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IMPLEMENTATION OF RESEARCH AND DEVELOPMENT AS CAPITAL FORMATION

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IMPLEMENTATION OF RESEARCH AND DEVELOPMENT AS CAPITAL FORMATION

1. BACKGROUND

Capitalisation of R&D is one of the major changes in 2008 SNA. Preliminary results from our projects in Statistics Norway suggest an increase in the level of GDP of 1.2 per cent. The change in volume growth of GDP was negligible. There was no change in net national income. The formation of fixed capital increased by 6.2 per cent, as estimated for 2007. So this issue will be clearly visible in the accounts.

It is agreed that the definition of R&D should follow the one given in the Frascati Manual (OECD, 2002). This has the important consequence that it is possible to use data from the R&D surveys that are conducted according to the Frascati Manual (for short: the FM-data) to estimate R&D capital formation. These surveys have a long history in many countries, including Norway. However, they were not put up in order to supply input to the national accounts. Task forces have looked into R&D capitalisation issues with the aim to guide us to how to use the FM-data for national accounts purposes. The discussions of R&D have resulted in the OECD handbook on deriving capital measures of intellectual property products, OECD (2009). In our paper, we shall discuss some difficulties that we see in implementing R&D capitalisation.

2. R&D IN THE 2008 SNA

In the 2008 SNA we meet research and development under a separate heading in the chapter on the production account (paragraph 6.207). There we find the definition of R&D and some comments to the valuation of the production and borderline against teaching. Further comments on the borderline with intermediate consumption are given in paragraph 6.230. The treatment of R&D is discussed also in chapter 10 on the capital account. There, under a separate heading, we find the paragraphs 10.103 – 10.105. The first of these paragraphs recapitulate the text from chapter 6. The text in 10.105 mentions the new status for patented entities, which no longer features as assets when R&D is capitalised. The two paragraphs 6.230 and 10.104 are however central in order to understand the issues involved.

Paragraph 6.230 states: *“Research and development is treated as capital formation except in any cases where it is clear that the activity does not entail any economic benefit for its owner in which case it is treated as intermediate consumption.”* Paragraph 10.104 strikes a rather modest. It says: *“R&D should be recognized as part of capital formation. In order to achieve this, several issues have to be addressed. These include deriving measures of research and development, price indices and service lives. Specific guidelines, together with handbooks on methodology and practice, will provide a useful way of working towards solutions that give the appropriate level of confidence in the resulting measures”*.

Referring to the borderline with intermediate consumption, what does it mean that the R&D activity does not entail any economic benefit for its owner? This has been a long discussion. A detailed account of diverse views is given in the OECD handbook, ch. 1.2 and box 3, explaining the more restrictive views of the OECD Task force on R&D. Particularly in the case of general government expenditures in R&D, there has been (and still is) a narrow view, that R&D gives benefit for the government only if it affects its normal work (better quality, improved efficiency), and a wider view, that R&D gives benefit to general government if it contributes to the public good. We suppose no government would say that they undertake R&D contrary to the public good. In the end, a pragmatic compromise resulted in the recommendation

(2.4) of the OECD handbook: *“As a general rule, all R&D purchased or produced on own account should be treated as gross fixed capital formation by the producer, except when the R&D is produced for sale or there is explicit information that there are no expected benefits for the producer”.*

The 2008 SNA mentions the need for price indices and service lives for R&D. The OECD handbook gives advice on both issues. For length of service lives, OECD refers empirical life lengths (OECD, 2009, table 2.7). The observed life lengths vary a lot according to the type of R&D. In our test compilation, we used a life length of 10 years, corresponding to what we then believed was similar for other countries. In the end, the choice of service life for capital consumption has to be a pragmatic one; we would not be able to introduce much detail, such as distinguishing major development from development of existing products. Still, we think that the empirical basis for the choice of life lengths now should now be better than for many other assets.

For price indices, the handbook recommends producer price index for specialised producers and suggest, if no alternatives are available, using input price indices for own-account production. This production was present also before the decision to capitalise the R&D services. Development of producer price indices in this area has, however, not been given priority (at least not in Norway). In our accounts we use input price indices for R&D deflation.

3. R&D CAPITALISATION FROM TEST COMPILATIONS TO FULL SCALE INTEGRATION

Norway is one among several countries that have done test compilations of R&D capital formation and the consequences for GDP etc. In these tests we have used the FM-data. This worked well for the estimate of the total R&D production and capital formation. In order to assess the consequences for GDP, it is necessary to distinguish R&D capital formation in non-market activities (general government and NPISH) and R&D capital formation in other activities. At this level there are already some problems with our test exercise. There were two kinds of problems. The first, conceptually simple, is that one of the categories for in the Norwegian FM-data, the ‘research institutes’, mixes data for non-financial corporations and units of general government. This may be a specific problem with the Norwegian data, in principle it is possible to reclassify the data by the same institutional sectors and industries that we use elsewhere in the national accounts. This is still something that needs to be done.

