A SYSTEMATIC APPROACH TO THE HIDDEN AND INFORMAL ACTIVITIES

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ABSTRACT

The paper proposes a method to deal with the non-observed economy in compiling national accounts. The first step is to identify the different types of non-observed activities and to determine its traces in the observation. The second step is to come up with an explicit estimate of each of the distinguished non-observed activities. These, together with the basic statistical data form the starting point for the compilation of the national accounts.

Key Words: non-observed economy, illegal activies, underground activities, commodity flow method, social accounting matrix, national accounts

1. INTRODUCTION

The subject of this paper, the Non-Observed Economy, applies to the statistical perspective of a range of topics: from under-coverage an underreporting at one side, to household production, organised crime and different forms of fraud at the other side. A national statistical office is expected to take a position. First of all because these topics affect the perception of the users of statistics on the quality and reliability of our statistics in general. And related to this, because the users specifically ask for information on these topics. Therefore it is important to highlight that

1. many phenomena can be estimated, but not all estimates can be based on reliable statistical observations;
2. the estimation of tax-evasion and fraud are not part of the core business of most statistical offices.
3. the national accounts aim at a complete and exhaustive description of the economy, as defined by the SNA'93 or the ESA'95 the European Community's extension of it.

Nevertheless, the users of our statistics show a clear interest in statistics on (parts of) the non-observed economy, because of its possible impact on matters like the labour market, consumption, investments, the income distribution and related matters (poverty), the relative economic importance of crime, taxes, imports and exports and the capital markets. Further, the extent to which the non-observed economy is included in the national accounts' estimates is generally considered as a measure of quality.

In this paper a method is proposed to deal with the non-observed economy in compiling national accounts in a systematic way. It is assumed that the main method used in compiling the national accounts is the *commodity-flow approach*. However, the proposed systematic approach also holds when the expenditure method or the income method is dominant.

2. CONCEPTS AND DEFINITIONS

The non-observed economy is the total of all relevant economic activities that are hidden from statistical observation. This is something else than the hidden and the illegal economies (see also Van Eck and Kazemier, 1988 and 1989). Those comprise of the activities that are hidden for reasons related to fiscal law and social security regulations (tax-fraud, tax-evasion) or for reasons related to criminal law (illegal activities). Of course there is overlap, but one can also think of activities that have nothing to do with criminality or tax evasion, but that are still unobserved, for example the production of small informal enterprises. On the other hand there is a good chance that part of fiscally hidden or even criminal activities are covered by statistical observation, for example the production of prostitution. Therefore, it is useful to start with a conceptual framework that illustrates the phenomena under discussion.

The production boundary

Production is defined in chapter 6 of the SNA. According to section 6.6 of the SNA, production is an activity in which inputs are used to produce outputs. Inputs are restricted to labour, capital, goods and services; outputs are

[1] The views expressed in this paper are those of the authors and do not necessarily reflect the views of Statistics Netherlands.

goods and services. Economic analysis of production, however, generally does not apply to all kinds of production, but is mainly restricted to "economic production". Economic production is production carried out under the control and the responsibility of an institutional unit (SNA 6.15). This excludes purely natural processes, which happen without human involvement or direction, like the unmanaged growth of fish stocks in international waters and the unmanaged growth of non-cultivated woods. Activities that are productive according to this definition satisfy the conditions of the third party criterion of Hawrylyshyn (1977), interpreted as "activities which can also be performed by others to obtain the same results". Examples of non-productive activities are sleeping, eating and drinking.

The national accounts are even more restrictive. They also exclude "household activities that produce domestic or personal services for own final consumption within the same household, except for services produced by employing paid domestic staff" (SNA 6.17). There is one exception: the services of owner occupied dwellings (SNA 6.29). Own-account production of goods within households is included: e.g. the production of agricultural products, the production of other primary products including the supply of water, the processing of agricultural goods and other kinds of processing. However, if there is strong evidence to believe that the size of this kind of production is quantitatively unimportant, one can neglect it in practice (SNA 6.24). Do-it-yourself activities fall outside the production boundary of the SNA, except for major do-it-yourself activities in the case of dwellings.

No exceptions are made for illegal and concealed production. Both types of production fall within the production boundary, as long as their legal or non-hidden counterparts do. So, both should be estimated and included in the national accounts statistics.

Illegal, underground and informal production

Illegal production is "(a) the production of goods or services whose sale, distribution or possession is forbidden by law; (b) production activities which are usually legal but which become illegal when carried out by unauthorised producers; e.g. unlicensed medical practitioners." (SNA 6.30). For many countries the most important illegal activities (in terms of value added) are production of and trade in drugs, prostitution, the production of (some kinds of) pornography, gambling without license, the production of and trade in copies of films, sounds-records, books and computer software without paying copyrights, smuggle, theft, bribery and blackmail. Part of these types of production fall within the production boundary of the national accounts. However, for practical reasons and a severe lack of data, it is not included in the national accounts estimates of many countries. A general methodology to measure illegal activities is not yet available. Examples can be found in Van der Werf (1997), Groom et al (1998) and Rey (1997).

Underground or concealed production is legal production which is kept hidden for public authorities (SNA 6.34). In general, the most important reasons to keep activities hidden is to avoid the payment of taxes or the payment of social security contributions. Other reasons can be the evasion of legal standards with respect to, for example, minimum wages and safety or health standards, or the sometimes legal obligation to complete statistical questionnaires or other administrative forms. The latter reason often coincides with one of the other reasons to commit fraud.

Informal production is the production of the informal sector. The term "informal sector" is defined by the ILO and consists of units which produce goods and services with the primary objective of generating employment and incomes to the persons concerned. Formal employer-employee relations generally do not exist and if they exist, they are mostly based on casual employment, kinship or personal and social relations (SNA Annex 4: (ELO) 5.1). For statistical purposes the informal sector is defined as the group of production units which form part of the household sector. (SNA Annex 4: (ELO) 6.1) In every day practice, however, the informal sector is defined as the group of self-employed plus the production units below a specified level of employment (small enterprises) .

Non-observed activities

Non-observed activities are activities that fall outside the statistical observation. The main reason that activities remain unobserved is that the units that perform the activities are not included in a business register or other (available) register. In many countries only the large enterprises are registered and observed in enterprise statistics. The smaller enterprises are generally not included. Secondly, some kind of activities, for example illegal activities, are deliberately made impossible to measure. The size of these activities can only be estimated from secondary

sources. A third reason for the existence of an non-observed economy is that the traditional survey tools are not perfect (non-response, under-reporting), that business registers are not always complete and up-to-date (under- and over-registration) or that the local law does not permit direct measurement for privacy reasons. Table 1 contains a simplified two-dimensional classification of the non-observed economy.

Table 1. The main reasons for the existence of a non-observed economy.

	Formal production	Informal production	Underground or concealed production	Illegal production
1. Not registered		X		X
2. Non-response	X		X	
3. Under-reporting	X		X	

3. THE COMMODITY FLOW METHOD

There are several methods used in compiling National Accounts. The commodity-flow method is recommended by Statistics Netherlands to countries in transition. Luttikhuizen (1997) called it the bottom up approach. It starts with a co-ordinated survey design for the business statistics. In such a design data is collected for each branch of industry. For smaller enterprises sometimes an sample survey is used. Larger enterprises, however, are all included in the survey. The exact breakdown between larger and smaller enterprises may vary from country to country, depending on the number of enterprises in a country and the resources available at the national statistical offices.

To be sure that the returns of the survey are correct, a micro editing procedure can be applied. In this procedure the information of the individual unit is analysed and checked for internal consistency. Further it is compared with the outcomes of the branch as a whole (by means of averages and ratios) and previous information from the same enterprise (by means of growth-rates of the main economic indicators like turnover, paid wages and salaries and intermediate inputs). If information is lacking or wrong, it is checked at the enterprise. If this is impossible or if it yields unsatisfactory results, the missing or wrong information is imputed using data from other enterprises.

For large samples, of for example medium- and small-sized firms, macro-editing is a good and cheaper alternative. In that case, the outcomes of the total survey are analysed, and only major errors are corrected. The survey results after macro-editing are in general as reliable as the results after comprehensive micro-editing. The main reason is that relatively small errors often cancel out and therefore only have a minor impact on the total outcomes.

Important is an accurate use of weighting schemes and grossing-up procedures to end up with estimates that are valid for the economy as a whole. This aspect is, among others, described in manuals of Statistics Netherlands and in a publications of international organisations.

After the results of the survey have been calculated and raised, the next process starts: partial integration. In that process all relevant information is used to come up with a final estimate of the production structure of each branch. Remaining problems, probably not sufficiently dealt with, are under-registration, underreporting of income or turn-over and overreporting of costs or intermediate consumption. For these, several additional methods are available (Kazemier, 1993).

4. SOCIAL ACCOUNTING MATRICES

Besides information on production, international trade and financial flows, much more information may be available, which can be of use in the compilation of national accounts. One may think of information on the labour market (labour force surveys), on household consumption (expenditure surveys), on income (income statistics, tax-returns), on time-use (time-use surveys), or just demographic data (censuses). Of course, these data can be used in an ad hoc way, for example to estimate the size of the non-observed activities or to gross up the results of production statistics, as is advocated in the previous chapter. But what is really needed, is a framework in which this kind of data and the core data used in the commodity-flow method can be put together in an integrated way.
The “System of National Accounts” presents such a framework: a Social Accounting Matrix. Essentially, a social accounting matrix is the presentation of the National Accounts in matrix format. But it can be more than that. It can

be used to link data on socio-economic phenomena (such as employment, income distribution, education and leisure), environmental data (for example, on pollution, CO2-emissions and others) and demographic data, with the traditional macro-economic indicators like Gross Domestic Product and Net National Income. Examples of these are the NAMEA and the SESAME. The first links national accounts data with environmental data (Keuning and De Haan, 1996; Keuning and Timmerman, 1995); the latter is a general framework to link national accounts data with all kind of other data to show the various aspects of welfare and well-being like income and poverty, social inclusion, education, health, leisure et cetera (Van de Ven, Kazemier and Keuning, 2000).

There are important similarities between a social accounting matrix (SAM) and an input-output table. An input-output table is a schematic representation of all flows of goods and services in the economy. Each row presents the destination of the goods and services produced in each branch; each column presents the goods and services, imports and primary inputs used in each branch.[2] The corresponding financial flows go the opposite direction. Consequently, each row of an input-output table can be considered as the income-side of the production-account of a branch of industry, and the corresponding column as the cost-side of that account. A social accounting matrix is just an extension of an input-output table, combining the production accounts, the income (distribution) accounts, the expenditure accounts and capital accounts within one all-embracing matrix.

Each account in a SAM can be broken down by a different classification. Traditionally, the production accounts are broken down by industry (and type of commodity), the income (distribution), expenditure and capital accounts by institutional or functional sector. In the Dutch case the SAM is supplemented by a specification of the investments (broken down by industry of origin and destination, and by type of fixed asset) and the financial accounts (broken down by institutional sector and by type of financial asset).

Up till here a SAM is little more than an alternative way of presenting the full system of national accounts, although the constraints of the system become more clear then in the traditional T-accounts: each row and corresponding column must sum up to the same amount. In terms of input-output tables: outputs must equal inputs. This transparency is one of its strengths. In the every day practice of national accounting it is not unusual that, after filling in all the accounts up to the financial accounts, a non-explainable statistical discrepancy pops up. The SAM is a helpful tool to trace the cause of this.

The real strength of a SAM, however, becomes available when one goes beyond the traditional national accounts. The introduction of alternative (sub)classifications, alternative units of measurement and alternative definitions (even an alternative production boundary, see Kazemier and Exel, 1992) is quite simple. Internal consistency is easily maintained. The new or additional constraints in terms of "outputs must equal inputs", introduced by those extensions, become visible at first glance. It is just this quality of a social accounting matrix which makes it an excellent tool for adding alternative data sources in the compilation process of the national accounts. An example for the Indonesian case can be found in Keuning (1995).

5. INCLUDING UNOBSERVED ACTIVITIES: A WAY TO GO

5.1. IDENTIFICATION OF NON-OBSERVED ACTIVITIES FROM A STATISTICAL PERSPECTIVE

Tabel 1 in section 2 presents an overview of the main components of the non-observed economy and how it generally affects the registration of units and the reporting of respondents. However, when it comes to estimation of the different components, this table does not suffice. In that case the possiblilities for observation must be the starting point. This is done in table 2. The dimension on the horizontal axes categorizes the statistical units, for example enterprises and own account workers, that generate production, value added et cetera. These units can be registered in a business register, the list generally used for business sampling purposes, or not. The other dimension identifies one of the inputs used in the production process. The most obvious input to be used for this analysis is

[2] The rows of an input-output table can be replaced by a make-matrix, which specifies the goods and services produced in each branch. The columns of an input-output table can be replaced by a use-matrix, which specifies all goods and services used by each branch. The advantage of make and use tables is that there is a close linkage with the specifications available in production statistics. However, they do not provide information on the flows of goods and services between branches of industry, as input-output tables do.

labour. Generally, labour input is well administered. In special cases, however, for example in cases of tax evasion, the payroll is deliberately incomplete.

