

APPENDIX 1

Special Problems in Measuring R&D

Statistics of industries and national accounts do not usually include separate data of R&D expenditure. Therefore, special surveys are needed to estimate its volume.

A. Identifying R&D of business-oriented producers

In national accounts, product accounts are presented to business enterprises in which the output, input and added value are registered.

PRODUCTION ACCOUNT FOR BUSINESS

Input	Output
Intermediate consumption	Output from:
Gross added value:	(1) Principal activity
Compensation of employees	(2) Secondary activity
Consumption of fixed capital	
Net taxes on production	
Operational surplus	

Output is measured as the value of sales plus the increase in inventory. Most businesses do not sell R&D products separately, but rather perform R&D in order to develop goods and services. The value of R&D embodied in sold goods and services is unclear. Therefore, in most cases, it is impossible to identify the component of R&D in the regular output data. Only if the establishment engages in the sale of R&D products, is it possible to identify the R&D activity in the establishment's production figures. Consequently, only establishments whose main activity is R&D will be classified according to one of the two R&D industries listed in the International Standard Industrial Classification (ISIC):

731: Research and Experimental Development in Natural Sciences and Engineering

732: Research and Experimental Development in Social Sciences and Humanities

The production of R&D that is not sold can be estimated by the cost of production. The cost of producing R&D includes labour costs, consumption of materials and energy, etc. Depreciation following the use of machinery and equipment is not imputed, nor is the gain or loss of production.

It is also difficult to identify the cost of R&D in the inputs of an establishment. In many cases, expenditure on R&D is combined with other inputs. Therefore, it is necessary to conduct special surveys, in which the establishments are requested to report on their expenditure on R&D according to the accepted definition (for example, Survey of R&D in Manufacturing).

B. Identifying R&D of Private Non-Profit Institutions

The output of non-profit producers, including the government ministries, local authorities, the national institutions and other non-profit institutions, is not usually sold. Only a small portion is sold – usually at nominal prices. Therefore, all of the output of these producers is estimated by the cost of production. The production account for non-profit institutions does not include operating surplus:

PRODUCTION ACCOUNT OF NON-PROFIT PRODUCERS

Input	Output
Intermediate consumption	Output from:
Gross added value:	(1) Principal activity
Consumption of employees	(2) Secondary activity
Consumption of fixed capital	
Net taxes on production	

If the main activity of the non-profit institution is R&D (e.g., a research institute), the institution will be classified by the industry in which R&D is conducted. Identification of R&D in non-profit institutions that engage in several activities involves problems that are similar to, and even more difficult than the problems in identification of R&D in businesses. In many cases, employees in non-profit institutions engage part-time in routine activity and part-time in research. For example, faculty in universities, who engage in teaching, as well as doctors in hospitals, who provide health services, conduct also research.

Special surveys are conducted annually on R&D expenditure in the government ministries, local authorities, national institutions, and other non-profit institutions. Surveys that aim to estimate the labour input of R&D in universities require more resources and are therefore conducted every few years; surveys of labour input in hospitals have not yet been conducted in Israel, and the estimate of labour input in these institutions is based on a gross assessment.

C. Registration of R&D Output in Macroeconomic Accounts

In the economic classification of produced goods and services in macroeconomic accounts, the following flows are distinguished:

- (1) Final consumption expenditure: private consumption expenditure – the value of goods and services purchased by households (except purchase of dwellings, which is classified as fixed capital formation) and public final consumption expenditure – the value of labour cost and other current purchases by the general government and non-profit institutions.
- (2) Gross capital formation – the value of capital goods purchased by all resident producers, net sales and transfers of used capital goods, plus the value of changes in producers' inventories.
- (3) Export of goods and services.

- (4) Intermediate consumption: the value of goods and services consumed as inputs by producers, in the process of generating their output.

Output of R&D is registered in the national accounts as follows:

1. R&D produced by a business enterprise for the purpose of being sold: the output will be classified as exported services if it is sold abroad, and as intermediate consumption if it is sold to a resident producer.
2. R&D produced by a non-profit institution: the cost of producing R&D will be registered as R&D output used for final consumption (by the general government or private non-profit institutions) for the purpose of research.

That is:

- (a) A large portion of R&D expenditure is not registered in final uses, but as an intermediate product.
- (b) R&D is not defined as part of capital formation in the macroeconomic accounts.

Since the influence of R&D on economic development is similar to that of fixed capital formation products, R&D expenditure can be viewed for certain purposes as fixed capital formation.

In the new version of the system of National Accounts, published in 1993 by the Statistical Offices of five organizations, it is recommended to present a separate estimate of R&D expenditure, in order to enable the researchers, policy makers and other users to use R&D data together with other macroeconomic indicators.