R&D Statistics： From FM7 to China’s Standard

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What am I going to say?

- R&D statistics
  - Development of Frascati Manual
  - Release of Chinese R&D input Standard(2019)
- Comparison:
  - Guidance of the international standard
  - Extensions and current situations of Chinese Standard

Contents

- Introduction
- Overall contents analysis and comparison
- Introduction and comparison of concrete content
  - Definition of R&D activities
  - Classification and division of R&D statistics
  - Key indicators of R&D input statistics
  - Working flow of R&D statistics
- Conclusions

Introduction：

The importance of R&D has increased the importance of R&D statistics/accounting

- Economic growth or connotative economic growth are increasingly depends on R&D and Innovation
  - R&D and Innovation are the internal source of total factor productivity
- Therefore, measurement of R&D and Innovation is increasingly valued and demanded
  - Not only the measurement at the national level, but also the measurement at the Enterprise level-enterprise accounting for R&D
  - Not just the measurement of the R&D activity itself, but extend to the measurement of
    - Estimation of government financial support
    - Measurement of macroeconomic effects brought by R&D

About R&D statistics and accounting：
Three points and new developing

- OECD released *FRASCATI MANUAL 2015*
- China released new version of *R&D Statistics Standard*

- In order to encourage enterprises to conduct R&D activities, the governments of all countries have corresponding policies to stimulate the accounting for R&D of enterprises
- China is no exception

- Significant changes in SNA-2008: R&D is capitalized through the concept of intellectual property products and becomes an important part of a country's assets
- Countries release the GDP accounting results after adjusting one after another
  - China released in 2016

Frascati Manual: The starting point

- All of this starts with statistics on R&D expenditure
- Macro perspective: In order to observe the influence of R&D on economic growth. It is necessary to implement R&D capitalization on the platform of GDP, and R&D statistics is the data source.
- From the macro to the micro: corporate accounting is conducted under the discipline of intangible asset, and the basic principles followed are consistent with the Frascati Manual
- From international to national application: FM is the international general standard, and each country establishes own statistical norm in the concrete implementation
- Therefore, the following I would like to analyze and compare the "Frascati manual" version 7 and "China’s R&D Statistical Standard" 2019 edition.

1. Overall content analysis and comparison

- Changes between FM6 and FM7
  - As the basic framework of R&D statistics, it has been steady and mature.
  - As an instruction manual, it is more operability.
  - Changes are mainly reflected in: extensions on basic content based on further development
- My conclusion: optimization, concretization and extension

Table 1 Comparison of the structure between the old and new editions of FM

Version 6	Version 7
Chapter1 Aim and Scope of the Manual	Chapter1 Introduction to R&D statistics and the Frascati Manual
	Part 1 Defining and measuring R&D: General guidance
Chapter2 Basic Definitions and Conventions	Chapter2 Concepts and definitions for identifying R&D
Chapter3 Institutional Classification	Chapter3 Institutional sectors and classifications for R&D statistics
Chapter4 Functional Distribution	Chapter4 Measurement of R&D expenditures: Performance and sources of funds
Chapter5 Measurement of R&D Personnel	Chapter5 Measurement of R&D personnel: Persons employed and external contributors
Chapter6 Measurement of Expenditures Devoted to R&D	Chapter6 Measuring R&D: Methodologies and procedures
Chapter7 Survey Methodology and Procedures	Part 2 Measuring R&D: Sector-specific guidance
	Chapter7 Business enterprise R&D
	Chapter8 Government R&
	Chapter9 Higher education R&D
	Chapter10 Private non-profit R&D
	Chapter11 Measurement of R&D globalization
Chapter8 Government Budget Appropriations or Outlays for R&D by Socio-economic Objectives (GBAORD)	Part 3 Measuring government support for R&D
	Chapter12 Government budget allocations for R&D
	Chapter13 Measurement of government tax relief for R&D

