

BEA BRIEFING

Treatment of Research and Development in Economic Accounts and in Business Accounts

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RESEARCH AND DEVELOPMENT (R&D) activities are important in many economies and thus warrant a consistent treatment across countries for purposes of national economic accounting. International guidelines for national economic accounting, notably the *System of National Accounts 2008 (SNA 2008)*, recommend capitalizing expenditures on R&D—that is, treating such expenditures as investment that contributes to future production and income generation. In contrast, U.S. rules for business accounting, as embodied by U.S. generally accepted accounting principles (GAAP), use a more conservative treatment that requires immediate expensing of R&D expenditures.

The different accounting treatments result from their respective objectives. To meet their objectives, the *SNA 2008* and U.S. GAAP share some fundamental principles, such as double-entry bookkeeping with debits and credits and accrual methods to match reve-

nues and expenses in the same accounting period.¹ However, the *SNA* recommends measures on a current-cost basis rather than a historical-cost basis as required under U.S. GAAP, which imposes a measurement challenge that is unique to national economic accounting. Table 1 provides a quick look at the relationship between national economic accounting measures and business accounting measures.

The objective of the *SNA* is to provide measures of national economic activity for policymakers, investors, business leaders, researchers, and other interested users. Thus, the *SNA* guidelines yield measures of national economic activity within an accounting framework that is based on economic concepts. The *SNA* is a system in which symmetric treatment is given to both parties of a transaction, and national economic

1. Given a seller and buyer for each transaction, national economic accounts give rise to quadruple-entry accounting: a debit and credit for the seller and a debit and credit for the buyer.

Table 1. Concordance of National Economic Accounting Measures and Business Accounting Measures

<i>National Economic Accounting</i>	<i>Business Accounting</i>
Output	Net sales
	Less: Cost of sales
	Gross margin
	Less: Operating expenses
Less: Intermediate consumption	
Value added (GDP)	
Less: Compensation	
Less: Taxes on production less subsidies	
Gross operating surplus	Operating income
Less: Consumption of fixed capital	Less: Depreciation and amortization
Net operating surplus	Earnings before interest and taxes
Less: Net property income	Less: Net interest paid
Net entrepreneurial income before current taxes	Income before income taxes
Less: Current taxes on income, wealth, etc.	Less: Provision for income taxes
Net entrepreneurial income after current taxes	Net income

GDP Gross domestic product
NOTE: Some economic accounting measures are conceptually different than the corresponding financial accounting measure. For example, consumption of fixed capital is based on current-cost

accounting, and depreciation and amortization is based on historical-cost accounting.
Source: Author's concordance of national economic accounting measures and financial accounting measures.

accounts are designed to summarize transactions from the perspectives of both sellers and buyers. Under the *SNA 2008*, R&D is recognized as capital formation because of future economic benefits associated with R&D. Under previous versions of the *SNA*, R&D was treated as intermediate consumption, which was consistent with immediate expensing required under U.S. GAAP.²

The objective of U.S. GAAP is to provide financial information on individual firms to managers, investors, creditors, and other interested users. Thus, the U.S. rules yield financial information on individual firms within an accounting framework that is based on business accounting concepts. Business accounts are designed to summarize transactions for a firm in isolation. Under U.S. GAAP, R&D is not recognized as capital formation because of the uncertainty of future economic benefits associated with R&D—that is, U.S. rule makers are traditionally conservative in the treatment of expenditures. Immediate expensing implies that R&D expenditures contribute to sales and the related profits in the current period with no contribution to sales and profits in future periods.

The Bureau of Economic Analysis (BEA) generally accounts for R&D according to recommendations in the *SNA 2008*. As a result, the recent 2013 comprehensive revision of the national income and product accounts (NIPAs) incorporates the conceptual change in the treatment of R&D (Smith and Holdren 2013).

This *BEA Briefing* discusses the international guidelines for national economic accounting under the *SNA 2008* and the U.S. business accounting rules under GAAP for expensing or capitalizing expenditures on R&D. The article also demonstrates that the national economic accounting measures of production and income and the business accounting measures of operating income and net income are all higher when R&D expenditures are capitalized. The article then discusses the aforementioned measurement challenge associated with current-cost accounting under the *SNA*.

The article is an abbreviated version of Rassier (2013), which outlines the international economic accounting guidelines and the U.S. business accounting rules for all intellectual property products identified in the *SNA 2008*.