In table 2, distinction is made between units that are included in a business register and units that are not. All government units, non financial corporations, financial corporations and non profit organisations are assumed to be in the business register. The same applies to the own account workers as far as registration is obliged. This group of units is summarized under 'Incorporated enterprises'. The remainder is grouped under 'household uncorporated enterprises'.

Table 2. Production of goods and services by enterprises and not registered own account workers versus labour inputs: a classification of unobserved activities from a statistical perspective.

	Incorporated enterprises		*Household unincorporated enterprises*
Labour	**Registered** in the business register	**Not registered** in the business register	**Not registered** own account workers
Administered	H1	H3	
Not administered	H2	H4	H5

Hidden production by registered units, related to administered labour inputs

Quadrant H1 presents the confrontation of output of registered enterprises using administered labour. If errors or gaps occur in this quadrant, it can only be because of an explicit restriction of the sample frame (for example when only enterprises with more than a given number of employees are surveyed), errors in the sample frame, misreporting and non-response. Underreporting of production related to the underreporting of labour costs is not part of this quadrant but is part of quadrant H2, as one may assume that all administered labour will be reported.

Adjustment for restrictions of the sample frame to the larger enterprises can be made by assuming that the production, turnover, value added et cetera per worker of the smaller enterprises equal those of the smallest enterprises included in the sample. Of course, this can only be done if the number of employees is the criterion whether to include or not an enterprise in the sample frame. If, for example, the reported turnover in last year's tax return act as a criterion, the latter variable should be used for adjustment.

Sample frame errors can be adjusted for by means of the labour force survey. Provided that the data from the labour force survey on the supply of labour is of sufficient quality, it can be used to reweight the other variables in the business surveys, like production, intermediate consumption, operating surplus, value added et cetera to correct for errors. This is even more the case when a detailed confrontation at a branch-level is possible.

However, corrections for sample frame errors do not correct for underreporting of turnover and overreporting of costs, both decreasing value added. Examples of these can be found in Árvay and Vértes (1995). It must be noted that enterprises that overreport cost not necessarily commit fraud. It can also be caused by the differences between business accounting and national accounting. For example, income in kind is often correctly booked as intermediate consumption in terms of business accounting and tax laws, while in terms of national accounting it should be booked as part of the wages and salaries, and thus as part of the value added. Other reasons for misreporting can be inadequate bookkeeping practices, which is the case in many transition countries.

Special cases are overreporting or underreporting of both turnover and cost at the same time. This misreporting does not necessarily affect value added. However, it does affect the confrontation of supply and use of goods and services and the estimates of the final consumption categories like household consumption and capital formation, especially if these are calculated as a residual. This may lead to difficulties in the compilation of the sector accounts. Therefore, one must correct for this kind of bias.

Insight into what extent this phenomenon exists and the size of the resulting bias can come from a detailed comparison of the individual survey returns, both cross-section and over time. This should be part of the normal data-editing process. Further, a one time special investigation may yield results which can be used for several years and may lead to improvements of the questionnaire.

To correct for non-response, one can use data taken from the response. For example, if an enterprise did not provide a breakdown of intermediate consumption by product, one can borrow this structure from enterprises of similar size in the same branch of industry. A same technique can be used to impute values for enterprises, which were not surveyed because of a cut off in the sample frame. In this case one can borrow the structure and other of the enterprises in the survey, closest in terms of size and branch. Note that if not all enterprises in the register are surveyed regularly, especially when there is a systematic cut off in the sample design, the maintenance of the business register is seriously hampered. In that case one needs information from other sources, for example tax files or the VAT-administration, to update the register.

Hidden production by registered units, directly related to not administered labour inputs.

Quadrant H2 reflects the output of registered enterprises by the use of not administered labour. If labour is kept hidden it is most likely that this is done to evade taxes and social contributions. Actually, it is underreporting of labour costs. If the only purpose is to evade income taxes and social contributions, it may be very possible that other variables are not biased, except for operation surplus that now also includes the hidden labour. However, to decrease the risk of being caught (and perhaps to evade taxes on operating surplus also), most enterprises will also underreport other variables to such an extent that the reported figures suggest a normal production structure. It may be clear that, although in principle all enterprises (perhaps except governmental organisations) might commit such a fraud, the opportunities to do so are the best for small enterprises with a rather simple production structure, so with a relatively high labour input: trade, construction, repair, services et cetera.

There are at least three ways to correct for this kind of bias in the figures. The first one is the so-called Italian method. This method uses the data of the labour force surveys to re-weight the outcomes of the business surveys and is quite similar to the method to adjust for sample frame errors and restrictions. There is only one additional requirement: the results of the labour force surveys must implicitly or explicitly include hidden labour supply. If the labour force surveys as such do not satisfy this requirement, it is sometimes possible to enrich the results with data from other sources, for example special one time surveys, and by means of assumptions. A second solution is to conduct special investigations on the hidden labour supply (see for example Van Eck and Kazemier, 1989). A third solution is to rely on assumptions, expert knowledge and incidental research.

Hidden production in not registered enterprises due to problems in the register

This case reflects problems in the registration. One reason may be that enterprises are wrongly classified. Most common are errors in the branch of industry code and in the size code. If, for example, only larger firms in a number, but not all branches of industry are surveyed, a wrong code me lead to an unjust exclusion from the sample frame.[3] To get insight in the size of this problem, one has to keep track of the number of unjustly included units in the sample. If this number is very small, than this problem can probably be neglected. If, on the contrary, the number of unjustly included enterprises is relatively high, it is necessary to put additional effort in maintaining the business register. The relative number of unjustly included enterprises and their characteristics like size and legal form may lead to a argumented guess (guestimate) of the size of this phenomenon in terms of hidden value added, hidden labour force, et cetera. Making guestimates can be part of a qualitative analysis. The earlier mentioned Italian method may also help.

Another reason can be that the register is not up to date enough. In that case new enterprises are missing while the number of already dead enterprises will be relatively high. Again, the only long-term solution is to put extra effort in the maintenance of the business register, while a short time solution can be the application of the Italian or comparable method. The number of employees in new enterprises, however, is mostly not very high. The same applies to variables like value added, wages and salaries and operation surplus.

A third reason can be that enterprises are missing because there is no need or obligation to do so. In this case, the Italian method does not provide sufficient results, except that the labour force survey may give a first impression of

[3] A wrong code in a record in the business register may also lead to unjust inclusion in the sample frame of a different branch of industry. This complication is not addressed in the description of quadrant H1 of table 2. It is assumed that these errors are already corrected for in the normal data-editing process that preceeds the tabulation of the results of the business surveys.

the relative importance, measured in terms of number of employees, of these enterprises. If the number of enterprises is low, and if there are no reasons to assume an exceptional high value added per employee, an acceptable guess of its size is possible. However, in many cases there are reasons to assume that enterprises that need not register significantly differ from those that have to. Then a special investigation in the size and the structure of these enterprises is needed. One may think of area sampling, city market analysis, special surveys, et cetera. In general it can be assumed that, on average, the value added per worker is less than in registered enterprises.

However, this assumption needs be proven.

Hidden activities in not registered enterprises, related to not administered labour inputs

Quadrant H4 may contain the production of the same enterprises as those in quadrant H3, but then for as far as production is related to hidden labour. In this respect there are similarities with the distinction between quadrant H1 and H2, and if these enterprises were included in the register, the problems were similar to those in H2. Therefore, if the sizes of quadrants H1 to H3 are known, the size of quadrant H4 can be deduced from these. The more detail on H1-H3 there is available, the better the estimate of quadrant H4.

This would be true if quadrant H4 did not also contain all enterprises that normally would be registered but for one reason or another want to be kept out of any control by the government. These enterprises may include those that produce illegal products or produce products in an illegal way. How to deal with these specific units falls outside the scope of this paper. For more details on this topic, see Van der Werf (1997).

Hidden activities by not registered own account workers

Quadrant H5 presents the production of not registered own account workers. In general these are part of the informal sector. The production unit mostly coincides with a household or a small number or related households. Bookkeepings are mostly absent. The main reason that the production of the informal sector is often not fully covered in the national accounts is just because they are not measured. However, if the number of households involved in the informal sector is known, for example from labour force surveys or population censuses, an estimate can be made assuming that the production value and value added are almost the same for own account workers registered, or a certain percentage of it. If there is no data available on registered own account workers, a minimum estimate can be made by assuming that the mixed income of households involved in the informal sector equals the minimum amount of money needed to make a living.

Not included in the table is own account production for own use that needs to be included in the national accounts. In most Western European and North American countries, this is almost negligible. However, there are also many countries where these activities are quite substantial. If wished, one may include these activities in this quadrant.

5.2. THE ORGANISATION OF ESTIMATES OF NON-OBSERVED PRODUCTION

In the previous section a tool was introduced to analyse the different aspects of the non-observed economy. With that tool, together with the results of additional research, insight is gained in the size and character of the non-observed economy. This section will introduce a frame in which the results of the previous section can be organized in a systematic way. The advantage of doing so is at least threefold. Firstly, it provides the statisticians who are in charge of the national accounts with a systematic and complete picture of all information on the hidden economy that can be deduced from the available datasources without duplicating the work of the national accountants. Secondly, it can serve as a database of information on the non-observed economy, which can easily be updated each year without much effort. Thirdly, it enables to determine priorities and posteriorities when it comes to allocating resources.

This section builds on table 2 in the previous section. It is assumed that the commodity-flow method is leading in the compilation of the national accounts. A similar framework, however, will do if the income method or the expenditure method is the leading method.

The purpose of the frame is to collect all information used in the compilation of the national account as far as relevant for the estimation and allocation of the non-observed economy. The layout of the frame is inspired by the

layout of the supply and use tables. For each row and column of these tables the information on the most important variables is summarized. For the different branches of industry, a breakdown is made that corresponds with the branches distinguished in the business surveys. In addition each branch of industry is broken down by size class, at least as far as hidden activities are assumed to be present. If the smallest enterprises were not included in the sample, the smallest size class sampled should be shown separately. The same applies for branches of industry with a relatively large informal sector, for example trade, construction, furniture and services. The exact breakdown should follow from the investigations described in the section 5.1. A schematic example of such a breakdown is presented in table 3. The vertical axis shows the breakdown of the branches of industry; the horizontal axis the various variables of interest.

Each cell in table 3 may contain several layers. This is visualized in table 4. The first layer should contain the raw outcomes of the surveys (or administrative files) after normal data editing and weighting (Q in table 4). These are the raw figures of quadrant H1 in table 2. A second layer should contain the adjustments (Q1 in table 4) for sample frame errors, misreporting and non-response not linked with the use of hidden labour. So Q+Q1 should be the best estimate of non-hidden activities in registered enterprises. The next four layers Q2 to Q5 contain the adjustments for hidden activities linked with not administered labour in registered (quadrant H2 in table 2) and not registered units (H4), hidden activities linked with administered labour in not registered units (quadrant H3 in table 2) and the activities in the informal sector, both hidden and not hidden (quadrant H5 in table 2). Each adjustment should be accompanied with a qualitative statement or quantitative measure of its quality and if available, supplemented with alternative adjustments. The final layer, Q6, is the national accountants' decision.

Table 3. A schematic breakdown of branches of industry by variable of interest

Available layers: ***- Layer 1: survey results (H1)*** ***- layer 2: adjustments for H1*** ***- layer 3: adjustments for H2*** ***- layer 4: adjustments for H3*** ***- layer 5: adjustments for H4*** ***- layer 6: adjustments for H5*** ***- layer 7: national accounts decision***	**Total production**	**Intermediate consumption**	**Final consumption**							**Primary cost**					
			Household consumption	**Government cons.**	**Investment**	**Exports**	…	…	…	**Wages and salaries**	**Social contributions**	**Taxes minus subsidies**	**Operation surplus**	…	…
Business surveys															
Agriculture			-	-	-	-									
2+ employees	-	-								-	-	-	-		
1 employee	-	-								-	-	-	-		
0 employees	-	-								-	-	-	-		
Mining	-	-								-	-	-	-		
…	-	-	-	-	-	-				-	-	-	-		
Construction			-	-	-	-									
25+ employees	-	-								-	-	-	-		
10-25 employees	-	-								-	-	-	-		
2-9 employees	-	-								-	-	-	-		
1 employee	-	-								-	-	-	-		
0 employees	-	-								-	-	-	-		
…	-	-	-	-	-	-				-	-	-	-		
Custom forms:															
Exports	-		-	-	-	-									
Imports	-		-	-	-	-									
Tax returns:															
Wages and salaries	-									-	-	-	-		
VAT	-	-	-	-	-	-				-	-	-	-		

The estimates in this three-dimensional table are based on the confrontations of datasources and additional special investigations. Some of these confrontations may be far more detailed than ever possible in the context of the national accounts. It may even lead to new statistics supplementing the national accounts. In such cases one might

talk about so-called partial integration. A good example of partial integration is the construction of labour accounts out of a large number of datasources like the labour force survey, employment survey (which is the counterpart of the business survey, but then for enterprises) and surveys on earnings, see Leunis and Verhagen (1999). Another example is the energy-accounts, which combines the results of special surveys on the production, transformation and use of energy, data on the imports and exports of energy and fuels et cetera, resulting in energy balances per branch of industry and per type of fuel. More information on energy accounts can be found in, for example, Eurostat (2000). All partial integration projects have in common that they focus on one single topic which is not fully covered or not sufficiently detailed in the national accounts.

