed).

**Table 1: Self employment income in Eu-Silc and in National accounts, 2008, millions of euros**

	<b>Eu-Silc</b>	<b>NA<sup>1</sup></b>	<b>Eu-Silc/NA %</b>
Share of mixed income distributed to consumer households	161.452	164.005	98
Withdrawals from the income of quasi-corporations (D422)	28.260	59.331	48
Other income distributed from corporations (D423)	9.371	58.487	16
<b>Total self employed income</b>	<b>199.082</b>	<b>281.823</b>	<b>71</b>

### 3 Imputing hidden income at the micro level

We tried to replicate the methodology used by NAs to re-evaluate value added. This is done only for those persons declaring themselves as self employed, for at least one month (to be able to compute an annual per capita value) and who gave information about sector of economic activity and class size. The procedure is described in the appendix.

As a result, the self employment income is 22% higher than the original value.

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<sup>1</sup> Na published value also include actual rents received by households, which are recorded as producer household production since it is market production. The table reports instead only the share of distributed income that remunerate self employment income, the share due to actual rents have been subtracted.

This correction leads Eu-Silc to represent 86% of NAs corresponding total self-employment income (table 2). The correction affects less the flow “Other income distributed from corporations”, which is revalued by 16,5%. after revaluation the share of mixed income distributed to consumer households overcome the NA value, while the other flows (especially D423) are still considerably lower than the NA amounts. This could be due to mis-classification of self employed: some of those who did not state their characteristics and hence have been classified as working in the producer household sector should have been placed in the other sub-sectors.

**Table 2 Self-employment income in Eu-Silc, revalued, and in National accounts, 2008, millions of euros**

	<b>Eu-Silc revalued</b>	<b>NA</b>	<b>Eu-Silc revalued /NA %</b>
Share of mixed income distributed to consumer households	198.158	164.005	121
Withdrawals from the income of quasi-corporations (D422)	34.572	59.331	58
Other income distributed from corporations (D423)	10.921	58.487	19
<b>Total self employed income</b>	<b>243.652</b>	<b>281.823</b>	<b>86</b>

Table 3 compares FTEUs by sub-sectors. If all persons getting self employment income are classified as self employed, computing FTEUs (in annual average) only for those stating all characteristics which are necessary to classify them into sub-sectors are considered, and counting each of the other as one FTEU, the total number of self employed exceed NA FTEUs, especially for producer households. If, instead, only those which is possible to classify are counted, then Eu-Silc represents 72% of NA total self employed. Of course, those that can not be classified, should be counted, but not always as entire FTEU or not necessarily in the producer household sector. This is more clear when analysing per capita values, tables 4A and 4B. The revaluation process considerably approaches per capita values to NA amounts, especially when considering only those persons who stated all necessary characteristics to classify them in the three flows and to compute per capita value and operate the revaluation process. If only those persons are considered, the per capita compensation of total self employment income from Eu-Silc revalued almost equal the NA one<sup>1</sup>.

It is especially the number of self employed working in the corporation sector that fall short the NA one, this could derive from a sampling problem of Eu-Silc, or just from an incorrect classification of self-employed surveyed.

<sup>1</sup> Probably in this case the per capita EuSilc remuneration overestimate the “real” survey average, it is quite likely that marginal workers, who earn less, are not taken into account.

**Table 3 FTEUs in Eu-Silc and NA by sub-sector, thousands**

	Eu-Silc	NA <sup>1</sup>	Eu-Silc/NA %
producer households	6.377	4.656	137
<i>Of wich: only persons declaring all characteristics necessary for classification into sub-sectors</i>	3.920		84
Quasi -corporations	798	1.396	57
Other corporations	213	795	27
<b>Total self employed</b>	<b>7.388</b>	<b>6.847</b>	<b>108</b>
<i>Of wich: only persons declaring all characteristics necessary for classification into sub-sectors</i>	<b>4.931</b>		<b>72</b>

**Table 4A per capita values in Eu-Silc (original values) and NA by sub-sector, thousands of euros**

	Eu-Silc	NA	Eu-Silc/NA %
Share of mixed income distributed to consumer households	25,3	35,2	71,9
<i>Of wich: only persons declaring all characteristics necessary for classification into sub-sectors</i>	29,9		84,8
Withdrawals from the income of quasi-corporations (D422)	35,4	42,5	83,4
Other income distributed from corporations (D423)	43,9	73,5	59,7
<b>Total self employed income</b>	<b>26,9</b>	<b>41,2</b>	<b>65,5</b>
<i>Of wich: only persons declaring all characteristics necessary for classification into sub-sectors</i>	<b>31,4</b>		<b>76,2</b>

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<sup>1</sup> Data on FTEUs by sub-sectors of corporations are based on provisional internal estimates.