2. The conceptual change is a result of considerable research by international organizations and national statistical offices. Likewise, some work on business accounting research focuses on changing the U.S. requirements for R&D from immediate expensing to capitalization (Amir and Lev 1996; Lev and Sougiannis 1996; Collins, Maydew, and Weiss 1997; Aboody and Lev 1998; Francis and Schipper 1999; Lev and Zarowin 1999; Penman 2009; and Ciftci, Darrrough, and Mashruwala 2013).

The System of National Accounts 2008 and R&D

The *SNA 2008* is a collaboration of five international organizations: the United Nations, the European Commission, the Organisation for Economic Co-operation and Development (OECD), the International Monetary Fund, and the World Bank Group. Countries are encouraged to follow the recommendations provided in the international guidelines in order to facilitate the comparability of national income and product statistics. In addition, some organizations' member countries are periodically required to report statistics that are consistent with the international guidelines.

The *SNA 2008*

The accounting framework of the *SNA 2008* is structured as a sequence of accounts that reflect stocks of assets and liabilities and related economic flows for national economies. Each account in the sequence yields a residual or balancing item that is carried forward to the next account in the sequence. The sequence of accounts includes three categories of accounts:

- **Current accounts.** These accounts include a production account, which reflects production, and income accounts, which reflect the generation, distribution, and uses of income from production.
- **Accumulation accounts.** These accounts reflect changes in assets, liabilities, and net worth as a result of volume changes, price changes, and saving from production. The accumulation accounts include the capital account, which shows transactions in nonfinancial assets (such as R&D) and capital transfers.
- **Balance sheet.** This presentation reflects stocks of assets and liabilities and changes in assets and liabilities. The difference between assets and liabilities is net worth.

Please see the appendix for more detail and a summary of the sequence of accounts.

R&D in the *SNA* capital account

The capital account shows transactions in nonfinancial assets and capital transfers. Nonfinancial assets are either produced or nonproduced. Produced assets result from a production process and include fixed assets, inventories, and valuables. In order to be considered a fixed asset, an asset must be used in production for more than 1 year. Inventories may be used in production or may be held for sale or other uses. Valuables are stores of value that are generally not used in production. Nonproduced assets result from a process other

than production and include natural resources; contracts, leases, and licenses; and purchased goodwill and marketing assets.

Capitalizing fixed assets in the capital account requires statisticians to derive related measures of gross fixed capital formation and consumption of fixed capital (CFC), which is a measure of economic depreciation. Gross fixed capital formation includes fixed assets purchased by a producer from other producers and includes fixed assets produced by a producer and retained for the producer's own use in future production (that is, own-account production). Thus, CFC also includes own-account fixed assets.

The asset boundary for fixed assets in the capital account generally includes R&D. Similar to other types of fixed assets, R&D may be purchased from other producers or produced internally. According to the *SNA 2008*, the amounts capitalized should be consistent with the future economic benefits the R&D is expected to provide, which can be determined by the market prices of purchased R&D or by the costs associated with own-account R&D when market prices are unavailable. Costs should be capitalized regardless of the actual commercial or technological success of an endeavor because all costs form part of a future successful endeavor. While some R&D may require many failures to reap one success, businesses are not presumed to incur costs related to R&D with an expectation of ultimate failure. Once R&D is recorded in the capital account, subsequent charges should be made to CFC over the useful life determined for the R&D output.³

The *SNA 2008* defines R&D as follows: "Research and [experimental] development consists of the value of expenditures on creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and use of this stock of knowledge to devise new applications. This does not extend to human capital as assets within the SNA" (*SNA 2008*, paragraph 10.103, 206).

Under prior versions of the *SNA*, expenditures on R&D were treated as intermediate consumption. As a result, the assets that were recognized as resulting from R&D were limited to legal rights or contractual agreements, such as patents and trademarks, and were treated as nonproduced assets that were brought into existence through the legal system rather than through the production of knowledge. The *SNA 2008* recognizes the creation of an underlying intellectual property product requires production activity using

resources such as labor and capital and treats R&D as a produced fixed asset. Under this treatment, legal rights and contractual agreements are no longer recorded in the capital account.

R&D Under U.S. Business Accounting Rules

Two organizations are recognized for issuing U.S. GAAP for nongovernmental entities: the Financial Accounting Standards Board (FASB) and the Securities and Exchange Commission (SEC). The single source of authoritative GAAP issued by FASB for nongovernmental entities is provided by the Accounting Standards Codification. In addition to the Codification, the SEC issues rules and interpretive releases, which serve as authoritative GAAP for SEC registrants.

Under the FASB Codification, expenditures on R&D are treated as expenses regardless of the success of the R&D. In contrast to the *SNA 2008*, the justification for expensing R&D expenditures is due to the uncertainty associated with future economic benefits. As a result, expenditures on R&D are distinguished from expenditures on intangibles that may evolve from the results of R&D and result in asset recognition, such as legal fees incurred to obtain a patent.