After having completed table 4 for all variables of interest (except column Q6), the information in this table is used in the compilation of the national accounts. In that compilation process almost all data available is confronted with each other and reconciled. Such a confrontation is only possible on a rather high degree of aggregation. For that reason, details that matter for a good adjustment for hidden activities should be included in the table.

5.3. SETTING PRIORITIES

Table 4 can be a good tool for setting priorities in the allocation of resources. Adjustments that are relatively small aren't probably worth any additional effort. Large adjustments, however, especially those that are based on rather weak assumptions or datasources need extra research. Depending on the main causes of the ajustments, different actions may be taken. For example, hidden production in registered enterprises related to administered labour (Q1 in table 4; H1 in table 2) is the main problem the preferable actions are the improvement of the business register by eliminating registration errors and improving the coverage of the business surveys, both the number of branches covered and the number of size classes included in the sample.

Table 5.3. A schematic breakdown of branches of industry by type of adjustment

Available variables of interest: ***- Total production*** ***- Intermediate consumption*** ***- Final consumption*** ***- Household consumption*** ***- Government consumption*** ***- Investment*** ***- Export*** ***- Primary costs*** ***- Wages and salaries*** ***- Social contributions*** ***- Taxes minus subsidies*** ***- Operation surplus***	**Q** **Survey results after normal data editing and weighting**	**Q1** **Adjustments for hidden activities in registered enterprises not linked with hidden labour**	**Q2** **Adjustments for hidden activities in registered enterprises linked with hidden labour**	**Q3** **Adjustments for activities of not registered enterprises not linked with hidden labour**	**Q4** **Adjustments for activities in not registered enterprises linked with hidden labour**	**Q5** **Estimates for the informal sector**	**Q6** **Final national accountants decision**
Business surveys							
Agriculture							
2+ employees	-	-	-	-	-	-	-
1 employee	-	-	-	-	-	-	-
0 employees	-	-	-	-	-	-	-
Mining	-	-	-	-	-	-	-
…	-	-	-	-	-	-	-
Construction							
25+ employees	-	-	-	-	-	-	-
10-25 employees	-	-	-	-	-	-	-
2-9 employees	-	-	-	-	-	-	-
1 employee	-	-	-	-	-	-	-
0 employees	-	-	-	-	-	-	-
…	-	-	-	-	-	-	-
Custom forms:							
Exports	-	-	-	-	-	-	-
Imports	-	-	-	-	-	-	-
Tax returns:							
Wages and salaries	-	-	-	-	-	-	-
VAT	-	-	-	-	-	-	-

Improving the business register is also the best action if the adjustment Q3 (hidden production related to administered labour in not registered units) is relatively large. Improving the register by including more enterprises, eliminating dead units and more frequent updating may improve the quality of the raw survey based or administration based estimates (Q in table 4). Consequently this will decrease the adjustments for the production of not registered units (Q3 and Q4). Whether it will decrease the adjustments for the production of registered units (Q1 and Q2) or not, depends on the finally realised improvement of the register. See also Van Eck (1983).

In the ideal case, where all enterprises are included in the register, the adjustment for hidden production related to administered labour will become (almost) zero, while quadrant 4 in table 2 (hidden production linked with not administered labour in not registered units) will only contain illegal production.

When the adjustments for hidden production related with not administered labour input (Q2 and Q4) are relatively large and relatively weak, improving or enhancing the statistical program may be the wisest thing to do. This is especially the case if the statistical program is almost minimal. Changing over to another mix of surveys and statistics or adding new surveys and statistics to the program can lead to other types of confrontations which may, but not necessarily do improve the adjustments for hidden activities.

Confrontations of datasource, and more general, the usefulness of statistics may improve if all statistics use the same classifications and definitions. This so called statistical co-ordination is probably the most difficult thing to achieve, especially if all statistics have their own users with their own wishes and needs. Nevertheless, it is worthwhile to attempt, as it can significantly improve the quality of statistics and the adjustments for hidden activities.

Finally, if none of the above actions are possible because of lack of resources, because they are too expensive compared to the expected results, or because they simply do not sufficiently improve the adjustments, the only things to be done are special investigations. In general it is possible to organize such a research in such a way that the results can be used for several years. This is especially the case if these researches lead to adjustment percentages, which can be expected not to change very much over years.

6. FINAL REMARKS

This paper presents a systematic framework to analyse the nature of the non-observed economy and how statistical observation is affected. At least four types of problems, in terms of statistical observation, can be distinguished: units not (properly) included in the business register, combined with deliberate misreporting because of concealed activities. A fifth problem in terms of observation can be the existence of an informal economy.

Different combinations of observation problems require different solutions. Some of these are the improvement of the business register, better statistical co-ordination or extension of the statistical program. Others require special research. Some problems can only be partly solved, for example illegal activities.

As additional effort means additional resources, a framework is needed to set priorities. Such a framework is presented in the tables 3 and 4. A first step is to fill these tables with already available data and with well argumented guesses. This leads to a first insight of the main problems, in terms of, for example, non-observed value added. This table can also already be used in the compilation of the national accounts. Over years, this table can be updated and weak adjustments can be replaced by stronger and better adjustments.

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THE EXHAUSTIVENESS OF PRODUCTION ESTIMATES: NEW CONCEPTS AND METHODOLOGIES

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ABSTRACT

In this paper we outline the conceptual framework to be used to verify the exhaustiveness of the production estimates according to the System of National Accounts (SNA, 1993). We describe the types of production units (regular, irregular, informal, not physically identifiable) that we have to investigate and the statistical problems that we have to deal with. As regards the application of this framework, we present the methods of the Italian National Statistical Institute (Istat) used to ensure the exhaustiveness of the GDP estimates.

Key Words: exhaustiveness, input of labour, productive units, non observed economy

1. INTRODUCTION

By "productive units" we refer nowadays to a very large number of different typologies. If our objective is to obtain a complete picture of the volume and characteristics of production activities, i.e. an exhaustive estimate of them, we need to take into account the problems of measuring the activities of all types of units. Furthermore, if our population target is production as defined in the latest version of the System of National Accounts (SNA93), we also need to consider the problems of measuring the production of units that, in order to avoid payment of taxes or social security or because of their economic characteristics, may be invisible to the statistical instruments.

2. DEFINITIONS AND POPULATION TARGET

The SNA93, for the first time, has built a coherent framework for the identification of all the components to include in the National Accounts estimates; therefore, it is possible to capitalise on this considerable work and to adopt at the international level a homogeneous language as a basis for describing and analysing all types of production units and their output.
The foregoing concerns are common to industrialised, transition and developing countries alike, in their efforts to build a more adequate information base for economic analysis.
Because of the experiences developed within the EU to guarantee the "Exhaustiveness of the GDP" we think it is useful to use the description adopted in the European Commission (Decision 94/168/EC, Euratom of 22 February 1994, Article Type 2, Title II, *Definition of Terms*):..... "Within the production boundary, national accounts provide an exhaustive measure of production when they cover production, primary income and expenditures that are directly and **non** directly **observed** in statistical surveys or administrative files".... According to the internationally accepted definition described in the SNA93, the **Non** directly **Observed Economy** (from this decision derive "NOE", drawing this term, as a convenient summary), includes the following "areas": (1) illegal, (2) underground, (3) informal sector.
(1) Illegal activities are classified by the SNA (SNA93: 6.30-6.33) in two categories: (a) the production of goods and services whose sale, distribution or mere possession is forbidden by law (i.e. production and distribution of illegal drugs); (b) production activities which are usually legal but which become illegal when carried out by unauthorised producers (i.e. unlicensed practising of a profession).
Both kinds of production are included within the production boundary of the SNA93, provided that they are genuine processes whose outputs consist of goods and services for which there is an effective market demand.
(2) Underground economy (SNA93: 6.34-6.36) stands for all legal production unknown to public authorities due to various reasons: (a) to avoid the payment of income, value added or other taxes; (b) to avoid the payment of social security contributions; (c) to avoid having to meet legal standards such as: minimum wages, maximum hours, safety standards, etc.; (d) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.
Therefore, underground activities can be defined either as **"economic underground",** indicating those activities characterised by the deliberate will not to respect administrative standards, with the purpose of cutting production

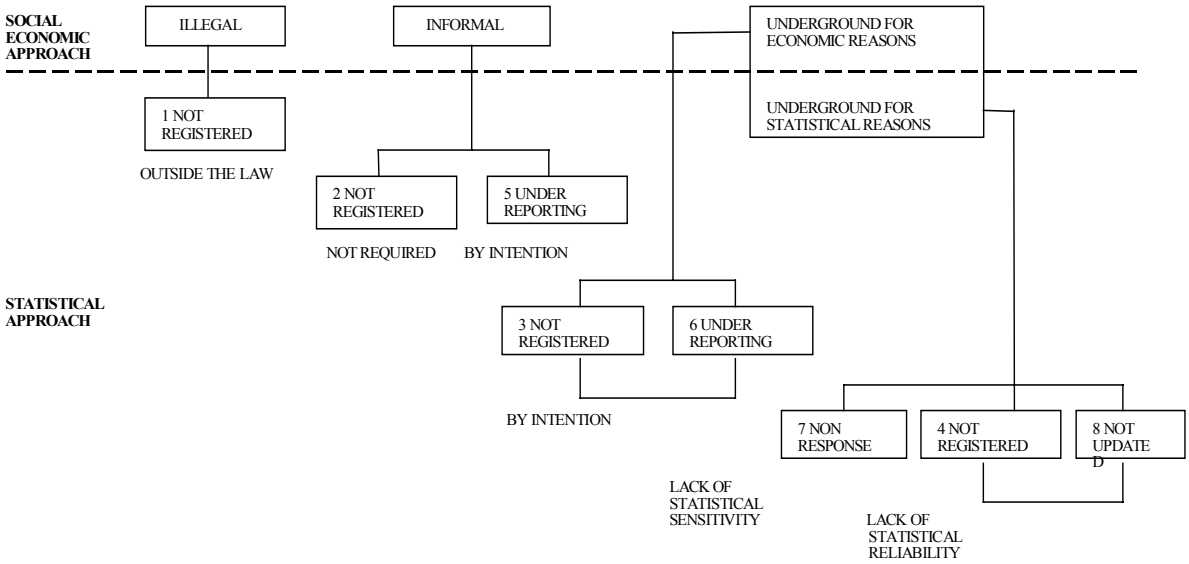
costs (items (a) (b), (c)), or as **"statistical underground"** indicating those activities that are not surveyed because of inefficiencies in the statistical information system, the characteristics of productive units or the lack of statistical sensitivity on the part that are requested to compile the questionnaires (item (d)).
(3) To define the Informal sector, the SNA93 (IV – Annex) refers to institutional production units characterised by: (a) a low level of organisation; (b) little or no division between labour and capital; (c) labour relations based mainly on occasional employment, kinship or personal and social relations, as opposed to formal contracts.
These units belong to the household sector and cannot be associated with other production units. In such units the owner is fully responsible for all financial and non-financial obligations undertaken for the productive activity. There is no need to underline that informal activities are not necessarily carried out in order to evade taxes or other controls related to social security contributions (as mentioned before). On the basis of the laws in force in each country, for example, this sector may be identified by referring to the "size" of the production unit or to the characteristics of the legislation (no obligation whatsoever to register with public authorities).

3. PROBLEMS AFFECTING THE EXHAUSTIVENESS: THE STATISTICAL POINT OF VIEW

From the statistical point of view, measuring NOE is obviously a very difficult endeavour because of the elusive nature of what is being measured and, consequently, the approximations made in the measurement process. Figure 1 shows how the aforementioned phenomena relate to the statistical problems: the origins of such problems, their impact on the statistical system and the different NOE typologies that can be identified

accordingly. To sum up, from the statistical point of view we have four different problems: Non registered, Underreporting and non updated activities. These issues are then briefly illustrated to highlight the statistical aspects involved in the measurement of the single NOE components.

