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CONSISTENCY OF MICRO DATA

Invited Paper submitted by Central Statistics Office of Ireland*

Introduction

1. The Irish economy has grown rapidly in recent years. A particular feature has been the influence of foreign direct investment enterprises. One of the results has been that statisticians have had to deal with a number of complex trading practices that underlie the reported data. One particularly important step taken by the Central Statistics Office (CSO) to deal with this issue was the establishment of a Consistency Unit.

2. This unit was set up in the mid-1990s to examine the consistency of the various statistical returns made by major enterprises. There are some important features in the Irish statistical system that facilitate the consistency analysis:

* Prepared by Mr. Bill Keating, Central Statistics Office, Ireland.

- The CSO publishes the merchandise trade and BOP data (based on statistical surveys) which means that, when adjustments are required, they can be applied at the most appropriate source;
- The CSO's unique access to company accounting records held by the Revenue Commissioners (tax authorities) allows a detailed comparison of the operating surplus calculations for large companies with their equity incomes data from the BOP source. This allows for a reconciliation of operating surplus and primary income outflows at a very detailed level, so that GDP and GNI calculations for 'consistency' companies can be balanced.

Irish economy background

3. In Ireland two approaches to measuring GDP at current prices are used. These are the income and expenditure methods. The official level of GDP is taken to be the average of the two measures. The components of both estimates are published unadjusted in the national publication and a balancing item is shown which is calculated as half of the difference between the two estimates. This is the amount by which both measures have to be adjusted to determine the final level of GDP.

4. The income measure was traditionally regarded as the better measure of GDP for Ireland, primarily because of the strength of having access, for statistical purposes, to Corporation Tax records (for corporate enterprises) and to Income Tax records (for the self-employed). The accounting data submitted in support of the tax declarations contain all the information needed to calculate reliable estimates of operating surplus for both incorporated and unincorporated enterprises.

5. Traditionally, the expenditure measure would not have been as strong with regard to household consumption, in particular, although reliability has improved greatly in recent years. At this stage, the expenditure measure is influenced much more strongly by the total exports and imports of goods and services, with the aggregate of these two flows amounting to approximately 175 per cent of GDP in 2000.

6. To set this paper in context, it is also necessary to put on record some salient facts regarding the Irish economy. The 1980s and 1990s saw wide variations in growth rates in Ireland. Between 1980 and 1987, GDP increased by an average of about 2% per annum but this accelerated to an average of 6% in the three years from 1988 through to 1990. The early 1990s again showed relatively slow growth rates (an average of just over 2.5% between 1990 and 1993) but then economic growth really took off with an increase of 5.8% in 1994 and annual increases of more than 7% in each year up to 2000.

7. One of the main factors driving Irish economic performance for a number of years has been the influence of foreign direct investment. Its importance can be gauged from a few simple examples. In 2000, the ten foreign direct investment enterprises with the greatest value of exports accounted for exports to a total value of £27.1bn or just over one-third of the total exports of goods and services. These ten enterprises also accounted for imports of goods and services valued at £18.1bn or 28 per cent of the total. A special study in respect of 1998 showed that the top 34 enterprises (all those with exports exceeding £200m.) accounted directly (without multiplier effects) for about £10bn. out of a GDP total of £61bn. in that year and for about £3bn. of the GNP total of £53bn. Table 1 illustrates the overall development of Ireland's GDP since 1990.

Table 1: Main components of GDP (expenditure measure) at constant 1995 prices

National accounts aggregate	<i>million euro</i>		
	1990	1995	2000
Household Consumption	25,077	29,461	42,895
Government Consumption	6,948	7,856	10,125
Capital Formation	8,913	9,529	17,824
Exports	22,055	40,224	87,783
Imports	- 21,357	-34,202	-73,714
Statistical discrepancy	247	- 171	-461
GDP at constant 1995 prices	41,883	52,697	84,452

Consistency Unit

8. In 1994, shortly after the introduction within the EU of the Intrastat system for collecting external trade statistics, there was considerable criticism of the estimates of economic growth published by CSO. The view among many economists was that growth in 1993 must be overstated and that, perhaps as a result of the change to the Intrastat system, the trade data could be inconsistent with other statistical series.