The Codification includes five categories of costs to be identified with R&D activities: (1) materials, equipment, and facilities, (2) personnel, (3) intangible assets purchased from others with no alternative future uses, (4) contract services, and (5) indirect costs. For the third category, purchased software may be capitalized if the software has an alternative future use.

Current-Cost Accounting and Economic Accounts

The *SNA 2008* recommends that the costs of production be consistent with the economic concept of opportunity cost. Opportunity cost is the value of the next best alternative that is foregone when a resource is used. Current-cost accounting is offered in the *SNA 2008* as a practical solution to opportunity cost. Under current-cost accounting, a resource used in production is valued at its actual or estimated current-market price at the time production takes place. Thus, in the capital account, current-cost accounting requires assets that are purchased and used in different time periods to be adjusted using price indexes. In the case of previously capitalized expenditures related to R&D, data on current prices may not be readily available, because there are no observed transactions.

In contrast to the *SNA 2008*, the U.S. business accounting rules require a resource to be recorded on a historical-cost basis, which is determined by the actual costs incurred to acquire the resource. Thus, national

3. Measurement of capitalized amounts and subsequent charges to CFC are outside the scope of this paper, but guidance is offered in Li (2012), OECD (2010), and Aizcorbe, Moylan, and Robbins (2009) in addition to the *SNA 2008*.

economic accounting statisticians face a measurement challenge under current-cost accounting that is unique to national economic accounting.⁴

Effects of Own-Account R&D on Economic Accounting Measures and Business Accounting Measures

Expensing R&D expenditures assumes that the expenditures only affect the current period, thus affecting related accounting measures only in the current period. Capitalizing R&D expenditures assumes the expenditures provide current and future benefits, which affects accounting measures in the current and future periods. Table 1 provides a concordance of national economic accounting measures and business accounting measures. Some of the differences in scope between cost of sales and intermediate consumption and between operating expenses and compensation and taxes on production less subsidies affect the concordance between value added (Gross domestic product) in national economic accounting and gross margin in business accounting. Likewise, some economic accounting measures are conceptually different from the corresponding business accounting measure; for example, CFC in national economic accounting is based on current-cost accounting, and depreciation and amortization in business accounting is based on historical-cost accounting.

National economic accounting measures

Based on Hulten and Hao (2008), table 2 summarizes the conceptual effects of expensing or capitalizing own-account R&D on the SNA production account and the SNA generation of income account. In table 2, Q denotes output, X denotes intermediate consumption, and R denotes R&D expenditures. In addition,

4. Measurement of prices related to R&D is outside the scope of this paper, but guidance is offered in Copeland and Fixler (2012), Robbins, Belay, Donahoe, and Lee (2012), Corrado, Goodridge, and Haskel (2011), and Copeland, Medeiros, and Robbins (2007).

when expenditures are capitalized, the capitalized amounts are subject to economic depreciation at a rate denoted δ , where $0 < \delta < 1$.

If R&D expenditures are expensed, the expenditures are treated as intermediate consumption in the production of products other than R&D and have no impact on the output of R&D. If the expenditures are capitalized, however, they are treated as intermediate consumption in the production of R&D, and the capitalized amount is treated as R&D output. Whether the R&D output is sold to other producers or used internally, there is presumably a return, denoted Π , associated with the output. Thus, if own-account R&D is capitalized in lieu of expensing, output increases by the amount of the expenditures plus the associated return, $(1 + \Pi)R$. Intermediate consumption stays the same because capitalizing own-account R&D does not change the purchases of intermediate inputs. Likewise, value added (GDP) and gross operating surplus increase by $(1 + \Pi)R$, and net operating surplus increases by the output of R&D adjusted for economic depreciation $(1 + \Pi - \delta)R$.

To demonstrate the quantitative effects of expensed and capitalized business R&D on U.S. product and income measures, table 3 presents annual U.S. GDP and net operating surplus with expensed and capitalized business R&D expenditures for 2008–2012. Lines 1 and 4 in table 3 include capitalized measures of R&D and are published in the U.S. NIPAs. Likewise, lines 2, 5, and 6 are published in the U.S. fixed assets accounts. The amounts in lines 2 and 5 are equivalent to $(1 + \Pi)R$ in table 2, and the amounts on line 6 are equivalent to δR in table 2. Before the 2013 comprehensive revision of the NIPAs, business R&D was treated as intermediate consumption rather than as investment. To demonstrate the effects of expensed R&D, line 3 in table 3 presents GDP net of R&D investment, and line 7 presents net operating surplus net of R&D investment and the related CFC.