Figure 1 – NON OBSERVED ECONOMY



Non-Registered Activities
The existence of non-registered production activities implies that there are missing institutional units in our data sources (statistical or administrative ones). The most important consequence is the lack of reliable business registers. Let us analyse how this situation arises. The first and simplest reason for non-registered activities is the illegal activity (in fig. 1 this corresponds to NOE type 1 - illegal economy, non registered).
Production units in the "informal" sector may be missing when they are not requested to register at all by any kind of legislation (in our typology this corresponds to NOE type 2 - informal sector, non registered).
Among the enterprises belonging to the "formal" sector, some units (one enterprise or a part of it) are missing due to the deliberate intention to avoid the existing obligations to register. The main reason for such behaviour is to avoid

additional costs of various kinds: value added taxes, social security contributions, costs related to the compliance with health and safety standards, etc. (NOE type 3 - underground economy, non registered).
Within the "formal sector", enterprises may also be missing in our sources due to statistical reasons (independent from their will). This can happen, for example, because of: (1) the great turbulence in the enterprise universe, such as the high rate of turnover of enterprises (considerable where the share of small-sized units is particularly high); (2) the lack of adequate laws about statistics; (3) the lack of efficiency in the statistical system; (4) special laws for specific types of units. The main consequence is the difficulty to maintain reliable business registers and, therefore, the impossibility to guarantee the exhaustiveness of the information derived from business surveys (NOE type 4 - statistical underground, non registered).

Underreporting

This occurs when data provided by a production unit are not consistent or have abnormal characteristic values (i.e. costs/production ratio). In general, this happens because one or more components contributing to make up the production value are underreported or, vice versa, because cost components are over-reported. In all cases, the final result is an underreporting of the enterprise's profits, highlighted by an underestimate of the value added. Such underreporting can be identified both within the informal sector (when tax returns about such units are available) and within the underground economy (in the first case it is NOE type 5 - underreporting, informal sector; in the second case, it is NOE type 6 - underreporting, underground economy).

Non response

This problem is related to the "statistical sensitivity" of single enterprises, a problem well known to statisticians. Therefore, we will not discuss it here (NOE type 7 - non response, statistical underground).

Lack of updated information

Usually this is due to the fact that the registers (or more generally speaking the population target) used by National Statistical Institutes (NSIs) are not reliable. In general, we refer to problems related to out-of-date information on production units inside statistical or administrative "registers". The lack of updating can be due to various kinds of changes in the production structure of enterprises, such as: 1) enterprises that do not exist any longer, but are still considered as "active" ones; 2) changes in the structure (mergers, demergers, etc.); 3) changes in size/dimension (in terms of employees or of turnover, etc.); 4) changes in economic activity; 5) changes in the geographical distribution of production units. Obviously, the above mentioned items affect the exhaustiveness and the quality of National Accounts (NA), as they affect both the level of estimates and their analysis by geographical area and by economic activity (NOE Type 8 - statistical underground, non updated).

4. THE ITALIAN APPROACH

The Italian economy is characterised by a strong presence of small productive units, often unrecorded, and a high rate of irregular employment in the labour market. In order to ensure coverage of these two problem areas in GDP estimates, in the 1980s the Istat (Istat, 1993) have developed an original method, the "Input of Labour Approach". The procedure recommended by the SNA93 as most appropriate to estimate the input of labour in terms of full time equivalence (FTE) is very close to the method used by the Istat. In the Italian methodology FTEs are used as a tool to estimate the total labour input including NOE activities, and to obtain the total estimates of output and value added (by multiplying the number of FTEs by the per capita values of output and value added). In light of this, it can be said that not only is the NOE (excluding illegal) already included in current estimates it constitutes an integral part of all the economic aggregates influenced by it.
As can certainly be seen from the following explanation, brief though it may be, this type of methodology contains numerous advantages such as organic unity and the systematic nature with which the problem of the Non Observed Economy is treated, as well as the replicability resulting from its standardisation.
The techniques used for estimating the production and value added are diversified by branch of economic activity, on the basis of the best results obtainable in exhaustiveness terms:

A. estimates "quantity × price", this technique is used for estimating the activities of the agricultural and energy sectors and part of construction;
B. estimates through expenditure (part of constructions, rents and private services for education and research, health, entertainment and leisure);
C. estimates through direct gathering of costs and earnings from balance sheets (credit, insurance and some branches mostly belonging to public enterprises);
D. estimates through distributed incomes (non-market services);

E. estimates through expansion of per capita values for FTE, after having estimated the overall labour underlying the product and after having corrected the per capita values for possible underreporting (technique "input of labour × average per capita values", used for estimating all other branches).

These criteria show the fundamental role played by employment in methods which estimate the product from the point of view of formation . Approximately 70% of the value added is estimated with the E technique.

By combining the different estimation techniques, of which the E technique is the most original one, Italian accountants believe that they can cover exhaustively the "non observed economy" linked to legal activities (i.e. non-criminal ones, that EU decided not to estimate for the time being).

To sum up, Italian accountants consider (i) the statistical underground which is due, first of all, to the weight of small enterprises (in fig. 1 statistical underground), (ii) the utilisation of irregular labour within the productive process (economic underground) and (iii) the under-declaration of the production obtained by means of regular labour (economic underground) the major aspects that characterise the Italian NOE reality.

The procedure for estimating the aggregates of NA (such as production, value added, compensation of employees) analysed by branch of economic activity can be summarised with the following formula:

$$Y = \sum_{i=1}^{m} \sum_{j=1}^{8} x_{ij} \cdot U_{ij} + \sum_{i=m+1}^{101} Y_i \qquad [1]$$

where:

Y = overall estimate of the aggregate (for example value added)

i = indicator of the branch of economic activity (101 branches are chosen in accordance to the Italian productive system)

j = indicator of the size of the enterprise (1-5 employed, 6-9, 10-19, 20-49, 50-99, 100-249, 250 and over)

x = average per capita value of the aggregate (for example: production or value added per employed)

U = Full Time Equivalence (FTE)

$\sum_{i=m+1}^{101} Y_i$ = part of the aggregate not estimated through the units of labour technique

Input of labour estimates are obtained with the same methodology for all industries. In those branches where the technique "E" is not used, input of labour estimates are applied for coherence controls.

With reference to the consequences which the NOE has on the exhaustiveness of the statistical sources we have to solve three main problems: the non registered activity, non updated information and underreporting. In accordance with the Italian approach to solve them we need an exhaustive estimate of the input of labour ("U" in the formula) for the non registered and non updated components, and an adjustment of the per-capita ("x" in formula) for the underreporting components.

The importance of the ISTAT experience in this field is also demonstrated by Eurostat's decision to adopt this approach for verifying the exhaustiveness of GDP estimates in the EU. The reasoning behind the methodology developed by ISTAT is fairly simple. If the same sources which are needed to estimate value added in the NA (enterprises' side) can also be used to yield an estimate of employment, then that employment estimate can also be assessed for completeness against the estimates of employment available from demographic data sources (households' side). As summarised by Hayes and Lozano (1998), the exercise can be described as a process in four steps: Defining 'employment underlying GDP', so that the link with the variables of production and value added are as straight-forward and as close as possible; Standardising the definition of employment, to compare different sources a meaningful way; Assessing the employment comparisons, for the whole economy or at branch level (the implicit assumption made concerning households is that they have less interest than the enterprises to hide their real working condition, regular or "non regular" though it may be, so that the discrepancies that may emerge can be economically meaningful); Assessing the impact of the resulting best employment estimates on the estimate of value added and hence GDP.

4.1. Estimating non registered and non updated components

Before moving on to a description of the main methodological steps that have been implemented for obtaining an exhaustive estimate of labour input it is necessary to highlight the different informational capacity that the two survey units (enterprises and households) have, at least in the Italian context. Enterprise data (demand side) provide a measure of regular jobs (both primary and secondary), i.e., they provide information on employment for which legal provisions and obligations are full filled. On the other hand, data collected via households (supply side) measure the

number of employed persons, both those who are regularly and irregularly employed. The existence of such a situation is not a hypothesis but rather a reality that has been repeatedly verified by researches carried out by Istat.
The labour input estimation technique foresees the following main steps, in accordance with the fig. 2:

A. Adjustment of sources. Temporal and territorial harmonisation; conceptual harmonisation to national accounts definitions (the concept of "domestic employment" as a productive factor of GDP), etc.;

B. Integration of sources. On the supply side (B1) and on the demand side (B2) of labour so as to have the most exhaustive measure of employment from the demand side and the supply side derived independently;

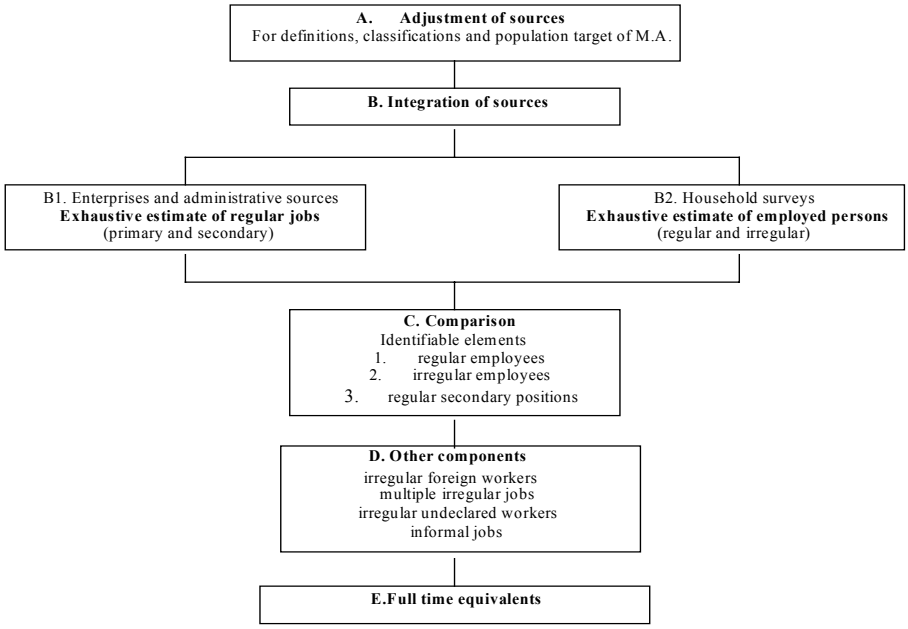
C. Comparison of sources and quantification of the various segments of employment in terms of "jobs" attributing economic significance to the discrepancies;

D. Other components;

E. Full time equivalence.

With reference to the five steps mentioned above, only the more complex operations are recalled here, while further in-depth analysis can be found by consulting the relevant text (Calzaroni, 1999).

Fig. 2 Methodological scheme to estimate the input of labour



Integration of sources on enterprises (B.1 in fig.2)

The objective of this phase is to estimate and classify workers identified through informational sources that utilise the enterprise as the survey unit; thereby determining an exhaustive estimate of the "regular" component of employment in terms of both its primary and secondary job. This objective is reached by using a register of enterprises that was constructed on the basis of Regulations defined at the EU level and applied to all member countries (Eurostat, 1999).
The register is based on both administrative sources and data gathered through statistical surveys. The main administrative sources are: fiscal data, social security data for pensions, social security data for insurance and against accidents at work, data on enterprises that are registered with Chambers of Commerce, data on the utilisation of electrical energy and telephone services. The main statistical data sources are: census of agriculture, census of industry and services, surveys on the budgets of enterprises, surveys for the up-dating of the business register, monthly surveys on labour indicators in large enterprises in industry and services.
Enterprises systematically produce administrative acts during their lives: they pay taxes, stipulate telephone and electrical energy services contracts, insure the employees against accidents at work. All the aforementioned administrative acts are potential sources of useful information to describe economic activity from a statistical point of view.

Every administrative body has its own function to collect data and manage the corresponding records, under specific legislation and rules which govern relations between various individuals and between them and the public administration. The administrative body defines, classifies, collects and records information on economic agents and their characteristics that, in the strict sense of word, do not have statistical validity. In other words using administrative data causes a problem for statisticians: the inconsistency of data.

The use of administrative data for statistical purposes imposes the necessity to solve the usual problems of a statistical survey - accuracy, completeness, timeliness – with a new conceptual and methodological approach.

Within a survey, consistency is a problem evaluated ex-ante as well as it is strongly linked to the process of microdata collection and macrodata production. When we want to use data stored in non-statistical (administrative) databases, for which statisticians do not have any control of the production process, the problem of consistency is set in a different context and it is resolvable only ex-post.

The main problem that arises using administrative sources for statistical purposes is to identify the correspondences between the statistical concepts and the administrative rules through which those sources observe the population of reference. It is therefore necessary to handle the administrative sources in order to align them with the statistical concepts and definitions. This is possible if, on the one hand, we have an in depth knowledge of the sources to be used and, on the other, suitable statistical methodologies are available.

It is possible to synthesise the logical process for the use of the information derived from administrative sources according to the following three conceptual steps:

1. definition of the reference conceptual frame: statistical definitions and classifications;
2. knowledge of the observed universe (administrative files) referring to coverage, definition of the units and characters, classification used, time and modalities of updating;
3. identification of the rules to convert administrative data into statistical data.

