

International Comparison Program

Splitting GDP Expenditures for the ICP



**1st ICP National Accounts Working Group Meeting
February 16-17, 2011**

Washington DC

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SPLITTING GDP EXPENDITURES FOR THE ICP¹

1. Introduction

In principle, a basic heading consists of a set of very similar goods or services. In practice, there is a trade-off between the theoretical need for close similarity between the products within any single basic heading and the practical difficulty of estimating expenditures for very detailed basic headings. It is also true that few, if any, countries have the data available to estimate every basic heading using a bottom-up approach. As a result, basic heading expenditures are calculated in most cases by splitting a higher-level expenditure using a number of indicators (e.g. splitting household final consumption expenditure on food into the 16 basic headings within food).

Data from the 2005 ICP showed that some very arbitrary distribution methods were used to allocated expenditures to basic headings, particularly that of taking a simple average of the higher level aggregate and applying it across the number of basic headings underlying that value. For example, if there are five basic headings in an aggregate, which has a total value of 200, then a value of 40 (i.e. $1/5 \times 200$) would be allocated for each basic heading. This method is unsatisfactory and so the Global Office has suggested a number of different methods that could be used to allocate values to basic headings, ranging from the ideal of supply-use tables to a fairly arbitrary method of allocating values based on the expert judgment of the national accountants involved.

2. Categories of basic headings

The process of estimating detailed expenditure values depends on the type of basic heading. The 155 basic headings can be categorized according to 3 different criteria: (i) Consistency between the existence of price data and expenditure values; (ii) Important versus less important basic headings; (iii) Difficulties in estimating values because of the unavailability of source data.

2.1 *Consistency between the existence of price data and expenditure values*

General principle

One of the roles of basic headings is to identify groups of products for which prices have to be collected. The size of a basic heading also provides an indicator of the number of different products that may need to be specified to provide an adequate coverage of prices across countries. However, it is important to recognise that it may be possible for the price of a single product to be an excellent indicator of the price level in a basic heading. For example, if letters dominate the basic heading for “Postal services” and a country has a single rate for posting letters then that price will closely reflect the price level for that basic heading.

Any basic heading for which a price is provided for one or more products must have a non-zero value. The implication of having a zero value applied to a basic heading PPP is that the PPP will not affect the level of the PPPs for higher-level aggregates (including GDP). In this respect, it is very similar to the situation in a time series price index. If a zero weight is applied to a price in calculating the higher-level price indexes then that price will not contribute to the higher-level aggregates.

¹ Prepared by Paul McCarthy and Michel Mouyelo-Katoula.

Therefore, except for basic headings that are economically irrelevant in a particular country, it is very important that all basic headings should have values assigned to them, even if these values are based on data or processes that are less robust than those used to calculate higher-level national accounts aggregates.

This applies to “Reference PPPs basic headings” as well.

Reference PPPs

There is a special category of basic headings for which expenditure values are required even though there is It is not possible to collect comparable prices for some basic headings. In such cases, an indirect approach is adopted in the ICP to estimate PPP-based real expenditures. For example, real expenditures for inventories and valuables are based on indirect PPPs rather than prices specifically relating to the basic headings underlying these aggregates. These indirect PPPs are called “reference PPPs”, which are defined as PPPs that are based on prices collected for other basic headings. In the 2005 ICP, the reference PPPs were region-specific although there were many reference PPPs that were common across regions. As an example, the reference PPPs for inventories in the Asia-Pacific region were based on PPPs for durable and non-durable goods while those for valuables came from gross fixed capital formation (excluding reference PPP basic headings). In all regions, the reference PPPs for exports and imports of goods and services were exchange rates.

In some cases, reference PPPs are used in some countries but not in others within a region, although this is not a common practice. It arises when a country is unable to price any of the products specified in a particular basic heading. The reference PPP used is based on that for a closely-related basic heading or from the next level of expenditure (i.e. the expenditure class) in a similar way to that used to impute missing prices in a time series price index.

Basic editing procedures

Some basic editing procedures that should be applied by national accountants before they supply their data to the regional coordinators are:

- ensure that no basic heading has a zero value (except in the rare event that it is genuinely zero)
- the sum of the basic heading values within an aggregate equals the total value of that aggregate
- the sum of the major aggregates equals the value of GDP
- the major aggregates and GDP are consistent with the data reported in the annual national accounts questionnaire collected by international agencies such as the UN Statistics Division (or that any differences can be readily explained).