Table 2. National Economic Accounting Measures With Expensed and Capitalized R&D (Own-Account)

	<i>Expensed</i>	<i>Capitalized</i>
Output.....	Q	$Q + (1 + \Pi)R$
Less: Intermediate consumption.....	$X + R$	$X + R$
Value added (GDP).....	$Q - X - R$	$Q - X + \Pi R$
Less: Compensation.....	W	W
Less: Taxes less subsidies.....	T	T
Gross operating surplus.....	$Q - X - W - T - R$	$Q - X + \Pi R - W - T$
Less: Consumption of fixed capital.....	D	$D + \delta R$
Net operating surplus.....	$Q - X - W - T - D - R$	$Q - X - W - T - D + (\Pi - \delta)R$

Business accounting measures

Table 4 summarizes the differences between business accounting measures with expensed and capitalized own-account R&D expenditures. In this table, S denotes sales, C denotes cost of sales, and R denotes R&D expenditures. In addition, the return to own-account R&D is Π , and the associated amortization rate is δ ($0 < \delta < 1$).

If expenditures related to own-account R&D are expensed, the expenditures are treated as operating expenses with no impact on sales. If the expenditures are capitalized, they may be treated as the cost of sales in the production of intangibles, and the capitalized

amount may be treated as sales of intangibles. Thus, capitalizing own-account R&D instead of expensing increases the cost of sales by the amount of the expenditures, R , which are offset by an equal decrease in operating expenses. In addition, sales increase by the amount of the expenditures plus the associated return, $(1 + \Pi)R$, which is also reflected in operating income. Given the charge to amortization, the difference in earnings before interest and taxes and net income are each $(1 + \Pi - \delta)R$. The changes for sales, operating income, earnings before interest and taxes, and net income are equivalent to the changes for their counterparts in the national economic accounts.

Table 3. U.S. Economic Accounting Measures With Expensed and Capitalized Business R&D

[Billions of U.S. dollars]

Line		2008	2009	2010	2011	2012
1	GDP with capitalized business R&D	14,720.3	14,417.9	14,958.3	15,533.8	16,244.6
2	Less: Business R&D	224.5	214.0	223.6	235.3	248.7
3	GDP with expensed business R&D	14,495.8	14,203.9	14,734.7	15,298.5	15,995.9
4	NOS with capitalized business R&D	3,178.6	3,213.9	3,557.0	3,811.2	4,033.2
5	Less: Business R&D	224.5	214.0	223.6	235.3	248.7
6	Plus: Consumption of fixed capital	182.5	185.4	193.2	202.8	215.3
7	NOS with expensed business R&D	3,136.6	3,185.3	3,526.6	3,778.7	3,999.8

GDP Gross domestic product
NOS Net operating surplus
R&D Research and development

Source: Line 1 comes from line 1 of table 1.1.5 of the U.S. national income and product accounts

(NIPAs); lines 2 and 5 come from line 83 of table 2.7 of the U.S. fixed assets accounts (FAAs); line 4 comes from line 9 of table 1.10 of the U.S. NIPAs; and line 6 comes from line 83 of table 2.4 of the U.S. FAAs.

NOTE: Business R&D investment excludes expenditures on software development.

Table 4. Business Accounting Measures With Expensed and Capitalized R&D (Own-Account)

	<i>Expensed</i>	<i>Capitalized</i>
Net sales	S	$S + (1 + \Pi)R$
Less: Cost of sales	C	$C + R$
Gross margin	$S - C$	$S - C + \Pi R$
Less: Operating expenses	X	X
Less: R&D	R	
Operating income	$S - C - X - R$	$S - C - X + \Pi R$
Less: Depreciation and amortization	D	$D + \delta R$
Earnings before interest and taxes	$S - C - X - D - R$	$S - C - X - D + (\Pi - \delta)R$
Less: Interest and income taxes	T	T
Net income	$S - C - X - D - T - R$	$S - C - X - D - T + (\Pi - \delta)R$

R&D Research and development

Source: Adapted by the author from Hulton and Hao (2008).

Appendix

The *System of National Accounts 2008* sequence of accounts includes three categories of accounts: (1) current accounts, (2) accumulation accounts, and (3) a balance sheet. Tables 5.1 and 5.2 summarize this sequence. To understand the treatment of R&D in the accounting framework of the *SNA 2008*, a basic understanding of each category of accounts is helpful.