The use of an exclusively administrative source, for example the fiscal one used in some European countries as basis for statistical registers, could cause serious problems. Referring to a defined statistical universe, the typologies of errors generated in the use of only one administrative source for statistical purposes (described in fig. 1 as NOE due to non registered and non updated problems), can be summarised as follows:

E1 – error of under-recording	a) missing records of legal subjects due to delays, etc…; b) unrecording of legal subjects not obliged to the registration.
E2 – error of over-recording	a) registration of not active legal subjects due to duplications, delays or cessation recording; b) registration of legal subjects without any enterprise features.
E3 – error assignment of characters	a) incorrect recording due to delays in variations acquired or to errors in declarations, in recording, in checking; b) incorrect recording due to different definitions and classifications.
E4 – missing assignment of char.	a) partial or total lack of attribution of a character.

For the above mentioned reason together with the conceptual steps previously illustrated, it is necessary to develop a further function of "identification of rules for the integration of data coming from more administrative sources". After the implementation of such appropriate statistical methodologies, the integration process is a tool useful to ensure the exhaustiveness of units and of the characters of the units, obtaining in such way a reduction of type E1 and E4 errors. Such process must be less useful for the reduction of over recording errors and of wrong character attribution. In fact, using more sources can cause an increase of type E2 error; while if each source is really and considerably better than the other, further information for imputation of statistical characters would cause troubles. Besides, the presence of unchecked matching procedures among sources could cause record duplications and therefore an overestimation of units and statistical aggregates.

Referring to the formal aspect of the integration process, let x_i represent the real value of the i-th unit related to the attribute X and $x_{i1} \dots x_{ij}, \dots x_{im}$ are the values recorded in M available sources. The relation between the available and the real values can be described as follows: $x_{ij} = g(x_i, e_j, \varepsilon_{ij})$

where e_j is the error due to the bias (structural errors of type "b" previously described) of j-th source, and ε_{ij} describes the random error (errors type "a").

When the knowledge of the j-th source is completed, it is possible to locate rules which standardise (or harmonise or normalise) the units and the variables of input source in statistical units and variables. So the standardisation function is defined as the following application:

$f_s: X_j \Rightarrow X$ which changes the values $x_j \in X_j$ in values $x_i \in X_i$

In other words, a standardisation rule converts administrative concepts and classifications into statistical ones. This rule, generally deterministic, can be divided into three types:

- *coding rules*: which convert coding (e.g. economic activity, legal form, and location) into statistical classifications (Nace, Nuts, etc.);
- *link rules*: by which the different records corresponding to legal or administrative units in one source can be combined to define one statistical unit (enterprise or local unit) ;
- *conversion rules*: to obtain statistical variables from administrative characters

After the standardisation process the erratic component of the model is reduced to the random error ε_{ij}; therefore the sources are independent and unbiased random variables with same or at least constant quality in order to adopt procedures appropriate to some experimental frameworks such as the theory of repetition of an experiment. To reduce the systematic errors, produced by administrative functions (an example is the trend of enterprises in trade sectors to be classified, for fiscal facilities, as manufacturing enterprises), because the structure of input data it is not useful to use statistics based on linear functions of available x_{ij} (e.g. the mean) in order to avoid distorted estimations of x_i. The methodologies adopted in the imputation of characters must be based on the concept "choice among alternative values" and not on "combining the available values", when there are more values of an attribute for the same unit (Abbate Garofalo, 1998). This means to build a statistical business register.

Integration of sources on household (B.2. in fig. 2)

The approach is based, as for the previous point, on a micro level comparison between the two primary sources that utilise the household as the survey unit, the Population Census (PC) and the Labour Force Survey (LF). The objective is to verify the degree of compatibility between the various declarations provided by the same person and eventually correcting the discrepancies found, with reference to those variables linked to the "employment" phenomenon.

In reality, one can already find many important references in the literature (Cochran, 1977), that point out how important integration can be to improve the accuracy of the estimates of the variables: a census type survey (PC), characterised by non-casual errors but nonetheless capable of capturing statistically irrelevant phenomena that are difficult to capture and quantify in a sample survey; and a sample survey (LF), aimed at a specific phenomenon, in our case "employment", marked by a level of confidence in terms of its ability to both capture and check the data obtained, making it superior to a census survey, at least from these perspectives.

The adopted methodology foresees multiple phases. Here, however, we will limit the discussion to describing those that are most relevant to guaranteeing the exhaustiveness of the estimates.

The merging of the two surveys at the level of the single unit of analysis (that pertaining on the individual person) occurs via a "key" that encludes the following variables: place of residence, civil status, sex, academic degree held, day, month and year of birth. This procedure allows to obtain a dual declaration: one from the PC and another one from the LF, or, in other words, an "overlapping interview", even if somewhat different from that generally referred to in the literature given the structural differences that exist between a census and a sample survey. This "overlapping interview" concept is used as an instrument for improving the "quality" of the information gathered, both in terms of the significance that is normally attributed from a strictly statistical point of view as well as with respect to the main NA objective, which is the measurement of those components of employment that are not immediately "visible" and the effective discordance present in the information provided by the interviewee in the two surveys.

At this point, LF interviewees make available an overlapping series of information pertaining to their relationship with the labour market. What should be checked, therefore, is the compatibility of this information in terms of the employment phenomenon that can be obtained from the two surveys and, at the same time, identify those non-compatible elements between them that are useful for evaluating components of regular and non-regular employment (i.e., elements that a single survey does not capture).

To sum up, we define: "strong employment" if the respondents declare themselves working in both surveys; "weak employment" if they declare themselves employed in one survey and unemployed in the other one.

The interpretative hypothesis pertaining to the divergent declarations are the following:

- presence of measurement errors in one of the productive processes of the data, from the time of the interview to the validation and tabulation phase (non-sample errors);
- persons that given their marginal position, with respect to the labour market, are able to provide discordant responses. For example, a different "perception" with regard to their actual situation vis-a-vis the labour market in the two separate moments (the subjectivity of the interviewee).

On the basis of the LF information - which is known to be of higher quality – the employment condition declared therein is the one that is accepted. In fact, we maintain that the employment phenomenon targeted by the LF is not

subject to bias attributable to the presence of interviewees that declare themselves as being employed even though they are not, while the opposite situation (employed persons who declare themselves as being unemployed) is acceptable. For example carrying out a work activity that is "non stable" (i.e., one that the interviewee does not view as being the same as "employed" because it is: not ongoing over time, carried out for only a limited number of hours), exists outside of the existing normative framework, not connected with the level and/or typology of the professional skills possessed. Any one of these conditions is sufficient for not declaring oneself as employed. Therefore the mismatch between those that have declared themselves as not being employed in the LF but employed in the PC can be considered as a manifestation of their non-regular status which can be identified in through the integrated utilisation of the two sources.

The quality of census data and the underlying motivations of the respondents do not allow us to attribute in a deterministic manner the employment condition of the individual within the group of persons that declared themselves as being employed in the PC but as not being employed in the LF.

The method utilised for resolving incongruous information is based upon research on a "donor" taken from the matched records containing concordant information (employed or not employed in both surveys). The donor record is selected on the basis of a distance function between the information provided directly by the donor itself through a software developed by Istat (Calzaroni, 1999), which identifies a donor that represents the minimum distance with respect to the record to reconstruct. This distance is calculated with respect to the variables that are, by construction, available for the microdata existing in the original data sources.

Analysis on the records that contain a declaration that differs in terms of occupation has shown that, according to the LF, only 21% were part of the active population (8.8% unemployed and 12.5% looking for their first job) while the remaining 79% was comprised of the inactive population, housewives, retirees and students (the vast are housewives – 39%). As for economic activity, the amount of records to correct is the highest in agriculture (23.2%), in retail trade and public activities (10.4%) and in other services (9.9%); according to professional position, the number of records is highest among the unpaid family workers (15,7%), then among other self-employed persons (10,2%) and, finally, among salaried employees (9,1%). This confirms the hypothesis adopted. In fact, it can be seen that, in the Italian reality, "weak" or "marginal" employment is most predominant in sectors such as agriculture and in some branches of the service sector (as opposed to what occurs in manufactories) and among unpaid family workers, which often have an "informal" relationship with the enterprises not always perceived as a real occupation.

Comparison (C in fig. 2)

The work phases described thus far have permitted us to build a coherent and exhaustive information from both the point of views of the households and the enterprises. The estimation of the components that are most relevant to labour input (approximately 90% of the total) is carried out on the basis of such an information set and, in particular, they are identified from the comparison between households and enterprises data.

The assumption at the basis of the estimates of the different employment segments is that in a condition of unchanged field of observation of phenomena, of equal time and space reference of sources, of absence of use of irregular and multiple jobs, jobs detected by surveying the enterprises should equal the number of persons who declared themselves employed in households surveys. By comparing sources from the side of the labour demand with those from the side of labour supply, at a detailed level of territorial analysis and economic activity, separately for employees, the self employed and the unpaid family workers, the different segments of employment are obtained, depending on whether the number of persons who declared themselves employed is greater or smaller than the jobs declared by the enterprises. The following definitions are used:

- regulars: employed people who equal the number of jobs;
- full-time irregulars: employed people exceeding the number of jobs;
- regulars multiple jobs: jobs exceeding the number of employed people.

Other components of labour input (D in fig. 2)

There remain additional occupational segments to estimate on the basis of existing national accounts frameworks which are estimated outside of this procedure: due to the fact that they are directly captured through specific statistical surveys or because they remain outside of the field of observation and therefore are estimated in an indirect manner. For example: considering irregular multiple jobs, indirect sources are used, collecting data from sources on expenditure side**;** non resident foreigners are estimated on the basis of information provided by the Ministry of Internal Affairs; "informal" jobs, estimated by using "ad hoc" surveys.

Full Time Equivalents (E in fig. 2)

The employment figure obtained by the process as described thus far is quantified in terms of jobs. Now it is necessary to quantify the volume of work ("U" in formula [1]). A correct measurement of its size must take into account the actual quantity of work provided by all jobs in the entire productive process. The first best solution is to be able to quantify how many hours has been performed; however this is not always possible, therefore we convert jobs in FTEs, as suggested by the SNA93. This is achieved by:

⇒ for those components that provide their work on a less than full time basis (secondary jobs, part time), this pertains to regular, underground and informal employment;

⇒ for those components that provide employment on a full time basis, to take into consideration the effective quantity of work provided (for example, hours unworked due to lack of orders).

The conversion into FTEs is carried out through the estimation of "k" coefficients, defined as the relationship between the quantity of work by someone who occupies a position on other than a full time basis and that provided by someone who is employed full time, obtained on the basis of the available information for each of the components of estimated jobs (hours worked, days billed, per capita turnover by full time employees, etc.).

4.2 The component due to Underreporting

Average per capita values ("x" in formula [1]) to be allocated to the input of labour are estimated through surveys on enterprises budgets. These are conducted yearly and they cover the whole universe of enterprises.

Per capita values are corrected with special control and normalisation procedures that are particularly important as they aim at correcting underreporting of turnover. The hypothesis underlying such corrections is that the income of the self-employed worker of an enterprise should be equal at least to the average wage of the regular employees. The income of self-employed workers is obtained subtracting from the value added of the enterprise the compensations of employees, the capital consumption and other components in accordance to the SNA93 scheme (passive interests, banking expenses, rents, etc.). Therefore when the level of income of self-employed workers is less then the level of compensation of employees, the former is re-evaluated. As a consequence the production and the value added are also adjusted by the same amount.

5. CONCLUSION

On the basis of what has been described, the methodology that has been implemented permits a clear and coherent analysis while applying international definitions of the Non Observed Economy phenomenon.

One of the main aspects to be highlighted is that the presence of data derived from the integration of many administrative and statistical sources, completed with the realisation of the Italian business register, has formalised the adoption of the "productive unit" concept as opposed to the traditional "physical entity" (establishment) approach that was statistically surveyable (using the classic instruments of statistical science). By associating the data with the legal characteristics of the unit which is homogenous with the concepts contained in the new SNA93, albeit not necessarily physically identifiable, i.e., only identifiable with new instruments related to administrative sources. For example, we may cite the difficulty in identifying all of the independent or free lance workers – an increasing proportion of the workforce – and therefore necessitate the use of sources that are able to provide measures relative to non physically identifiable units.

One of the main consequences of this approach is that an exhaustive estimate of regular employment allows us to minimise the statistically non observed component of the economy and thereby more accurately identify the economic underground. Otherwise we might have an erroneous interpretations of the economic conditions that are being described.

The integrated use of numerous sources, aside from improving the exhaustiveness of the estimates, allows a more articulated analysis of employment itself given that the sources often identify particular work relationships and, as such, specific behavioural aspects of the production system. The typology of these relationships has become highly diversified over the course of the 1990's and, as a consequence, so has the demand for information on these typologies (part time, contracted, consultancy, false free-lance, etc.)