2.2 Important basic headings

Based on their share of GDP, some basic headings are more important in one country (or region) than in another. However, some basic headings are particularly important across most countries. For example, actual and imputed rents of dwellings is (or should be) one of the largest basic headings in most countries. Health and education are also very important although their importance can be partly hidden because of the mix between the private and government sector in providing these services and because the data collection for government expenditure is based on valuing each of the major components of production (as discussed in the paper on “The role of national accounts in the ICP”).

Gross fixed capital formation varies in its importance across countries but each of its basic headings generally contribute significantly to GDP because there are only 12 basic headings and gross fixed capital formation is more than 25% of GDP in some countries. One of the reasons for so few basic headings being defined in such an important contributor to GDP is that it is so difficult to obtain detailed data on the components of gross fixed capital formation.

Exports and imports can each be very significant (more than 100% of GDP in a few cases) but their contribution is best considered on a net basis because the same reference PPP, based on exchange rates, is applied to both exports and imports. Even so, the net figure can be several percent of GDP and in many developing economies it is negative (imports being greater than exports) which complicates the aggregation process.

2.3 Availability of data sources: Problematic basic headings

Some basic headings are particularly problematic because the data sources are either inaccurate or basic data may be unavailable. These have been briefly discussed in the paper “The role of national accounts in the ICP” but it is worthwhile summarising them again because of the importance of the issues involved. Alcoholic beverages are often consumed in countries where alcohol is officially forbidden for local citizens and it can easily escape the notice of national accountants because of an assumption that the law is being fully upheld and so consumption must be zero. A similar situation arises with basic headings that mostly or largely relate to underground or illegal activities: (e.g. Narcotics; Games of chance; Prostitution).

Basic headings that mostly relate to the informal sector (e.g. Animal drawn vehicles and some of the major components of Food, which are often provided via subsistence production) tend to be poorly estimated in many cases, with the result that household final consumption expenditure is under estimated, as is GDP.

The need for the adjustment for Net expenditures by residents abroad is not well understood and this is the subject of a more detailed discussion in the paper “Splitting GDP expenditures for the ICP”.

Many countries do not have separate estimates for NPISHs and so these estimates are either recorded as part of household final consumption expenditure or, often, are ignored altogether. They can be important in areas such as health and education and, more importantly, their importance varies across countries so ignoring them will distort the ICP comparisons of real expenditures.

3. Splitting GDP expenditures into basic heading – An overview

3.1 Five approaches to obtaining basic heading values

Several methods can be used to obtain basic heading values. They can be grouped together into five broad groups:

1. Direct estimation.
2. Extrapolation from a recent year or from 2005.
3. Borrowing a per capita quantity or volume from a country in the same cluster related to a particular basic heading.
4. Borrowing a structure related to a class, sub-group or group from a country in the same cluster related to a particular higher level heading.

5. Splitting a category's volume or quantity (class, sub-group or group) into its composing basic headings, using expert opinion.

Clearly, approach 1 (direct estimation) is the preferred method, with the extreme case being every one of the 155 basic headings being estimated directly and GDP obtained as the sum of these basic headings. In practice, a common approach is to take direct estimates at the most detailed level possible and then split them further into their component basic headings. The methods used in this splitting process can vary from being based on some data, even though it may not be directly related to the sources used in compiling the national accounts, to indirect methods such as those in approaches 2 to 5.

Approaches 2-5 are referred to herein as indirect methods. They are clearly second-best methods but it is preferable to use them rather than to use a simplistic method such as allocating the expenditure for a class (say) evenly across the basic headings in that class. Approaches 3 and 4 require the prior clustering of all the countries within a region into clusters for each basic heading or each category of basic headings.

To the extent possible, the commodity flow method should be implemented whatever the splitting approach being applied.

3.2 Commodity-flow approach

Supply-use tables provide a detailed picture of the flows of goods and services in an economy. They are based on the identity that the use of goods and services is equal to the supply of goods and services, not only for the economy as a whole but also for each good and service (or group of goods and/or services). The simplest example of describing how a supply-use table works is to start by examining the commodity-flow approach (sometimes referred to as a "commodity balance" or a "product-flow analysis") for a single product.

The commodity-flow approach is based on the identity in the goods and services account, which shows how the total supply of a product is equal to the total amount used:

$$\text{Output + imports (i.e. total supply) =} \\ \text{intermediate consumption + final consumption + gross capital formation + exports (i.e. total uses).}$$

In effect, goods and services are tracked through the economy from their original producers (either resident or abroad) to their resident users or abroad (as exports of goods and services). An important requirement is that the supply of products has to be allocated to the various uses (i.e. to consumption, investment and intermediate usage).