Optimization under continuous tone

- Structure: basically a continuation of the structure of FM6
  - Mainly in part 1 and chapter 12
- Content: as a whole, there are no substantial changes in the definition, scope, classification, basic measurement indicators and data collection method in FM7, but there are adjustments and optimizations in dealing with specific problems
  - Basic definition, classification and case optimization
  - Optimization of R&D personnel optimization
  - Further standardization of survey procedure

From Basic Methodological to Departmental Guidelines

- Mainly the second part
- It is divided into several parts according to the executive department of R&D activity, and provides methods and operation guides respectively.
  - Business enterprise R&D
  - Government R&D
  - Higher education R&D
  - Private non-profit R&D
  - R&D globalization

Extensions based on original content

- Some of the changes are in chapters, mainly the 11th chapter of the Second Part, the 13th chapter of the third part, and others are reflected in contents.
  - Measurement of government funding statistics to tax relief statistics
  - R&D capitalization accounting under the framework of GDP accounting
  - Exploring the measurement of R&D globalization

About Chinese R&D Statistics Standard

- From "Chinese R&D Input Statistics Standard" 2000 to " Chinese R&D Statistics Standard " 2019, background:
  - The corresponding FM international norms have changed
  - China's R&D statistics have made considerable progress during this period.
  - Future demand for R&D statistics
- Chinese R&D Input Statistics System: Three-tier Structure
  - Basic standard: Chinese R&D Input Statistics Standard
  - "Standard"-"comprehensive statistical reporting system"-"departmental statistical reporting system"
    - Department statement system: Enterprises, higher education, government-affiliated scientific and technological institutions, national defense and military industry

FM6	FM7	Chinese R&D input Statistics Standard
Chapter1 Aim and Scope of the Manual	Chapter1 Introduction to R&D statistics and the Frascati Manual	Chapter1 General principles
Chapter2 Basic Definitions and Conventions	Chapter2 Concepts and definitions for identifying R&D	Chapter2 Definitions for identifying R&D
Chapter3 Institutional Classification	Chapter3 Institutional sectors and classifications for R&D statistics	Chapter3 Basic principles for R&D input statistics
Chapter4 Functional Distribution	Chapter4 Measurement of R&D expenditures: Performance and sources of funds	Chapter4 Basic indicators for R&D input statistics
Chapter5 Measurement of R&D Personnel	Chapter5 Measurement of R&D personnel: Persons employed and external contributors	Chapter5 Classifications used in R&D input statistics
Chapter6 Measurement of Expenditures Devoted to R&D	Chapter6 Measuring R&D: Methodologies and procedures	Chapter6 Division of responsibilities for R&D input statistics
Chapter7 Survey Methodology and Procedures	Chapter7 Business enterprise R&D	Chapter7 Workflow of R&D input statistics and data quality control
Chapter8 Government Budget Appropriations or Outlays for R&D by Socio-economic Objectives	Chapter8 Government R&	Chapter8 Data Management and Publication
	Chapter9 Higher education R&D	
	Chapter10 Private non-profit R&D	
	Chapter11 Measurement of R&D globalization	
	Chapter12 Government budget allocations for R&D	
	Chapter13 Measurement of government tax	

From FM to Chinese R&D Input Statistics Standard

- In terms of structure, is it closer to FM6 or FM7?
- What about the overall structure of China’s R&D statistics?
- What is missing?

- How about the content in each chapter?

2.Introduction and comparison of contents

- Use "Chinese R&D Input Statistics Standard" contents as the clue
- Observe:
  - Consistency between China's R&D Input Statistics and international standards
  - The characteristics of implementing China's R&D input statistics