Finally, the integration of sources at the microdata level approach, utilised in all cases where it was possible to do so, has allowed us to construct an information system in which employment information serves as the bridge between economic data (provided by the NA aggregates that on the bases of the methodology, are consistent with employment as estimated in NA) and social data derived from the LF and PC surveys.

In general, the possibility of analysing employment in a framework bounded by the NA scheme represents a first step towards an approach that integrates monetary variables included in the NA scheme with underlying nonmonetary variables, that represent one of the most important innovations proposed by the accounting system described in the new versions of the SNA.

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ESTIMATION OF NON-OBSERVED ECONOMY: THE STATISTICAL PRACTICES IN RUSSIA

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The main aim of this paper is to introduce the Russian experience in estimating the non-observed economy. At present the Goskomstat makes adjustments only to hidden and informal activities. Adjustments to non-observed economy comprise about 22 – 25 per cent of the GDP of Russia. Macroeconomic data are adjusted in three stages: 1) estimation of output for individual industries (agriculture and trade are given here as examples); 2) balancing of the main accounts (hidden wages as an example); 3) compiling symmetric Input–Output tables (allowing us to find the disproportionality between production and use by individual groups of goods and services). The main tools are: a balancing method, estimation through reference indicators, a sampling method.

Non-recorded production, adjustments, sample surveys, balancing of accounts.

Introduction.

Estimation of the non-observed economic activities is of great importance for the Russian statistics due to large scale of this phenomenon in Russia. One of the natural features of the economy in transition is a faster implementation of new economic practices than the development of regulation mechanisms. Time is needed to develop a set of rules for economic activities and their reflection by statistics. Thus, one of the tasks of a statistical system is to account for events which are not yet subject to direct registration.

The State Committee for Statistics of Russia (Goskomstat) pays due attention to the work in this area. The national accountants in Russia have been the initiators and the coordinators of the efforts to estimate the non-observed economy in Russia.

In principle, the whole variety of adjustments undertaken in Russia to estimate non-recorded economic activities is based on the balance approach.

Comparison of the estimates on the supply side and on the use side is a core of the Goskomstat concept of the indirect calculations for obtaining estimates in various branches of statistics. For example, hidden wages and salaries are estimated at 10% of the GDP of Russia. This estimate was obtained by comparing officially reported wages and salaries, on the one hand, and household expenditures, on the other hand. Investments in capital assets are estimated with the consideration for their growth in constant prices, which, in its turn, is tied to the production growth in 'construction materials' and 'construction'. Adjustments for non-recorded imports are checked in the supply and use tables for the GDP. An important tool in revealing the unrecorded output is the construction of an Input-Output Table.

At present, Goskomstat in its macroeconomic estimates makes adjustments only for non-recorded economic activities, which are quite legal but are deliberately understated by economic agents or not recorded by statistical services due to their informal organization. Illegal economic activities are not yet considered by Russian statistics.

The upwards adjustment for the non-observed economy is approximately 22-25% of the GDP of Russia.

Adjustments for non-observed economy are made for all estimates reflecting various sides of the economy: production, income, consumption, accumulation, export, and import. The approaches to estimating non-observed economic activities are the most developed for the production approach towards obtaining the GDP estimates.

There is a three-stage approach to making these adjustments in computing the GDP:

I. calculating output of individual industries;
II. compiling and/or balancing the main accounts;
III. compiling symmetric input-output tables.

I. Output estimates of individual industries

Estimation of output by industries of the economy is done on the basis of SNA 93 recommendations with the consideration for the specific conditions of the Russian economy.

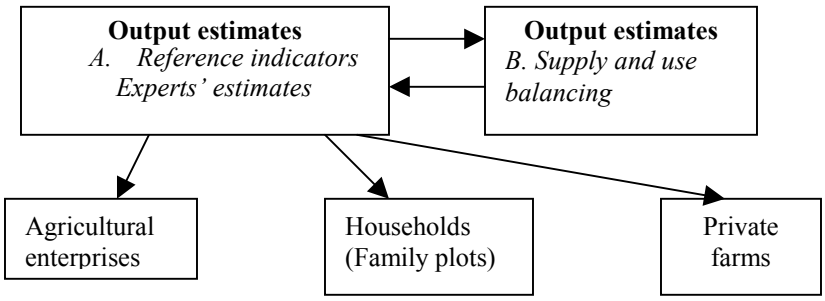
For nearly every industry, data on production volumes are obtained through sample surveys of the enterprises in each sector of the economy and they are extrapolated to the entire population of enterprises on the basis of the information contained in the Register of Incorporated Enterprises. Then adjustments for the output of unincorporated enterprises and for the deliberately undeclared output are made. Informal and hidden activities are largest in agriculture and trade. Households (family plots) produce over half of the country's agricultural production. Adjustments for hidden output and informal activities in trade amount to nearly two thirds of the total output. That is why we have chosen these industries to demonstrate the approaches to estimating non-observed output.

I.1. Output estimates in agriculture.

Estimates of the output of agricultural products are obtained at the regional level. Total output of agricultural products in Russia is the sum of the output estimates of all the regions. Estimation is based on a combination of methods: using reference indicators and balancing of tables.

The total output of agricultural products (including hidden) is calculated as a sum of outputs of three types of producers: ***incorporated agricultural enterprises, households (family plots), and private farms***.

The chart below presents a scheme of calculations at the regional level.



A. Using reference indicators and expert's adjustments.

I.1.1. Output of agricultural enterprises

The output of agricultural products at agricultural enterprises is estimated on the basis of a full count statistical observation of incorporated agricultural enterprises and is adjusted for the non-recorded production volume. These adjustments could be done by using reference indicators, which indirectly characterize production volumes, and using expert's estimates of hidden production.

- To estimate the output of animal products the reference indicator is average *production per unit of forage consumed*.

As a rule, enterprises' accounts as well as their statistical reports contain rather reliable information on costs, while output is understated. On the basis of statistical reports of enterprises, forage use per unit of product's output in kind is calculated. This is then compared with the reference indicator derived from a rural household survey, where experts' adjustment for better husbandry of animals has been done. The estimated of output is obtained by multiplying the obtained indicator by the reported consumption of forage. The difference between this and the measured output is defined to be hidden production.

Milk output estimate at agricultural enterprises

		(arbitrary numbers)
1	Reported use of all types of forage by cows, *thousand tons of nutrition equivalent*	43,937.9
2	Reported output of milk, *thousand tons*	25,286.8
3	Milk yield, *weight per weight unit of consumed forage*	
	- according to the reported data (2:1)	0.58
4	- according to experts' estimates	0.61
5	Estimated output of milk accounting for non-reported production, *thousand tons*	26,802.1
6.	Adjustment coefficient for non-recorded production	1.06

Similar estimates are obtained for other kinds of animal products.

- To estimate the output of cereals and other crops the reference indicator is *the quantity of seeds required per hectare*.

The output of cereals and other crops taking into account non-recorded output is computed on the basis of statistical data on crops harvest and by the determination of the harvest of similar crops from land which is under cultivation but is not reported. To estimate the non-reported areas of land under cultivation, we use statistical data on the consumption of spring crop seeds at agricultural enterprises, as well as data on average standard quantities of seeds

per hectare in various regions. An excess of the estimated area under cereals and other crops over the reported area is defined as non-reported land under cultivation. Total cereals and other crops production is estimated on the basis of average actual yield per hectare and the estimated total area of land under cultivation including non-reported areas. Such estimates are done for the main types of crops.

- Experts' adjustments are also used as it is assumed that a part of the actually produced output at agricultural enterprises is pinched workers at these enterprises for their own household consumption, and hence, was not recorded in the output. Adjustments for these amounts could be done using conventional coefficients.

Total output of agricultural enterprises including hidden production is obtained through a formula:

$Vad = Vrec \times K ad$, where

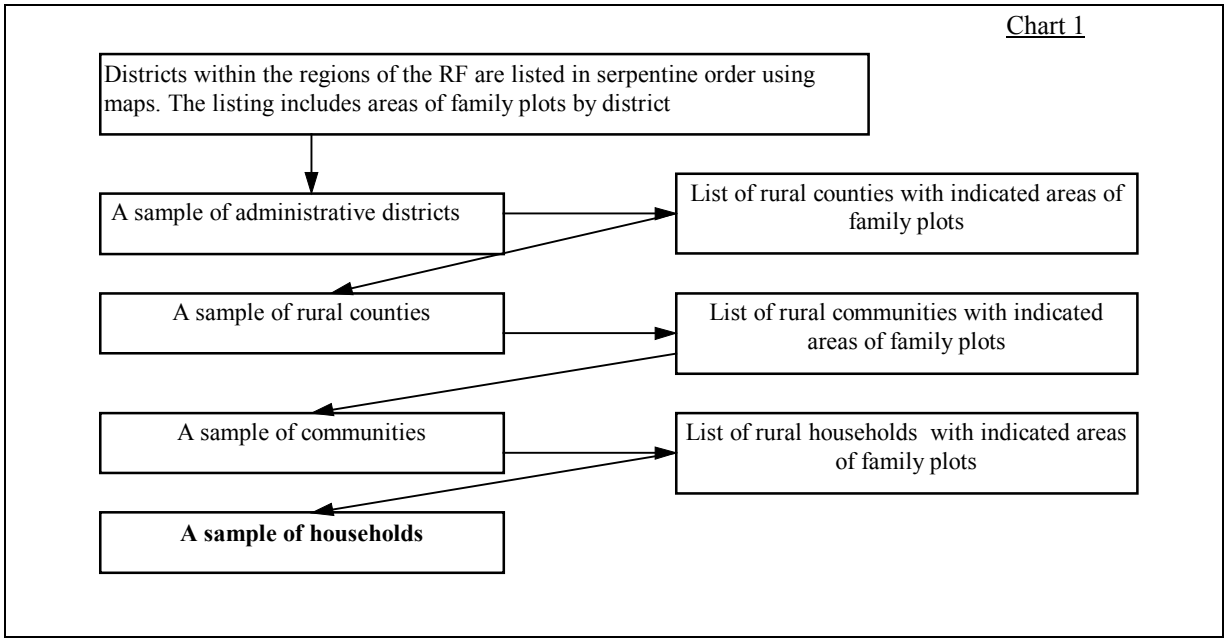
Vad	output of agricultural products in agricultural enterprises adjusted for non-recorded production;
Vrec	recorded output of all agricultural enterprises;
Kad	adjustment coefficient for non-recorded production (a weighted average for the main agricultural products computed after products' valuation at selling prices).

I.1.2. Output of agricultural products from households (family plots)

As it was mentioned above, Russia has been characterized from observation by having characterized by a large share of agricultural output generated by households. The share of certain products reaches 90% (e.g. potatoes). The volume of agricultural products produced at family plots (informal sector) is estimated on the basis of rural household surveys. The administrative records of the rural district administrations, as well as data of the committees of Land Resources and Management are used as well. Approximately once in 10 years, censuses of cattle and land under crops in family plots are conducted.

Two groups of family plots are considered in estimating the agricultural output of the household sector:

- family plots of rural population;
- family plots of urban population.



Family plots of the rural population

The output of agricultural products (of both plant cultivation and animal husbandry) produced by the rural population in their family plots is estimated on the basis of sample surveys.

The four-stage probability sampling of rural households has been conducted. Lists based on Land Taxpayers Register were used as a sample frame. At each of the four stages (on a district, county, community, and household level) samples were selected with probabilities proportional to size, with the size measure being the area of a family plot (For sample design, see Chart 1).

The selection probabilities were determined by the relation of the sampling unit (a district, a county, a community, or a household) land area to the total land area at each stage. The rural household survey results were obtained using ratio, average, and probability estimators.

Family plots of the urban population.

The output estimates for agricultural products in family plots belonging to the urban population, which are not covered by the sample surveys described above, are obtained through economic computations.

Plant cultivation. Output is estimated on the basis of data on the area of land under crops in family plots, the crops structure by kinds of crops, and average crops yield in territories; these data are obtained through specialized household surveys.

Land areas under crops at country-side plots of the urban population are determined using the data of once-time full census along with information of the Land Resources and Management committees on increase or decrease in area in subsequent periods. The share of land under crops in newly allotted plots for the urban population is assumed to be the same as in the total area of plots known through the full count survey. After the area of land under cultivation is estimated, the structure of land use by kinds of crops is calculated. These estimates are based on the crops structure determined through the last census. The harvest estimates for different kinds of crops are obtained as a product of the average yield in this territory and the estimated area of land under crops.

Thus estimated outputs of the main kinds of plant-growing products are valued at average market prices.