The commodity-flow approach can be used in two broad ways. The first is to check on the coherence of a full set of data relating to the supply and use of a product (or product group). When each of the aggregates in the above equation can be estimated independently the supply and use rarely balance, in practice, during the first iteration. However, the extent of the difference provides an indication of the inconsistencies in the data. Adjustments are made to the data progressively until the supply and use of a product (or group of products) are equal. The second use is to provide the framework for one of the components to be derived residually. In such cases, because of the lack of complete data, the commodity-flow approach becomes a means of data estimation rather than an editing tool. Generally, supply details are more detailed and firmly based than those for uses, so it will often be one of the uses that is calculated residually, with components of gross capital formation commonly being estimated this way.

The Global Office recognises that few countries have supply-use tables so it has recommended that the commodity-flow approach as an alternative that could be used to estimate final expenditures on

goods and services that are particularly important in a country. In those cases for which detailed supply data (i.e. production and imports) are available the commodity-flow approach may provide a useful means of estimating basic heading values for those basic headings that are likely to be most important in the country.

3.3 *Valuation*

The 1993 SNA identifies three different types of prices – basic prices, producers’ prices and purchasers’ prices. The **basic price** is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable (plus any subsidy receivable) on that unit as a consequence of its production or sale. It excludes any transport charges invoiced separately by the producer. The **producer’s price** is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any value added tax (VAT), or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the producer. The **purchaser’s price** is the amount paid by the purchaser, excluding any deductible VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser’s price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.

In summary, the relationships are:

Basic prices

plus taxes on products excluding invoiced VAT

less subsidies on products

equals ***Producers’ prices***

plus VAT not deductible by the purchaser

plus separately invoiced transport charges

plus wholesalers’ and retailers’ margins

equals ***Purchasers’ prices.***

Given that the ICP is based on final expenditures on GDP, the prices required for the ICP are purchasers’ prices (these are sometimes referred to as “market prices” because they are the prices that buyers are willing to pay to acquire something from willing sellers).

In practice, data collected in economic surveys will not all be on the pricing basis required for the ICP (i.e. purchasers’ prices). Therefore, the values that are recorded at either basic prices or producers’ prices need to be converted to purchasers’ prices by adjusting them for net taxes on products and for trade margins and transport charges. The margins are generally calculated as part of the national accounting estimation process.

The basic price excludes any transport charges **invoiced separately** by the producer. Therefore, when using a value at basic prices as the starting point to calculate a value at purchasers’ prices it is necessary to add on any transport charges invoiced separately by the producer.

3.4 *Price-factor method for pricing gross fixed capital formation on equipment*

The Price Factor Method (PFM) involves decomposing the price of machinery and equipment into its component “price factors”. The countries potentially using the PFM import almost all their equipment goods so the PFM starts with the ex-factory price of an equipment good in the exporting

country and follows it through to its final price when it is installed and ready to use on the importing country.

One advantage of the PFM is that (approximate) PPPs are obtained using information that is already available in many national statistical offices. Countries that have an input-output or supply and use table – even if it not very recent – will have estimates of the margins and other costs that are required by the PFM. This is also the case for countries that use a commodity flow method for estimating gross fixed capital formation. For these reasons PFM is an attractive alternative for countries with limited resources.

The PPPs required are based on the prices of particular types of equipment goods *installed and ready for use* at the producing establishments in each country. For an imported equipment good, this price can be broken down into the ex-factory price of the good and a series of costs, or “margins” that the purchaser incurs to bring it from where it was produced to where it will be used in production. These margins consist essentially of transport and trade margins, customs duties and other taxes and, except for transport equipment, installation costs.

The following table summarises the steps required to implement the price-factor method.

<i>Components of the price of an imported equipment good when it is installed and ready for use in the importing country</i>	
	Ex-factory price in exporting country
<i>plus</i>	<i>Surcharge less discount for country or region</i>
<i>plus</i>	<i>Product taxes less subsidies in exporting country</i>
<i>plus</i>	<i>Trade margin in exporting country</i>
<i>plus</i>	<i>Transport within the exporting country</i>
<i>plus</i>	<i>Wharfage (fee for using the wharf) in exporting country</i>
<i>plus</i>	<i>Fee for customs documentation in exporting country</i>
equals	F.o.b. (free on board) price in exporting country
<i>plus</i>	<i>International freight</i>
<i>plus</i>	<i>Insurance costs</i>
equals	C.i.f.(cost, insurance, freight) price in importing country
<i>plus</i>	<i>Fee for customs documentation in importing country</i>
<i>plus</i>	<i>Customs duty in importing country</i>
<i>plus</i>	<i>Wharfage (fee for using the wharf) in importing country</i>
<i>plus</i>	<i>Product taxes less subsidies in importing country</i>
<i>plus</i>	<i>Trade margins in importing country</i>
<i>plus</i>	<i>Transport within importing country</i>
<i>plus</i>	<i>Installation costs at the purchaser’s establishment</i>
equals	Installed, ready-to-use price in importing country