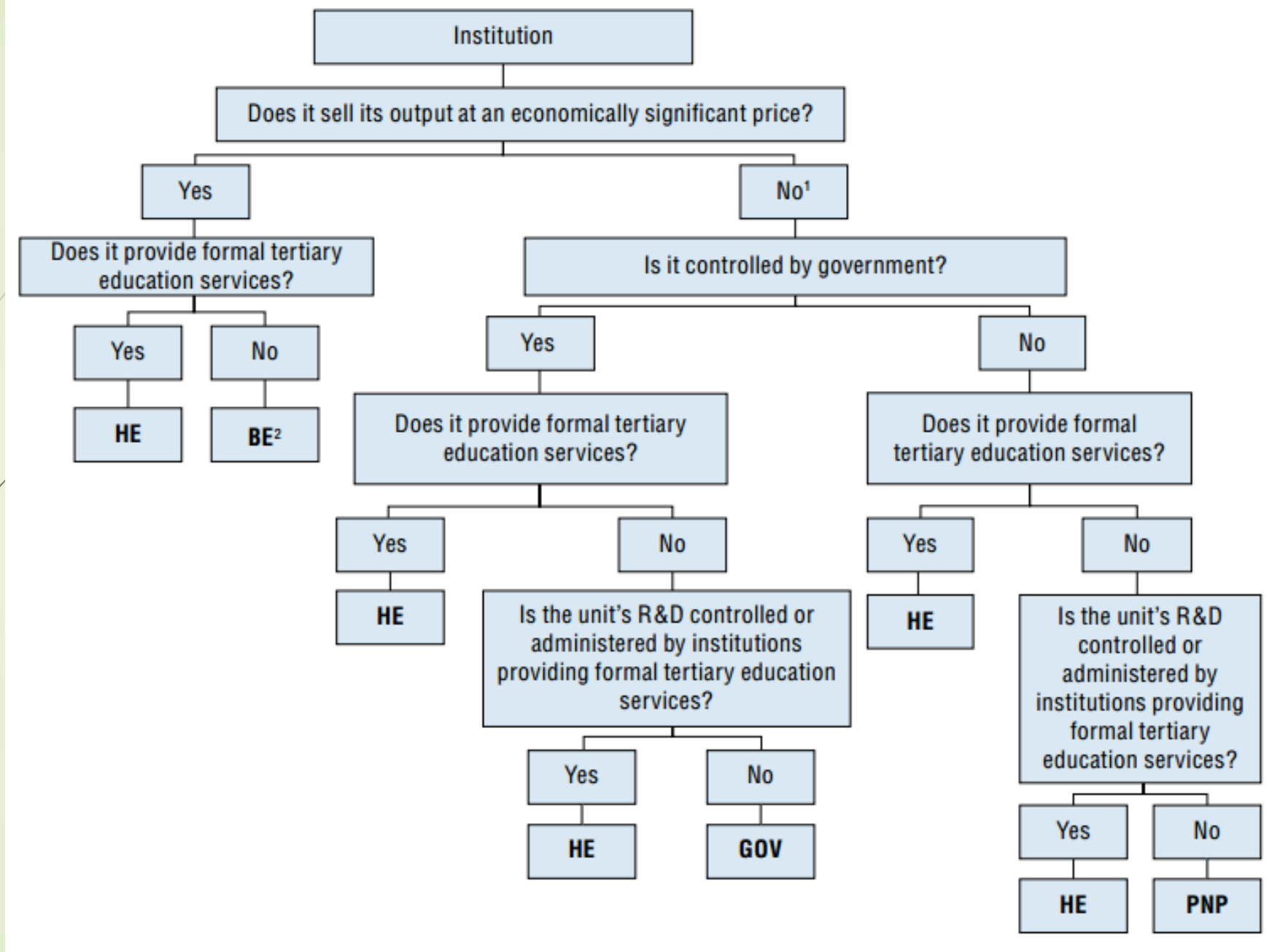
2.1 Definitions for identifying R&D

- Definition : Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge –including knowledge of humankind, culture and society – and to devise new applications of available knowledge.
  - **Basic research**: experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view**.**
  - **Applied research:** original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.
  - **Experimental development:** systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes

- Overall, the definition is the same as FM7
- FM7 has a lot of cases to help with identification
  - There are no specific cases in Chinese Standard, but each department will have training courses to help respondents to understand the relevant concepts in the survey process, as well as more accurate identification in the compilation process