9. The CSO examined the various statistical returns received from the most important enterprises and discussed their consistency directly with senior officials of many of the enterprises concerned. This study confirmed the overall accuracy of the statistics but did show that adjustments were necessary, in some cases, for Balance of Payments (BOP) purposes to take account of increasingly complex trading and accounting practices engaged in by some of the major enterprises.
10. This study was greatly facilitated by the introduction of the Intrastat system in 1993. Previously, individual customs transactions were confidential to the relevant authorities. The new system meant that, for the first time, information on the imports and exports of individual traders became available to the CSO. To fully exploit this information, the CSO established a special Consistency Unit within National Accounts to examine, on an ongoing basis, the consistency of the foreign trade data with other national accounting data available for the largest corporations.
11. The Consistency Unit brings together a wide range of data for the top 50 individual exporters, including monthly turnovers, annual turnovers, purchases, stocks, imports, exports, value added, service imports and exports and Balance of Payments profit variables. A limited number of variables are compared each quarter but the more detailed examinations are only possible on an annual basis since the detailed Census of Production results and tax accounts for each company are only available annually.
12. The majority of the large companies export all of their outputs and also import most of their raw materials. It is therefore possible to build up a coherent picture of each company, comparing turnover with exports, purchases with imports, research and development costs, royalties and other large service payments with Balance of Payments service imports. Ultimately value added from statistical sources can be compared with operating surplus based on tax returns.
13. Where the data appear to be inconsistent, the company is contacted and very often visited by CSO staff to identify reasons for possible problems. These visits usually take the form of lengthy and detailed discussions with senior financial personnel covering all aspects of the company from legal structure through to complex trading arrangements and pricing policy, including issues concerned with inter-affiliate activity. There are usually several follow-on contacts to establish precisely what is being recorded in the various statistical returns.
14. Varying reasons for inconsistencies in the data have been found, ranging from simple errors or timing effects to misinterpretation of statistical returns or, in the most detailed cases, to complex trading arrangements resulting in the data being recorded differently on different returns. Each issue is dealt with on a case by case basis and adjustments made accordingly to either the trade statistics or to the other statistical returns.
15. In some cases, different treatments may be applied to the same transaction within an enterprise because the statistical reporting is done by different functions within the enterprise (the

shipping department or, indeed, a shipping agent for external trade statistics and the accounts department for turnover data, for example).

16. In 1999, the companies, whose transactions were individually validated for correctness and consistency, accounted for the following proportions of exports and imports and of the operating surplus of corporations:

Table 2: Coverage of consistency study (1999)

National accounts aggregate	Total value in 1999 (mill. euro) A	Value accounted for by the companies whose transactions are individually verified (million euro) B	B as a % of A
Exports	76,765	42,951	56%
Imports	64,729	24,788	38%
Operating surplus of corporations	25,674	12,295	48%

Trading practices

17. The importance of getting consistent returns for the major enterprises is obviously of concern in all countries. In the Irish context, the relative importance of the largest enterprises makes this even more crucial. Some examples of special trading practices affecting this consistency are now given. Clearly it is necessary, as a simple example, to ensure that the value attributed to exports is the same as that shown in an enterprises turnover and, therefore, reflected in its profits. This may appear obvious but it is by no means a trivial problem. Among the complicated situations that can arise are:

- **Rebates**

At particular times (typically at the end of the accounting period) an enterprise may give rebates to its customers. The problem arises because these do not occur (and so are not recorded) at the time of the original transaction. Exports are initially valued perfectly correctly in accordance with the rules laid down for external trade statistics reporting and these are perfectly consistent with the turnover figures reported at the same time. The rebates must, therefore, be picked up by the statistical system if the overall picture is to be correct. The most likely source of information on such rebates will be a comparison of monthly turnover data with aggregate annual data.