Animal husbandry. Output is estimated on the basis of data collected through specialized household surveys, the last cattle census taking into account the changes in cattle population taken from annual surveys. According to the data collected through the household surveys (of family plots), average yields of animal products per head of different kinds of animals are estimated (beef per head of cattle, etc.). The production volume of animal products (by products) in households of urban population in the reporting period is a product of the estimated average yield per head of animal and the estimated animal population (by kinds).

The table below gives an example of estimation of animal products output in households (arbitrary numbers)

	Animal and poultry population at the beginning of the reporting period, thousand heads	Average product yield per animal head (according to the survey), kg	Total production of animal products, (1) x (2) tons
	1	2	3
Cattle	407.7	8.78	3,579.6
of which cows	219.4	-	-
Swine	129.0	18.91	2,439.4
Sheep and goats	456.6	2.02	922.3
Poultry	5,759.2	0.27	1,555.0
Milk	õ	544.78	19,524.7
Eggs, pieces		80.66	157,940.3

Estimates of total output of agricultural products generated by rural and urban households in the region are computed after obtaining the results for rural and urban households, and adjustment for agricultural production in individual and collective gardens and kitchen gardens, and at plots allotted for building individual houses.

I.1.2. Output of agricultural products at private farms.

It should be mentioned here that, at present, private farms in Russia contribute only about 5% of the total output of agricultural products

Information on the production of agricultural products at private farms is obtained through sample surveys. Selection has been made using the sub-register "Peasants' farms" as a sample frame. Such variables as 'land under main crops' and 'animal population (by types of animals)' were used as stratification factors. From time to time, full censuses of agricultural activities of private farms are conducted.

The survey results are obtained by summarizing the sample results (using a simple mean), which are adjusted for hidden (understated) production. Here, the same adjustment coefficient is used, which has been calculated for agricultural enterprises.

Valuation of output. After estimating physical volumes of production for agricultural enterprises, family plots, and private farms, their valuation is done. The valuation of output in actual prices for each category of agricultural units is done directly, by valuating main agricultural products in the reporting year using average selling prices. Valuation of output of fodder crops, growing perennial plants, and unfinished production is done on the basis of current costs per unit of product.

Total output of agriculture =
= output of agricultural enterprises + output of households + output of private farms

B. Balancing supply and use tables

The output estimates obtained through the procedures described above are checked by compilation of the supply and use tables.

Annually, commodity flows (in physical units) are compiled for grain, processed grain products, potatoes, vegetables, melons, fruit, meat and meat products, milk and diary products, and eggs. These flows are compiled in accordance with the following pattern:

Row	Items
	I. Supply
01	Stocks at the beginning of a year in the agriculture, food industry, and wholesale and retail trade
02	Production of agricultural products in agriculture
03	Import
04	Total supply (01+02+03)
	II. Use
05	Intermediate consumption (seeds, forage, and other non-food purposes)
06	Losses
07	Exports
08	Household consumption (04-05-06-07-09)
09	Stocks at year end

All these items are analyzed for the changes in volumes on a year-on-year basis, and balanced between themselves and with the indicators obtained from statistical records. Food consumption of households calculated from supply and use tables is compared with the household survey data on food consumption. When the comparative analysis is done, decisions are taken regarding the adjustments of supply estimates of food products, including estimates of production volumes. The estimated output of agricultural products in physical units is then valued at average market prices.

I.2. Output estimates for trade industry with the account for hidden and informal activities

The development of market activities in Russia has lead to a significant growth in trading activity. Trade comprises 20% of the GDP of Russia, and small businesses and individuals, who act without appropriate registration and licenses, generate almost half of the trade's value added.

Output estimates for the 'retail trade' are done at the regional level. The total national estimate is the sum of the regional outputs.

Computing the output is based on estimating wholesale and retail turnover of large, medium-size, and small incorporated businesses, and the sales volumes of registered and unregistered individual entrepreneurs. As a rule, the activities of individual entrepreneurs are concentrated at food and dry-goods markets. A description of retail turnover estimation is given below. The procedure for wholesale turnover is similar.

I.2.1. Estimation of retail sales

1.2.1.1. Incorporated trading enterprises and registered individual entrepreneurs.

The retail sales of large and medium-size retail enterprises is estimated on the basis of full count statistical observation, while small retail enterprises are subject to sample surveys. The retail sales of individual entrepreneurs,

who are listed in the State Register as retail traders, is added to the sales of small enterprises. The volume of retail sales of these individual entrepreneurs is computed by assuming the same average revenues from trade per person as for employees of small enterprises.
The coverage of retail enterprises by statistical observation may be incomplete, and the reported sales volumes may be deliberately understated. Estimates of sales that are deliberately hidden or are missed due to incomplete coverage of formal sales are obtained by comparing the reported total sales of large, medium-size, and small retail enterprises with receipts of trade revenues by banks and with household expenditures on food and non-food items.
According to 1991-1995 data, bank receipts of trade revenues were approximately 50-60% of the retail sales of the trade enterprises. The difference is due to cash salary payments to employees, cash payments for goods from individuals, and other cash expenses. The trade revenues index in constant prices (obtained by deflating revenues by CPI for the reporting period) is compared with retail sales index in constant prices and with changes in household expenditures. Taking into account the economic environment, the most appropriate index for adjustment of trade sales in then decided, and a revised *sales volume* is calculated.
I.2.1.2. Sales of food and dry goods markets
Estimates are obtained from sample surveys of the markets. In each region, in the middle of a quarter (one week-day and one week-end day) one or two city markets are surveyed. Sellers are interviewed on prices and quantities of goods sold. These markets employ individuals with and without licenses for retail trade. The total number of sellers is estimated as an average resulted from computations of two kinds:

- first, once a month, markets administrators shall provide to statistical bodies the number of markets in the region, and the number of sellers;
- second, the number of sellers is computed as a total sum of charges for renting trading space divided by charge for one space.

The total volume of sales at these markets is computed as the product of number of sellers, average sales per seller per day, and the number of trading days in the period in question.

1.2.2. Supply and use tables for consumer goods
In order to estimate more accurately the total (wholesale and retail) volume of sales, ***supply and use tables are compiled*** for 100 groups of consumer goods of high demand.
Those goods whose sales are estimated in kind are valued at average market prices computed from statistical data. The total estimate for all goods is computed by applying an adjustment coefficient to the sales volume estimated for 100 groups of consumer goods. This coefficient is based on the structure of household expenditures for purchasing goods derived from input-output tables.
This preliminary estimate of sales volume estimated by methods described above is checked by compiling commodity flows scheme of which closely resembles supply and use tables. Its scheme is given below:

	Items	**Source of data**
01	Stocks in the industrial sector, in retail and wholesale trade at the beginning of the period	statistical form No. P-1, estimate
02	Production	statistical form No. P-1
03	Imports	Customs statistics, estimate
04	Exports	Customs statistics, estimate
05	Stocks at the end of period	statistical form, estimate
06	Total resources for sale	01+02+03-04
07	Sales	06-05

The value of industrial goods in producer price is converted to purchaser price on the basis of producer price to purchaser price ratios from input-output tables.
The value of imports CIF is converted to domestic purchaser prices using an "efficiency coefficient" computed as the ratio of domestic purchaser price to the contract price of buying the goods abroad (converted to rubles at the average exchange rate of the Central Bank of Russia).

1.2.3. Output estimate.

The output of the trade industry is computed independently for each type of business (large, medium-sized, and small enterprises, and markets) using sales volumes estimates and *trade margins*. The trade margins for large and medium-size enterprises are obtained from statistical data, and for small businesses and individual entrepreneurs from surveys and experts' estimates.

II. Compiling and balancing the main accounts

When national accounts are compiled for Russia, the data for the production and consumption of goods and services at the level of industries, which are received from various sources, are brought together and adjusted. These adjustments deal mostly with data for services, as data received from users of services are usually more reliable than those received from producers. At the same time an adjustment is made for hidden income and mixed income.

It is a wide spread phenomenon in the Russian economy, that considerable sums actually paid by the enterprises, organizations, and private employers to employees are not reported with the purpose of tax evasion or for other reasons.

	Estimated share of undeclared wages in total wages	Estimated share of undeclared wages in GDP
1993	11.9	5.3
1994	17.3	8.5
1995	23	10.4
1996	23.5	11.7
1997	24.2	11.9
1998	24.1	11.9

The estimation of the total compensation of employees accounting for hidden income is done on the basis of current statistics on wages and salaries and the estimates of hidden income. Hidden income is estimated as a difference between all household expenditures, including changes in financial assets, and registered income. At present, household expenditures greatly exceed the disposable income estimate.

The following household income is considered registered income;

- primary income, including compensation of employees and social insurance charges, mixed income, and net income from property,
- secondary income, including balance of money transfers from various sources,
- balance of capital transfers.

Compensation of employees is obtained from regular official statistics, plus information on the execution of the state budget, and on off-budget funds for social insurance charges.

Mixed income is gross value added generated by households (after tax on production) from agricultural products, construction, including own construction, trading at food and dry-goods markets, and providing paid services of various kinds (industrial, domestic, legal, educational, medical, cultural, etc.)

Household expenditure comprises:

- taxes, fees, donations as redistribution of the secondary income;
- expenditures for final consumption, including expenditures for buying goods and services at markets and consumption of own produced goods or goods received as payment in kind or through humanitarian aid;
- accumulation, including investments in fixed assets - real estate, animals, increase in inventories, and net acquisitions of valuables and land;
- increase in financial assets.

Household expenditures for final consumption and accumulation are estimated on the basis of the data on retail sales volume, volume of paid services to households, construction of individual houses.

To estimate hidden income, an estimate of increase in financial assets is done, which includes:

- increase in cash savings in households in national currency;
- increase in cash savings in households in hard currency;
- increase in bank deposits by households;
- increase in value of securities owned by households;

- increase in government arrears on wages and pensions;
- increase in arrears on commodity credits.

This list does not include several items of increase in value of assets, in particular, does not include increase in households' stakes in business (except for shares), as well as capitalized investments in pension funds or insurance companies. The Goskomstat does not have information on these assets. However, lack of these data does not impact much the general macroeconomic estimate, as volumes of these assets are not large yet.

The increase of cash savings in hard currency by households is estimated as the difference between sales and purchases of hard currency by the population with an adjustment for sums spent abroad to buy goods with the purpose of reselling them in the domestic market, and net purchases of residents abroad. This estimate is rather approximate, as movement of hard currency cash is reflected only at the moment of its conversion from rubles into dollars and back, which is not in compliance with the SNA requirements for determining of the moment of property rights transfer for the assets. Besides, hard currency movement is related not only to selling and buying cash, but to paying wages in hard currency, import and export, and changing balances in hard currency accounts.

The increase in households' bank deposits comprises an increase in deposits in Sberbank and in commercial banks, and an increase in transactions using plastic cards. The increase in the value of securities held by households, includes increase in domestic loans of 1982 and 1992, bonds issued by the USSR and Russia, and shares. At present, data is not available for the secondary securities market, only purchases in the primary market are estimated.

Balancing of household income and expenditures is done both in current and constant prices, that is with account for changes in constant prices. A difference between income estimates obtained as a result of balancing with expenditures and registered income is defined as hidden income.

III. Compiling Input-Output Table

Compiling input-output tables allows us to determine the out discrepancies between production and use of various groups of products. Based on the analysis of production, import, intermediate consumption, and final use the necessary adjustments are introduced. Balancing at the level of certain product groups allows us to obtain more accurate estimates of supply and use in the country's economy. When an input-output table is compiled, the most serious adjustments are introduced in the estimates of middlemen activities, transport margins, production of crude oil and oil products, gas, and electricity. When middlemen activities and transport margins are estimated, special attention is given to the relation of producer and purchaser prices for products, and to commodity flows from producers to purchasers. Fast decentralization of all mechanisms of macroeconomic regulation in the economy, a high-speed denationalization of the state sector of the economy accompanied by the remaining monopolization created favorable conditions for free pricing and establishing a great number of middlemen. Some commodities pass through up to 30 intermediaries in their movement from producer to end-user. Because of shortages in the money supply and an increase in payment amongst producers, there has been an increase in barter, payments in hard currency, and provision of tax exemptions.

After the completion of input-output tables, national accounts estimates are adequately adjusted.

IV. Further improvements in estimation of non-observed economy.

In 1999, Goskomstat tested a technique for estimating the non-observed economy proposed by Italian statisticians. Estimates of output in each of five industrial groupings (manufacturing, agriculture, transport, construction, and trade) in Bryansk oblast (region) have been computed using the labor input method. Data on labor costs and production per employed person were obtained from regular statistical observation of large and medium-size enterprises and through pilot surveys of households and small businesses.

First, the estimate of number of employed persons in accordance with the household survey was compared with the number of employees at enterprises and organizations reported by statistics. For further calculations the most reasonable number has been chosen.

Then, the estimated number of employed persons was allocated to large, medium-sized and small enterprises in the same proportions as for the data obtained from the enterprises statistics..