3.5 Implications of errors in basic heading data

Basic headings are the building blocks for the ICP. The basic heading is the lowest level for which PPPs are computed and acts as a form of stratification. Basic headings are used in several different ways. Products to be priced are identified within each basic heading so the basic heading values are used to determine the importance of products and, potentially, the number of product specifications required in each. The value of each basic heading directly influences the real expenditure for that basic heading (real expenditure for a basic heading = value / PPP in that basic heading). GDP expenditures allocated to each basic heading are used to weight the basic heading PPPs to higher levels of aggregation and to the GDP.

The implications of errors in basic heading values differ, depending on the use being made of the values. On one hand, a large error in a basic heading value would be unlikely to have a large impact on the products selected for pricing in that basic heading. However, it would have a significant impact on the real expenditure because any error in the value will lead to a similar-sized error in the real expenditure.

The impact on higher level aggregates of errors in basic headings depends on a number of things. For example, if the error is in a basic heading used as part of a “bottom-up” approach to GDP then it will flow through directly into GDP. An example commonly seen in the ICP is the imputed rent of owner-occupied dwellings, where the value of GDP is often understated significantly because the value of rent is understated. If the error in a basic heading is due to inaccurate splits being applied to a higher level aggregate then the impact on that higher level aggregate (and on GDP) will depend on the extent of the consequential error in the weights being used to aggregate the basic heading PPPs to higher levels and the differences in the PPPs for each basic heading. In this regard, it is similar to having an error in the weights being applied to prices to produce a summary level time series price index. If all the prices are changing at the same rate then the higher level index will be the same no matter which weights are applied. However, the weights can become very important if the prices are moving significantly differently, particularly if they move in opposite directions. Similarly, if the basic heading PPPs are at quite different levels then the weights become increasingly important and so any errors will have a larger impact.

4. Description of the 5 GDP splitting approaches

4.1 Direct method of estimating basic heading data (Approach 1)

The Global Office prefers that basic headings should be directly estimated to the greatest extent possible. To assist in this process, the Global Office has developed two sets of forms that countries can use in their estimation. The first is Form 3, which contains four separate forms that show the steps involved in adjusting values (or unit prices) expressed at basic prices to values (or unit prices) expressed in purchasers’ prices. The four individual forms are tailored to cover the adjustments required in the following components:

Household final consumption expenditure (domestically-produced goods)

Household final consumption expenditure (imported goods)

Gross fixed capital formation on machinery and equipment (domestically-produced goods)

Gross fixed capital formation on machinery and equipment (imported goods).

The second form is Form 4, which is a commodity flow matrix showing how the total supply of important products is distributed among intermediate and final uses. The theory underlying the commodity flow approach is that the sum of total supply at purchasers’ (or “market”) prices should be

the same as the sum of intermediate and final uses at purchasers' prices. If this table were completed for all products, GDP could be derived either as total supply less intermediate consumption or as total final expenditures plus net exports of goods and services (i.e. the expenditure approach to estimating GDP, as is required for the ICP). This table should be completed only for those products that are considered to be important products in a country and for which data are readily available.

Form 1 is used to obtain the basic heading data. Once all basic heading values have been entered it automatically provides the values for higher level aggregates for checking against the published national accounts aggregates.

One of the most important forms developed during the 2011 ICP is Form 2. It is clear that the procedures used to estimate basic heading values in the 2005 ICP were not documented at all in many countries and were poorly documented in many others. Form 2 provides a standard pro forma in which countries can describe the sources for their basic heading estimates and how data from the original source were adjusted to update them to the reference year of the data supplied in the basic heading reporting form or to correct them for coverage shortcomings or differences in definitions. Although documenting the procedures used may appear to be a daunting prospect, this form is designed to make the process as straightforward as possible. In many cases, the same adjustment method will be used for blocks of basic headings within a class and this can be documented either by cutting and pasting the common elements or by describing them as "ditto" or "same as above". The form can also be used to link directly to other relevant documents.

The Global Office would like to obtain a completed Form 2 from as many countries as possible for 2005 (and/or for a more recent year, e.g. 2009 for those regions that ran a 2009 PPP Update).