- **Triangular Trade**

A manufacturing enterprise sells goods to a distributor in Country A. This enterprise then sells on to a customer in Country B. The goods, however, may be shipped directly to B and recorded in the export data at their final price. It is clear that, for statistical recording purposes, some of this price should accrue to the distributor in Country A. Again, the statistical system must be in a position to make the necessary adjustment to ensure the revenue finally accruing to both the original manufacturing enterprise and the distributor (in Country A) is correctly recorded.

- **Consignment Goods**

Goods are exported for storage abroad to be sold as required. In practice, these goods are recorded in merchandise trade as exports when they cross the border. If they do not change ownership, they must be netted off BOP exports. This can most easily be established by comparison with turnover.

- **Commissionaire Trading**

Under this arrangement, enterprises do not sell to distribution affiliates abroad for onward selling but sell directly to the final customer who has been identified by a local distribution company; the latter receives a standard commission fee. The change to this type of arrangement from previously selling to affiliates can result in overnight increases in turnover and exports that are then balanced by service imports (commission fees) so that the value added recorded for the enterprise remains the same. The important thing for statistical compilers is to make sure the new service payments are captured in their collection systems.

18. The consistency analysis and discussions with companies can also be of benefit in determining the need for other adjustments to statistical returns in situations such as goods shipped for repair or processing. These contacts also identify cases where adjustments are needed to the trade data to correct for mistakes or misinterpretations. For example, wrong valuations can be entered. A typical example is a company failing to convert foreign exchange amounts into Irish pounds (up to end 2001). In other cases, some imports or exports may not even be recorded, due to confusion between the company and the shipping agent. Another example is the possibility of imports originating outside the EU and transited, under customs control, via another Member State being double counted and included in both the Intrastat and SAD returns.

19. These are just some examples of the problems now arising in measuring a complex, fast changing, open economy. One problem in this regard is that, when making adjustments in these cases, they cannot always be made at the time of publication of the results of the primary statistical series. The changes are often made retrospectively on the basis of comparisons with other data

sources and subsequent discussions with the relevant enterprises. In other instances, such as in the case of the switch to commissionaire trading mentioned above, the trade aggregates can change overnight for accounting reasons. Instances such as these make series such as the external trade data a poorer predictor of the final national accounts aggregates but this is unavoidable. It makes the publication of timely BOP statistics that incorporate many of these adjustments all the more important.

Future work

20. To date, this exercise has been confined to the current price measures. Translating the lessons learned into appropriate procedures for dealing with the constant price accounts will be more difficult. It is difficult to envisage the possibility of producing constant price estimates for individual enterprises and also reconciling all the relevant data flows in that context. However, the contacts already made with enterprises could be developed to give a better understanding of both inputs and outputs and of the appropriate price measures to use.

21. Many of the major enterprises in Ireland are concentrated in the ICT sector. CSO is currently developing hedonic price indices for the outputs of this sector. However, it will not be feasible to use these in compiling constant price measures for the output of industry until corresponding price indices are developed for inputs. In their absence, the measure of value added at constant prices would obviously not be valid. The added factor then to ensure consistency will be the application of corresponding prices to the relevant exports and imports. In determining the appropriate products to which these prices should be applied, the experience gained through the consistency exercise will be extremely useful.

Conclusions

22. In general, Ireland's experience with this exercise has been positive. It has helped, of course, that Ireland is a small country with a corresponding small number of major players. The investigations have had a number of benefits. In the first place they have clearly helped to ensure the basic data are compatible and that the income and expenditure measures of GDP at current prices do not diverge because of problems with the major enterprises. Secondly, the interaction with senior personnel in the enterprises has helped give CSO staff a better understanding of company accounts and company trading practices, which has informed decisions regarding treatment in the accounts. Finally, the interaction has also hopefully raised awareness in business of the importance of statistics and of the need for timely, accurate reporting.