Another problem in the test exercise has been to trace transactions in R&D services., Part of the Norwegian FM-data contains data on R&D services bought and sold to other units. For part of the data, as for instance in the higher education sector, such data is missing. The FM-data primarily report on production of R&D services. In order to get from production to uses of R&D by industry, we need to know net purchases of R&D output by industry For most other types of capital, data is collected by asking the units for data on their capital formation. This could be a way forward also in the case of R&D capital, if budgets permit.

When the R&D capitalisation is integrated in the national accounts, we need more industry detail than for the test compilations. With the national accounting system we use in Norway, we need to integrate the R&D production and capital formation into our supply and use tables (SUT). We would then need more industry details than the FM-data so far has been able to give. There is also a question on the relationship between the data that already are present in our SUT tables and the new data available from the FM-data source.

There are also some questions to be considered that were not part of the text exercises, but comes in naturally when R&D capitalisation is integrated into the national accounts. The most important is the

question of quarterly accounts. We will also mention the need to include R&D capital formation in the regional accounts.

4. INTEGRATION OF FRASCATI MANUAL-DATA AND STRUCTURAL BUSINESS STATISTICS

4.1. *Production of R&D*

R&D services are not a new activity in the national accounts. In Norway, we have already a service product named 'Research and development' present in our supply and use tables. The production estimate of this product corresponds to the characteristic production of the establishments in the `nace_rev2` industry 72: Scientific research and development. This estimate based on the structural business statistics (SBS) looks, however, somewhat different from the estimate based on the FM-data. The characteristic production in the SBS is larger than the R&D estimates that follows from the R&D surveys. There are also more units included in the industry than in the category 'research institutes' in the FM-data, despite the fact that the FM-data units include some units in the general government sector.

Unfortunately, we have so far not had resources to compare systematically the units and reported production between the two datasets. It seems, however, that some of the research institutes had comparable figures in the two data sets, while some institutes reported less costs to the FM-data than is stated in the business survey. We think this shows that in their view only part of their activities generated new knowledge. We have concluded that the industry `NACE_rev2 72` also produces 'research and development services' of a kind that do not meet the definition in the FM manual, and this may well be the reason for the different production estimates. There are, however, still some questions to be answered. Does the fact that there are more units in the business statistics indicate that FM-data is understating R&D production? Recently, the cut-off limit in other parts of the FM-data survey was lowered from 10 to 5 employees. This change gave a significantly higher production estimate according to FM-data. On the other hand, could it be that some of the units in the business statistics have been misclassified to this industry?

4.2. *Other supply side issues*

In the Norwegian national accounts, we find production of R&D services only in `nace 72`. Integrating the FM-data, this situation will change. According to our test data, 44 per cent of R&D production was produced in the private corporation sector (outside `NACE 72`). However, much of this production is own-account production/investment that according to 2003 SNA is outside the production boundaries (as it is not so far capitalised). If all production in industries other than `nace72` were for own account investment, The FM-data would be easy to integrate with our present accounts. The FM-data shows, however, that some units have transactions in R&D services. In principle, these transactions should be visible in our present supply and use tables. It is, however, a sad fact that our source data often can not distinguish well between the different services produced. This is for instance the case of the `prodcom` data for manufacturing industries, which (at least in Norway), does not ask for production of services. In addition, production data from service industries are based on business accounts (register data), and these do not provide any product specifications at all. For many industries, what is now shown as characteristic production or rather general service production may have to be reclassified in order to make room for production of R&D services.

The R&D survey (FM-data) can only give estimates of domestic production of R&D services. Supply is, however, equal to domestic production plus imports of R&D services. Imports of such services are difficult to assess. The situation is not changed, even though there is a decision to capitalise R&D.

We should have in mind that except the new element of own-account capital formation of R&D, production in each industry should be unchanged. Generally, we would decide upon production (less own-account capital formation of R&D) from the present sources of business statistics. The new information from the FM-data indicates that the product composition of the production in some industries needs to be adjusted.

5. THE NEED FOR FM-DATA ESTIMATES OF OWN-ACCOUNT CAPITAL FORMATION

In order to integrate the FM-data into our existing SUT, it would help a lot if we knew own-account capital formation of R&D services. This is an important component of R&D production (supply) and investments (use). If the origin of the estimate is the FM-data, it could be allocated to the correct industry. It would also make possible the adjustments of the product composition of the production data needed to integrate R&D in the supply table. In the handbook, OECD considers three categories of R&D production; own account, custom-made and speculative production. Roughly, the custom-made R&D would correspond to sales or externally financed production. Using such data from our FM surveys, we would further need to separate out speculative R&D production. Such production is probably not very common in Norway, and, thus, we could receive some informed guesstimates for this type of production from the experts on R&D. It still remains to see if this can be done with good results.

6. THE USE OF R&D SERVICES

Research and development services can, according to 2008 SNA, be used for fixed capital formation, exports, intermediate consumption, or as change in inventories of work in progress. According to the conclusions in the OECD handbook, most of the domestic use should be for capital formation.