The number of employed persons is considered in five groups: employees at registered enterprises (including government organizations); persons employed at agricultural enterprises and farms; persons employed at unincorporated enterprises; persons hired by physical persons, and self-employed persons.

Productivity estimates (output per employed person) have been used to obtain the output estimates. The productivity of small enterprises and of self-employed persons has been assumed to be the same as the productivity measured by the survey of small enterprises. For large and medium enterprises the productivity has been computed from statistical data. .

The results for the five industrial groupings have been compared with those obtained during the calculation of the gross regional product (GRP) by the methods currently employed in Goskomstat (obtaining output estimated for agriculture and trade is described in this paper).

	Industries	Output (using survey results) mil rub	Output (using current methodology of GRP estimation), mil rub	Comparison of results (2:1) %
		1	2	3
1	Manufacturing	1538.6	1543.6	100.3
2	Agriculture	338.5	596.2	176.1
3	Construction	276.1	368.3	133.4
4	Transport	510.7	667.9	130.8
5	Trade	383.5	423.0	110.3

Analysis of the differences between the obtained estimates and the GRP calculations allows us to assume that, to a large extent, they could be explained by differences in methodology.
We see that for manufacturing, the figures are almost identical.
For agriculture and construction, the GRP figures are much larger because they include production of households for own consumption.
For transport, adjustment for hidden and informal activities in the GRP figures is made at the federal level and allocated to the regions in proportion to value added. The inapplicability of this model to Bryansk region could be the reason for the larger GRP figure.
For trade, the assumption that self-employed individuals have the same productivity as employees in small enterprises is questionable and might explain the difference.
If we carried out these estimations using a unified methodology for output calculation, that is, if we included in output of agriculture and construction own produced goods for household consumption, and introduced the necessary changes in the productivity estimates of individual traders, the results obtained by two methods may have been closer.
Experimentation with the suggested methodology was also carried out for estimating 1997 output for 13 industries in Tatarstan. The analysis of the results for Tatarstan supported the considerations that occurred when we compared the production volumes in Bryansk oblast estimated by two methods.
It was confirmed that the proposed method of using data from labor market surveys together with data from statistical observation for estimating the non-observed economy provides reasonable estimate of outputs of the main industries in the region, however, adjustments are needed due to peculiarities of some industries (agriculture, construction, trade).
Together with certain advantages of this method, such as estimating the output generated by self-employed, there are some disadvantages in applying it to enterprises caused by the peculiarities of the economic environment in Russia. The conducted survey once again demonstrated that Russian businessmen, for tax evasion purposes, understate not only the production volumes but the number of employees. It is characteristic for both large and small enterprises, including banks. These calculations once again drew attention to a problem of estimating productivity (output per employee). Here we have discrepancies between the production volume and the number of employees who produced these volumes.
In order to get additional information on the expansion of non-observed economy in Russia and its scope in various industries, research work on new methodological approaches to its estimation has been undertaken. Within this research project, it was suggested to conduct a sample survey of tax inspectors, officials from the economic departments of the regional administrations, auditors, managers of the enterprises, recruiting agents by interviewing them on their quantitative estimates of the scope of the hidden economy in various sectors. It is suggested to assess the size of deliberate understatement of income. Comparing these estimates with the results of the periodic checks done by the tax services will allow drawing more reliable conclusions.

PRINCIPLES AND PRACTICES IN THE MEASUREMENT OF THE UNRECORDED ECONOMY: DISCUSSANT'S REMARKS

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1. INTRODUCTORY REMARKS

A lot of attention is being paid these days to the "hidden economy". Reports often suggest that the figures published by national statistical offices miss large parts of the economy. They challenge the credibility of national accounts' estimates. For example, Schneider and Enste (2000) estimate an average level of the hidden economy in Canada over the period 1990-93 at 13.5% whereas a Statistics Canada report (1994) concluded that the upper bound to what could have been missed in the 1992 official gross domestic product figures was 2.7%.

However, the research papers on the hidden economy are often subject to one or both of two major weaknesses. First, they often fail to define exactly what is to be measured and thus possibly missed. This lack of precision regarding the measurement target is epitomized by the wide range of different terms in common use - hidden economy, shadow economy, parallel economy, subterranean economy, informal economy, cash economy, black market - to mention just a few. There is no common understanding whether they all mean the same thing, and if not, what relationships they have to one another. The second problem is the dependence of most estimation methods upon high level model assumptions that cannot be justified. For example, the model upon which Schneider and many others base their estimates is one that assumes that changes in the patterns of currency demand can be attributed entirely to, and reflect accurately, changes in the hidden economy. Another model used by Lackó (see Schneider, 2000) assumes the hidden economy can be measured through changes in household consumption of electricity. Such methods make inadequate use of the wealth of pertinent economic data available and there is no obvious way in which their findings can be combined with others jointly to provide more reliable measures.

By contrast, the three papers presented in this session all start from a solid definition of what is to be measured, namely economic production as defined in the 1993 System of National Accounts (SNA93). They identify the elements that are difficult to measure as "illegal", "underground" and "informal" productive activities, all of which terms are well defined in the SNA93, and which are collectively referred to in this session as "unrecorded" or equivalently "non-observed". And they embody use of data from a wide variety of sources that can be brought together and reconciled within the SNA93 framework.

2. PAPER BY RONALD LUTTIKHUIZEN AND BRUGT KAZEMIER

Based on their experiences at Statistics Netherlands, Ronald Luttikhuizen and Brugt Kazemier present a perspective on how hidden (meaning underground in SNA terms) and informal activities can best be systematically incorporated in the national accounts. They indicate their preference for a "commodity flow" (production) approach to national accounts compilation, especially for countries in transition. They briefly describe the approach in terms of the systematic collection, editing and integration of data from surveys within, and then across, industrial branches. They recommend use of social accounting matrices as possible means of displaying additional dimensions of, and integrating, data pertinent to the non-observed economy (NOE).

More specifically, the authors suggest the use of a two dimensional table to characterize non-observed activities. One axis classifies the producing units as incorporated enterprises or household enterprises, and further divides the first group into those enterprises that appear in the national business register and those that do not. The second axis classifies the labour input as being "administered" (i.e., known to the appropriate administrative authorities), or "not administered". In combination the two axes define five cells (called quadrants in the paper). Within each cell, the

authors identify the likely NOE activities and describe the methods available to measure them. They also note that the table can be extended to include a cell for non-market production by household enterprises.

The authors further suggest that, in compiling the accounts by the commodity flow approach, a three dimensional table be produced with industries in one axis and the variables of interest on the second axis. The third axis comprises seven layers, containing the initial values of each variable, the adjustments for NOE activities for each of the five cells in the NOE table, and the final values of the variables after all the adjustments have been applied. Such an approach is recommended as a means not only of documenting adjustments but also of identifying the major sources of weakness in economic measurements and deciding on priorities for the survey program.

The paper provides valuable insight into the sort of ways in which the NOE may be characterised and measured. Its practical application would raise three questions. First, is the five cell breakdown optimal from the perspective of understanding and measuring the NOE? Second, is the documentation procedure too data intensive to be affordable? Third, is there an existing example of a social accounting matrix specifically designed for the NOE?

3. PAPER BY MANLIO CALZARONI

The paper by Manlio Calzoroni characterizes the NOE in terms of eight components and it describes the well tried and tested process actually used by the Italian National Statistical Institute (Istat) to ensure exhaustiveness of estimates of the Italian gross domestic product (GDP), including NOE activities. The activities comprising the NOE are classified into the eight groups:

- (1) illegal activities;
- informal sector activities by units that (2) are not required to register; or (3) are registered but underreport;
- formal sector activities by units that (4) do not register, or (5) register but underreport; and
- formal sector activities by units that register and are willing to report but that (6) are not registered or (7) are mis-registered or (8) for which survey responses are not obtained.

Activities in groups (6), (7) and (8) are collectively referred to as the "statistical underground", meaning that the failure to measure them is due to problems in the core statistical processes rather than deliberate concealment or because the units belong to the informal sector and hence are out of scope for most enterprise surveys.

At the heart of Istat's procedures is the labour input approach used in the compilation of production account. About 70% of the total GDP estimate is computed this way. The essence of this approach is that:

- the important economic variables such as output and valued added are obtained from surveys of establishments in the form of *ratios per unit of labour*, within industry by and size group strata;
- "demand side" employment data are obtained from surveys of establishments;
- "supply side" employment data are obtained from a labour force survey of households;
- the two sets of employment data are transformed to a common, national accounts based framework in terms of full time equivalent employment, and are confronted and reconciled to produce estimates of labour input by industry and size group;
- ratios per labour unit are multiplied by the labour inputs to compute estimates of the economic variables.

Whilst this approach is not specifically designed to measure NOE, by its very nature, it includes (a large part of) the NOE. It is sometimes called the Italian approach because it was first described in detail by Istat, and has been used by Istat since 1987. However, the underlying notion of adjusting or replacing employment measured by establishment surveys by employment from a household survey is used by statistical agencies in other countries too, for example by the national accounts area in the Australian Bureau of Statistics.

A (statistical) business register is a key part of the establishment survey infrastructure and the paper outlines the methods used to combine information from administrative and statistical sources to ensure that this register is comprehensive, well coded and up to date. It describes the reconciliation of data from the population census and the labour force survey, in particular identification of persons employed according to the SNA93 definition but reporting themselves as unemployed. Finally, it indicates how output per capita values for self employed workers are adjusted upwards when they are observed to be less than those for employees in the same industry.

The paper provides a fine, practical example of NOE characterization and measurement. It raises two questions. First, how probable is it that people report all their employment activities, including those that they are not declaring to an administrative source, to a household census or survey? Second, why is no adjustment made for under-reporting of production or over-reporting of costs by enterprises in the formal sector? For example, the Australian Bureau of Statistics makes an upwards adjustments in the order of 5% and 15% to profits data reported by incorporated and unincorporated enterprises, respectively, to tax authorities.

4. PAPER BY IRINA MASAKOVA

The paper by Irina Masakova is a description of the procedures actually used by the Russian State Committee for Statistics to estimate and include the NOE component (22-25%) within GDP. A three stage approach is outlined, comprising adjustments (1) to the outputs within individual industries, (2) during compilation and balancing of the national accounts, and (3) during balancing of the input-output tables.

Within two of the areas where the NOE is particularly large, namely agriculture and retail trade, three types of adjustments to individual industry outputs are described.

- Supplementary surveys are used to measure informal production not covered by regular enterprise surveys. The examples given are: a four stage sample survey based on a land taxpayers' register, for measuring the: agricultural production of rural family plots; a single stage sample survey based on a peasants' register for measuring the agricultural production at private farms; and quarterly surveys of city markets in which data about the numbers of stall holders are obtained from market authorities, and the sales are obtained by direct question and by observation.
- Reference indicators are used to compensate for understated outputs as exemplified in the adjustments of milk production and cereal production using forage and seed consumption, respectively. Estimates of retail sales that are hidden or missed are obtained by comparing total reported sales with receipts of trade revenues by banks, and with household expenditures.
- Supply-use tables for individual commodities are prepared and balanced, examples given being for agricultural products (in physical quantities), and high demand consumer goods.

The sort of adjustments made while compiling and balancing the national accounts are illustrated through the comparison of household incomes (which are underreported) with household expenditures, allowing for changes in assets. The strengths and weaknesses of the data are discussed. Finally the results of ongoing experimentation with the labour input approach are outlined.

The paper indicates the painstaking way in which Russian GDP estimates are adjusted to include informal and hidden activities. Given this very thorough approach and the focus on detail, is there any scope at all for really substantial omissions from the estimates due to something missing at the big picture level?

5. CONCLUDING REMARKS

What is striking about these three papers, taken as a group, are their similarities. As previously noted, they all take the SNA93 as the reference point. They describe NOE measurement within the context of national accounts' compilation by production approach. They involve systematic dissection, analysis, and measurement of the NOE, integrating all the data available, and modelling only as a last resort at low levels when data are not available. None of the papers deal explicitly with illegal activities.

Whilst, the confluence of ideas is not entirely surprising - the authors all have a national accountant's optic and they have been exchanging ideas for a decade - it suggests there is scope for a comprehensive description that embodies all these ideas and promotes an integrated approach based on international standards. This is the basis for the ongoing development of a Handbook for Measurement of the Non-observed Economy (provisional title) as a supplement to SNA93. The Handbook Project is being organized by the OECD with team members from international organizations and national statistical offices. Indeed, all the authors in this session are contributors.

The need for the Handbook initially arose in the particular context of countries in transition, where the contribution of the NOE is high. However, the Handbook itself is intended to be universally applicable, although one chapter will be devoted to dealing with problems in specific situations, e.g., in a transition economy. A preliminary draft of the Handbook is being prepared for discussion and review at a Workshop on NOE Measurement in the Russian Federation, October 16-20, 2000. The next version incorporating feedback from Workshop will be distributed January 2001. Further details of both the Handbook and workshop are available from the discussant.

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