2.2 Classification and functional division of R&D activities

- There are two categories:
  - Classification based on R&D activity institutions: Mainly on executive department
  - Classification based on R&D activities : Basic Research, Applied Research and Experimental Development
- Executive department Classification based on institutional sector classification
  - SNA: non financial corporations; financial corporations; government units including social security funds; NPIs serving households(NPISHs); households.
  - FM7: business; government; higher education; private non-profit; abroad
  - Chinese Standard: business; government scientific research institutions; higher education/ others
    - Not as accuracy as the classification accuracy required by FM7


Institution
Does it sell its output at an economically significant price?
Yes
No[1]
Does it provide formal tertiary education services?
Yes
No
HE
BE[2]
Is it controlled by government?
Yes
No
Does it provide formal tertiary education services?
Does it provide formal tertiary education services?
Yes
No
Yes
No
HE
Is the unit's R&D controlled or administered by institutions providing formal tertiary education services?
HE
Is the unit's R&D controlled or administered by institutions providing formal tertiary education services?
Yes
No
HE
GOV
Yes
No
HE
PNP

2.3 Indicators to measure R&D input

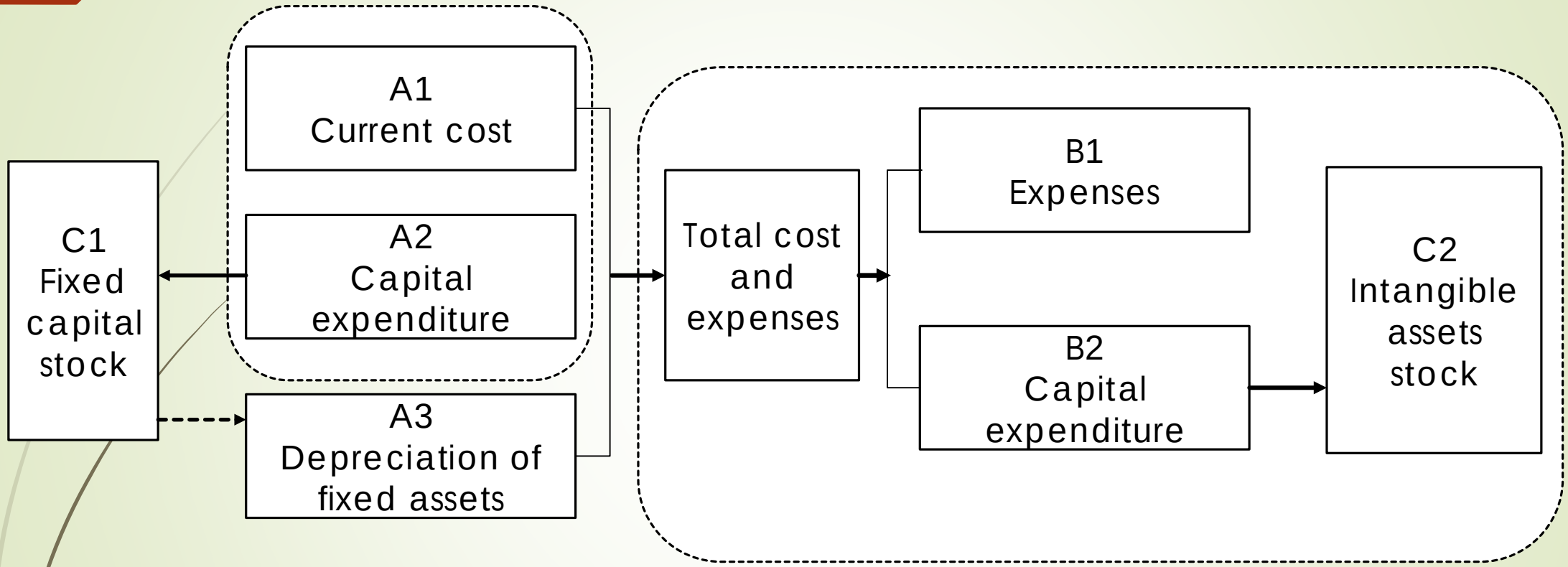
- Ground Rules
  - Taking "project" as the basic organization unit of R&D activities
  - Principle of local statistics
  - Institution is the basic unit
  - Focus on input statistics
- Indicators: Personnel Statistics and Expenditure Statistics
- They are consistent with FM7.