Current accounts

Table 5.1 summarizes the current accounts. The current accounts include a production account, which reflects production, and income accounts, which reflect the generation, distribution, and uses of income from production. The production account is the first account in the sequence and yields value added as a residual between output and intermediate consumption of materials, energy, and purchased services. Value added is referred to in the *SNA 2008* as gross domestic product (GDP) and is conceptually equivalent to GDP and gross domestic income (GDI) in the NIPAs.

The income accounts of the *SNA 2008* are composed of a primary distribution of income account, a secondary distribution of income account, and a use of disposable income account. The primary distribution of income account shows the generation of income from production and the allocation of income to the primary factors involved in production: labor, capital, and government. In concept, value added equals the income generated in production. The secondary distribution of income account shows the redistribution of primary income through income taxes and transfers. The balancing item in the secondary distribution of income account is disposable income, which is shown in the use of disposable income account for final consumption expenditures or saving. Saving is the starting point for the accumulation accounts.

The balancing items of the current accounts may be

measured gross or net. In the *SNA 2008*, the difference between gross and net is consumption of fixed capital (CFC), a measure of economic depreciation. While CFC is excluded from the summary in table 5.1 for simplicity, CFC plays an important role in the current accounts by revealing the extent to which production and the related income are affected by declines in invested capital. Thus, CFC plays a role in national economic accounts similar to the role of depreciation and amortization in business accounts, where income is measured gross (operating income) and net (net income) of depreciation and amortization.

Accumulation accounts

Accumulation accounts reflect changes in assets, liabilities, and net worth as a result of volume changes, price changes, and saving from production. Accumulation accounts include four accounts: the capital account, the financial account, the other changes in volume of assets account (OCVA), and the revaluation account. The capital account shows transactions in nonfinancial assets and capital transfers, which result in a redistribution of wealth. The financial account reflects transactions in financial assets and liabilities, such as stock and bonds. The OCVA records changes in the values of assets that result from flows other than transactions, such as catastrophic losses or discovery of subsoil resources. The revaluation account captures holding gains and losses, which reflect changes in prices but do not reflect transactions and do not arise from production. Table 5.2 summarizes the contents of the accumulation accounts.

Balance sheet

The balance sheet is also summarized in table 5.2. The balance sheet reflects stocks of assets and liabilities and changes in assets and liabilities for the accounting period. The difference between assets and liabilities is net worth.

**Table 5.1. Summary Current Accounts,
System of National Accounts 2008**

<i>Uses</i>	<i>Resources</i>
Production Account	
	Output
Intermediate consumption	
Value added (GDP)	
Primary Distribution of Income Account	
<i>Generation of Income Subaccount</i>	
	Value added (GDP)
Compensation of employees	
Taxes on production less subsidies	
Operating surplus	
<i>Entrepreneurial Income Subaccount</i>	
	Operating surplus Property income (received)
Property income (paid)	
Entrepreneurial income	
<i>Allocation of Other Primary Income Subaccount</i>	
	Entrepreneurial income Compensation Taxes on production less subsidies Property income (received)
Property income (paid)	
National income	
Secondary Distribution of Income Account	
	National income Current transfers
Current transfers	
Current taxes on income, wealth, etc.	Current taxes on income, wealth, etc.
Disposable income	
Use of Disposable Income Account	
	Disposable income
Final consumption expenditures	
Saving	

GDP Gross domestic product
Source: Adapted by the author from the SNA 2008.

**Table 5.2. Summary Accumulation Accounts and Balance Sheet,
System of National Accounts 2008**

<i>Assets</i>	<i>Liabilities and net worth</i>
Capital Account	
	Saving
Gross capital formation	
Gross fixed capital formation	
Changes in inventories	
Acquisitions less disposals of valuables	
Consumption of fixed capital (-)	
Acquisitions less disposals of nonproduced assets	
	Capital transfers receivable (+) Capital transfers payable (-)
	Changes in net worth due to saving and capital transfers
Net lending (+) / net borrowing (-)	
Financial Account	
	Net lending (+) / net borrowing (-)
Net acquisitions of financial assets	Net acquisitions of financial liabilities
Other Changes in the Volume of Assets (OCVA) Account	
OCVA	OCVA
	Changes in net worth due to OCVA
Revaluation Account	
Holding gains and losses	Holding gains and losses
	Changes in net worth due to holding gains and losses
Balance Sheet	
Opening assets	Opening liabilities and net worth
Transactions in nonfinancial assets and financial assets and liabilities	Transactions in nonfinancial assets and financial assets and liabilities Saving and capital transfers OCVA Holding gains and losses
Closing assets	Closing liabilities and net worth

Source: Adapted by the author from the SNA 2008.

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