4.2 Indirect methods of estimating basic heading data (Approaches 2-5)

It is certain that all countries participating in the 2011 ICP will experience some difficulties in providing estimates of final expenditure for all the basic headings required for their regional expenditure classification. Suppose that a country is able to provide expenditures only at the *Group* or *Class* levels of the classification.

In this situation, it is important to realize that the ICP organizers must have expenditure values for all the basic headings used for each regional comparison. If a country supplies only expenditure values at the group or class levels for certain items, the Regional Coordinators will themselves be forced to allocate those values among the basic headings. This will necessarily be an unsatisfactory way of proceeding because they will always have less information than will the statisticians working in the countries concerned. Therefore, participating countries should assign values to all basic headings even if this is possible only in a rather arbitrary and subjective fashion. Some possibilities, in order of preference, are the splitting approaches 2-5 which are further described below:

Approach 2: Extrapolation from a recent year or from 2005

If an expenditure breakdown is available for an earlier year, e.g. when the country participated in the 2005 ICP, the relevant detailed expenditures could be at least partially updated, under specific assumptions on population growth, price evolutions, etc.

For many of the components of household final consumption expenditure that are similar to those included in a country's CPI, the CPI weights can be used to estimate the expenditure values for the relevant headings in the GDP classification. The issue is about obtaining the basic heading values by using the CPI weights (price updated) to split higher level values, which still have to be estimated directly.

Approach 3: Borrowing a per capita quantity or volume from a country in the same cluster related to a particular basic heading

This requires the clustering of countries for each basic heading or group of basic headings. The per capita quantity or volume borrowed from a same-cluster country will be multiplied by the population of the borrowing country and a price factor representing the price level index between the two countries.

Approach 4: Borrowing a structure related to a class, sub-group or group from a country in the same cluster related to a particular higher level heading

This too requires the clustering of countries for each basic heading or group of basic headings. The structure borrowed from a same-cluster country will be adjusted by a vector of price factors representing the price level indices between the two countries for the relevant higher level heading.

Approach 5: Splitting a category's volume or quantity (class, sub-group or group) into its composing basic headings, using expert opinion.

Expenditures estimated for a higher level of the classification should **not** be evenly divided among the basic headings. This is an unsatisfactory solution, and an informed guess by a country's national accountants, even if it is rough, is preferable to a simplistic split into even amounts. However, if none of the 4 other approaches can be implemented, the notional volume or quantity estimated for a higher level of the classification could be divided among the basic headings using expert opinion. This might involve consulting retailers, manufacturers, marketing experts, chambers of commerce and other government departments. Each resulting basic heading notional volume or quantity will be multiplied by a price factor that expresses the price level of the basic heading in relation to the other basic headings under the same higher level of the classification. This provides basic heading expenditure indicators that will be calibrated to the total expenditure value of the higher aggregate.

5. Data validation procedures

The Regional Offices are responsible for the first stage of editing the national accounts data provided for the ICP. Basic checks should be applied, such as ensuring that expenditures have been reported for all basic headings, that the sum of components is equal to the corresponding aggregates, and that correct signs have been applied to those components that are potentially negative (inventories and net trade). In addition, the values reported for GDP and its major aggregates should be compared with the data reported in the annual international national accounts questionnaire, which are stored in the UNSD data base. A check could also be made on whether a non-zero value should be reported for net expenditures abroad (details of the data sources used for household final consumption expenditure are required for this check).

Once any queries raised from the basic edits have been resolved, a number of other checks will be applied, such as comparisons between similar economies of the shares of GDP contributed by each basic heading and comparisons between similar economies of per capita real expenditures for each basic heading. Experience in the 2005 ICP round showed that inconsistencies in these shares can point to problems with the price data as well as with the national accounts data. Any lack of consistency in the price level indexes (PLIs) across basic headings within a country may indicate potential data problems. Another validation method that proved its worth in the 2005 ICP was to compare the per capita volumes between countries in the same cluster. These comparisons can be at various levels, from the basic headings up to the major aggregates.

Table 5 (see the paper on *National accounts activities for the 2011 ICP*) also provides a means of checking the consistency of the prices and national accounts data reported in 2005 and 2011 in each

country that has participated in both these ICP rounds. Each country should use this procedure to check the basic heading data before they are provided to the Regional Coordinators but it would be a useful for the regional offices to also check this.

Discussion Paper

6. Issues for discussion

- (a) To what extent will the commodity-flow approach be able to be used?
- (b) Do INAG members have any comments on the potential usefulness of the price-factor method for estimating gross fixed capital formation on equipment?
- (c) Are INAG members aware of any alternative means of estimating basic heading expenditures?
- (d) Can INAG members describe any other possible validation procedures?

Discussion Paper