**Table 4B per capita values in Eu-Silc (revalued) and NA by sub-sector, thousands of euros**

	<b>EuSilc revalued</b>	<b>NA</b>	<b>Eu-Silc revalued/NA %</b>
Share of mixed income distributed to consumer households	31,1	35,2	88
<i>Of which: only persons declaring all characteristics necessary for classification into sub-sectors</i>	39,2		111
Withdrawals from the income of quasi-corporations (D422)	43,3	42,5	102
Other income distributed from corporations (D423)	51,2	73,5	70
<b>Total self employed income</b>	<b>33,0</b>	<b>41,2</b>	<b>80</b>
<i>Of which: only persons declaring all characteristics necessary for classification into sub-sectors</i>	<b>40,4</b>		<b>98</b>

The problem lies therefore in the correct representation of self employed. This could be achieved in three ways, that should all be pursued:

1. correct classification and computation in annual average of persons not declaring the necessary characteristics. This could be achieved with a micro linkage with administrative sources, namely the fiscal declaration made by firms where they state the amount paid to self employed. In this way it is possible to dispose of information about the enterprise (Nace, legal form, class size). The number of months worked should instead be estimated considering the amount paid.
2. estimate of non-registered FTEUs NA FTEUs include, in fact, also non registered self-employed. Some of these could be detected among Eu-Silc FTEUs, but not all of them, it is necessary to be able to identify all non registered self-employed. This could be done disposing of the original information declared by the households before the integration with fiscal records. Given that there are cases in which somebody declared a positive amount of self employment income which is not registered in fiscal data, the comparison between fiscal records and the survey values could allow to estimate a model to detect some non registered positions. It would mean to try to replicate the NA methodologies not only to correct per capita values, but also the one to estimate the labour input.
3. correction of NAs amounts. The number of current estimates of registered self-employed relies on the use of business register based on administrative records. The imputation procedure is based on the hypothesis that there should be at least one self-employed for each firm, to organize and coordinate all business activities. The procedure adopted could lead to mis-represent the

number of self-employed, especially in the corporation sector. This will be verified in the next revision of registers, where this hypothesis (one firm-one self-employed) should be released, since all registered workers should be imputed only strictly relying on administrative sources.

To operate the procedures described in step 1 and 2 it is necessary a closer cooperation among national accountants and the survey expert and especially to dispose of the full set of information about each self employed: all survey values and all his/her fiscal record, not only personal fiscal declaration, but also fiscal declaration that each firm has to compile relatively to self employed. They are the data sources Istat relies on to compile the new enterprise census.

It is not possible at this stage to operate these correction, it is quite complicated and needs a cooperation among different sector of data production and the integration of different data sources. But it is not impossible, moreover the data integration is one of the characteristics and tasks of the National Accounts department. This is in the agenda of future research.

#### **4 The impact of hidden economy on income distribution: some preliminary results**

Table 5 shows some indicators calculated on Eu-Silc original and revised disposable income.

We introduce three different figures for revised disposable income:

- Revised 1: the disposable income differs from the original one only for the adjusted for underground economy described in paragraph 3, i.e. it includes the correction to self-employment income.
- Revised 2: the self-employment income has been grossed up to NA, so that the total Eu-Silc revalued equals NA.
- Revised 3: not only self employment income, all income flows (compensation of employees, property incomes, taxes paid, social benefits and other transfers etc.) have been brought to NA values

**Table 5 Some statistics on the EuSilc original and revised data – Italy, 2008**

	<b>Eu-Silc Disposable Income (current euro)</b>			
	<b>Original</b>	<b>Revised 1</b>	<b>Revised 2</b>	<b>Revised 3<sup>1</sup></b>
1st Q.	15137	15988	15612	21305
Median	24309	26002	25265	32282
Mean	29606	31396	32929	41776
3 rd Q.	38436	41156	40432	49693
Standard deviation	25359	26130	45436	50774
Variation coefficient	0.86	0.83	1.38	1.22
Gini coefficient	0.37	0.368	0.404	0.374

We can observe that income revision for underground economy makes inequality (Gini coefficient) and variability (variation coefficient) slightly decrease. Grossing up to NA values, instead, increases inequality, this is due to the fact that it is Other incomes distributed from corporations, the highest per capita self-employment income typology among those analysed, that have to be grossed up by the highest percentage. If instead all other incomes (wages and salaries, social benefits, other property incomes etc.) are grossed up to the correspondent NA values, the inequality and variability decrease. This could be due to the fact that all other income flows are, on average, underestimated in the survey with respect to NA. Therefore with this last revision all flows are increased, also low income, this increase is proportional for each flow and therefore impacts more on low incomes, therefore the concentration (and variability) decreases.

## 5 Main conclusions

National accounts statistics are the result of the integration of several data sources, this guarantee the exhaustiveness of GDP estimates. At present, sample surveys data on households income are not used as an input for estimating the Italian national accounts aggregates. This is one of the reason which prevents an independent estimate of GDP on the basis of the so called income approach. This also prevent to go further the macro analysis on households and to examine the household sector also by group of households, to evaluate the impact of economic policies or macroeconomic shocks on the distribution of income.

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<sup>1</sup> To be more consistent with survey values, macro aggregates have been computed net of amount referred to population not covered by micro sources (persons living in collective households and in institutions, illegal immigrants). For this reason, National Accounts published data computed per household may slightly differ from the amount shown in the table.