There have been discussions on how much of R&D should be regarded as intermediate consumption, and in the handbook one flow remains for such input. This is purchases of R&D services by specialized R&D producers in nace rev. 72 (recommendation 2.5). The assumption is that this purchased R&D is fully integrated into the product that they deliver to their customers. There is a link to the question of handling outsourcing of a research project to third parties. In Eurostat's guidelines, it is suggested that such projects are treated on a net basis, which is possible using the FM-data. For the test compilations, each solution is possible, and the estimate of capital formation would be the same. In a full scale implementation we have to adapt to the regular economic statistics available for this industry. In our opinion this would support the OECD recommendation.

Hopefully, we are able to compile own-account formation of R&D capital, and that this will give ideas to changes in inventories, which are most relevant for the 'speculative' production. If the integration of FM-data into the national accounts is successful, we should expect lower figures for changes in work in progress.

Unfortunately, we do not know much about the users of R&D services from our present national accounts. We know total intermediate consumption by industry, but estimating the part consisting of R&D services is challenging. The difficulties are enhanced by the fact that the present product contains services that are not R&D services in the Frascati manual sense, services that still are to be seen as intermediate consumption.

Unless we manage to extend the coverage of the capital formation part of our regular business statistics, our analyses of the capital formation has to rely in the FM-data. These data give the opportunity to compile total investments, but the distribution by sector and industry is insufficient covered. This was looked upon in our test compilations. We found that the FM-data sector 'research institutions' has net sales of R&D services. This is hardly surprising. However, we also found that the 'business sector' had net sales

of R&D services. The business sector is actually a sample of all corporations (except nace 72), but with a cut-off limit of 10 employees (later reduced to 5 employees). The data collected cover not only costs of R&D production and finance, but also transactions in R&D services, purchases as well as sales. Given that both sectors are net sellers, and given the estimates of exports and imports, we concluded that general government must be the buyer of R&D services.

In fact, some industries are excluded from the Norwegian R&D survey. The reason is that they are deemed not to produce R&D services. They could still use such services. There is also a possibility that exports of R&D are underreported in our regular statistics on exports and imports of services. This statistics of exports and imports does not cover universities, which engage in international research cooperation, partly financed by the EU etc. In case the conclusion is maintained, that general government is a net buyer for R&D services from the other sectors, it is not obvious where to find these expenditures in the government accounts.

Once the capital formation of R&D capital by industry and sector has been decided, and own-account capital formation is known, we can make the final adaption of the use table. We would assume that the R&D services that are acquired from others would be included in the intermediate consumption, which has to be reduced accordingly. Probably, in many industries, the product composition of the intermediate consumption would not show consumption of R&D services, so the product composition has to be modified as well. It should be possible to balance the R&D services, especially if the information on both supply and uses comes from the same source.

Our present accounts contain a classification of general government consumption by purpose. In this classification, there are categories regarding research and development by type. As R&D services no longer will be intermediate consumption, these categories will change in nature, reporting on capital consumption. We have not seen any plans for introducing similar distribution by purpose for the R&D capital formation. Users of the present data can, however, still find information in the R&D statistics.

7. QUARTERLY DATA

Capitalisation of R&D services needs to be done in the quarterly as well as in the annual accounts. We are pleased that the Norwegian FM survey has been strengthened from survey every second year to the present state, where most of the data is collected annually. Further extension to quarterly survey data is probably unrealistic.

In the Norwegian quarterly accounts, production of research and development (nace 72) has up to now been lumped together with other business services. From this year on, we specify the industry, and it will be compiled by means of a quarterly sales indicator. In lack of information, fixed capital formation in R&D will have to be given the same growth as production. For some industries (such as manufacturing and oil extraction) we have quarterly investment data, which probably will be applied also to the R&D type of asset. Imports and exports have quarterly indicators, but so far these data are of poor quality.

By combining assumptions and indicators, the Norwegian quarterly accounts can be compiled also with capitalisation of R&D services. The information contents of the new type of capital formation will be limited, and mostly a result of the annual updates incorporating new annual statistics.

8. REGIONAL DATA

The Norwegian FM-data is published by regions. We will have a basis for regional figures of production of R&D services, possibly including own-account production. However, for our regional accounts we should also report on gross fixed capital formation, including the R&D capital. The FM-data will give clues to own account capital formation. Allocating the part of capital formation in R&D other

than own account investment by industry and region shall be a difficult task. This investment will probably have to be distributed by region according to other indicators of capital formation or production. The question is then, if this kind of distribution is of relevance for those analysing the regional accounts.

9. CONCLUDING REMARKS

In Norway, we have been in favour of the capitalisation of R&D services. Statistics Norway has an in-house research department which has been enthusiastic about the project. The capitalisation has been well prepared by the task forces that have operated in the field. The projects have brought a new source of data to the attention of the national accounts compilers.

The R&D surveys in Norway have been extended later years in order to prepare for the role as a source of input to national accounts. However, at least in Norway, the full implementation of the capitalisation of R&D services shall be a challenging task. This is partly because such services are not well identified in our present supply and use tables. Further, we should like to have even more direct information on the purchases of R&D services.

References

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