- Personnel Statistics:
  - Scope:
    - Fundamentally consistent with FM7: Personnel statistics directly related to R&D
    - Difference: Treatment of master’s level students
    - Difference: Distinguish between Internal R&D personnel and external R&D personnel
  - Indicators: Counts and Full-time equivalents (FTEs) of R&D personnel

- Expenditure statistics:
  - Distinguishing the statistics of executive funds and sources of funds, the former is the main one.
  - Distinguishing between internal expenditure statistics and external expenditure statistics, the former is dominant
  - Internal expenditure consists of current costs and capital expenditures.
- The above is basically consistent with FM7, and the difference lies in:
  - According to the source of funds, we can provide the data of government sources of funds and overseas sources of funds, but it is still far from the requirements of FM7.
  - FM7 considers docking with SNA and proposes that it should be based on the sources of exchange funds and transfe funds, which can not be reflected in the Chinese Standard.

Expansion Note: Expenditure, Cost and Asset

- Expenses and costs
  - Current cost: on a cash basis
  - Costs and expenses: on an accrual basis
  - The Difference between capital expenditures and depreciation of fixed assets
- R&D expenditure and R&D assets
  - Results of capital expenditures form the fixed assets for R&D activities (newly added in the current period)
  - For all fixed assets used in R&D activities, depreciation can be taken as current consumption and included in R&D activity costs.
- Assets for R&D and R&D as assets
  - There's a difference


A1
Current cost
C1
Fixed
capital
stock
A2
Capital
expenditure
A3
Depreciation of
fixed assets
Total cost
and
expenses
B1
Expenses
B2
Capital
expenditure
C2
Intangible
assets
stock

- Current statistics of R&D expenditure: Only the expenditure statistics, there is no asset statistics, nor R&D activities cost statistics

- Accounting for R&D in enterprises: Focus on cost and expenses, and then extended to the capital accounting

- Capitalization of R&D within the framework of GDP: The goal is also to measure R&D output through cost and expenses and add to intellectual property products (assets) as capital formation (investments)

Ongoing exploration: Whether R&D expenditure in enterprises can be calculated using accounting data

- In general: R&D statistics is neutral/dynamic and consistent while accounting is susceptible to real benefits such as tax reliefs and subsidies
- Data Collection Channels: The current corporate tabulation system can provide support
- Indicator generation:
  - It can generate expenditure indicators of R&D funds
  - We can get a tax exemption indicators at the same time
  - The intangible asset data need further study

2.4 The organization and practice of R&D Statistics

- FM7 does not provide specific statistical practices
- Key points from the Chinese Standard
- Conduct R&D Statistics based on the framework of Statistics of Science and Technology
- It contains several procedures according to the project to identify the filter.
- Different departments work separately and data are reported to National Bureau of Statistics. Data are discussed and then uniformly released.

- Work of different departments
  - Ministry of Science and Technology: Government Scientific Research Institution
  - Ministry of Education: Higher Education Institutions
  - National Bureau of Statistics: Enterprises
- Other relevant departments
  - Ministry of Finance
  - National Development and Reform Commission
  - National Accounting department of National Bureau of Statistics

3. Conclusion

- It is difficult to conduct statistics in practice with an academic concept like R&D.
- With the efforts of OECD and other countries, R&D statistics has been established on the basis of concepts mentioned before, but there are still many problems to be solved.
  - The measurement of government support: funding, tax relief and others
  - The measurement of R&D internationalization: cross-border capital flow, R&D activities of cross-border institutions and international trade of R&D service
  - Corresponding treatment of R&D capitalization for GDP accounting

R&D Statistics in China

- Generally speaking, in terms of the basic content, the Chinese Standard keeps consistent with FM.
- Still further efforts are needed in the future
  - lay a solid foundation for the R&D statistics system and keep exploring
  - Strengthen source of funds statistics, especially the government funding
  - Focus on R&D internationalization

- *Thank you!*