In this paper we have tried to assess whether the European Statistics on Living condition might be fully harmonized with National Accounts not only for concepts and definitions but as well as computation model and especially as adjustment for underground economy.

Our analysis, though preliminary, suggests that household surveys data would provide valuable information to understand the impact of the adjustment for underground economy on the distribution of household income and to guarantee the exhaustiveness also from the distribution of income side.

National accounts have traditionally given relevance to the analysis of productive processes and final uses of income, while instead households have been given low attention. This perhaps may help understanding while in NAs the need of new and rich statistics on households income has not been compelling for years. Nowadays, even in official statistics the interest is moving from production units to people in order to supply indicators of economic growth as well as of people well-being and happiness. The estimate of this new set of indicators asks for a strongest and better integration of “people” data in the national accounts framework. This is in line with the recommendations of the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz et al., 2009). In fact, one of the key recommendations of the Report is “to shift emphasis from measuring economic production to measuring people’s well-being” (p. 12, Stiglitz et al. 2009). As suggested in the Report itself, this objective may be achieved emphasising the household perspective in national accounts.

## References

- Ascione, Carucci, Chiccholo, Ciaccia, Santoro, 2012, The Household sector in Italy: an analysis for producer and consumer units, UN economic and social council, Conference of European Statisticians, Group of Experts on National Accounts  
[http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.20/2012/14\\_ISTAT\\_HH\\_sector.pdf](http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.20/2012/14_ISTAT_HH_sector.pdf)
- Brandolini, A.: The Distribution of Personal Income, in Post-War Italy: Source Description, Data Quality, and the Time Pattern of Income Inequality, Temi e discussioni, Banca Italia, 1999.
- Calzaroni, M., “The exhaustiveness of production estimates: new concepts and methodologies”, International Conference on Establishment Surveys, Buffalo, USA, 17-21 June, 2001
- Coli A., Tartamella F.: Income and consumption expenditure by households groups in National accounts, Iariw Conference, Portoroz, Slovenia, August 2008.

- Coli A., Tartamella F.: Micro-Macro Integration: Survey Data on Household Income for the Estimate of the Italian GDP, Iariw Conference, St. Gallen, Switzerland, August 2010.
- Consolini P. (2009), "Integrazione di dati campionari Eu-Silc con dati di fonte amministrativa", Collana Metodi e Norme Istat, 38, Roma.
- Eurostat (1995) European system of Accounts
- Eurostat (2010). Cross Sectional UDB (User Data Base)
- Faramondi, F. Foschi, A. Puggioni, 2006, "Le innovazioni introdotte nel trattamento dei dati di impresa per le stime di contabilità nazionale" in La revisione generale dei conti nazionali del 2005 Roma, 21-22 giugno 2006
- Istat (2000) Le nuove stime dei consumi finali delle famiglie secondo il SEC 95, Metodi e norme n. 7, 2000
- Franz A. (1985), *Basic Model in Estimates of the hidden economy in Austria on the basis official statistics* - The Review of Income and Wealth, 4, 1985
- Istat (2010) *La misura dell'economia sommersa secondo le statistiche ufficiali, anni 2000 - 2008*. Statistiche in breve.
- OECD (2002) Handbook for Measuring the non-observed economy
- Stiglitz E., Sen A., Fitoussi J.P.: Report by the Commission on the Measurement of Economic Performance and Social Progress, 2009.
- United Nations (2008) Non observed economy in National Accounts – Survey of countries practices, New York and Geneva.

## Appendix

### **A: Procedure to adjust for under-reporting of value added in NA**

Step of the process of revaluation followed in Italian National accounts to correct for the under-reporting of value added, due to the under-reporting of legal production and/or over-reporting intermediate costs:

1. Employees compensation by stratum of class-size and economic activity is computed.
2. The employees compensation is rectified, to keep into account the different number of hours worked by employees, in fact, according to Labour force survey, self-employment work for longer hours.
3. For each firm the net revenue is computed, as difference between value added at factor cost, and the sum of compensation of employees, interests paid, gross fixed capital consumption.
4. Per capita self-employment income is computed as ratio between the result of step 3 and the number of self-employed working in the firm.
5. If the amount computed in step 4 is negative or lower than the one found in step 2 the enterprise net revenue is computed again, counting for each self-employed the per capita value resulting from step 2.
6. The difference between the result of step 5 and the result of step 3 is summed to firm value added.

### **B: Procedure to adjust for under-reporting of self-employment income in Eu-Silc**

The procedure followed by NA to correct for under reporting of Value added in firm economic accounts has been modified and translated to household survey data (Eu-Silc) through the following steps:

1. The benchmark employees annual per capita compensation of registered workers is the one computed in NA estimates, by economic activities (classified in 16 sectors) and class size
2. The labour force survey records for 2008 an average number of hours worked by self-employed almost 17% higher than the one recorded by employees. Per capita compensation is corrected to take this into account.
3. Annual per capita net self-employment income is computed considering the number of months working as self employed
4. If the amount computed in step 3 is negative or lower than the one found in step 2, self-employment income is set as the one resulting in step 2.
5. Gross self-employment income is computed summing to the original value the difference between the result of step 4 and the original value.