Intangible capital in the Netherlands: Measurement and contribution to economic growth

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Explanation of symbols

.	= data not available
*	= provisional figure
x	= publication prohibited (confidential figure)
–	= nil or less than half of unit concerned
–	= (between two figures) inclusive
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2005-2006	= 2005 to 2006 inclusive
2005/2006	= average of 2005 up to and including 2006
2005/'06	= crop year, financial year, school year etc. beginning in 2005 and ending in 2006
2003/'04–2005/'06	= crop year, financial year, etc. 2003/'04 to 2005/'06 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Intangible capital in the Netherlands: Measurement and contribution to economic growth

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Abstract

Following the approach pioneered by Corrado, Hulten and Sichel (2004, 2005 and 2006) for the US, this paper explores the broader range of intangible investment in the Netherlands. Both conceptual and measurement issues are discussed. Furthermore, intangibles are capitalized and their contribution to economic growth by industry is examined. According to our estimates intangible investment in the Dutch commercial sector totals 36.9 billion euro in 2005, amounting to 7.2 per cent of (unrevised) GDP. It comprises only 6.0 percent of (unrevised) GDP in 1987 and increases in the late nineties, with a peak of 8.1 percent in 1999. From our results it is evident that in the Netherlands too, intangibles have an important contribution to output growth. Their importance however, varies across industries.

Keywords: Intangible Capital, National Accounts, growth accounts

1. Introduction and background

Since September 2007 the national accounts of the Netherlands are expanded with a set of multi-factor productivity statistics.[6] Capital inputs in these statistics are confined to asset categories as defined within the national accounting framework. Although the upcoming revision of the SNA (SNA 93 Rev.1)[7] will include a recommendation to capitalise R&D expenditure, at this moment the intangible assets covered in the official productivity

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[6] For a description of methods behind productivity measurement at Statistics Netherlands see van den Bergen *et al*., 2007. In collaboration with Statistics Netherlands a Dutch database has also been compiled on behalf of the EU-KLEMS project. For the sake of international comparability, EU-KLEMS productivity-statistics for the Netherlands sometimes differ from those published by Statistics Netherlands.

[7] The new System of National Accounts has not yet been finalized. However the registration of R&D as gross fixed capital formation has already been approved by the Statistical Commission. In this paper references are made to the draft version SNA 93 Rev.1.

statistics of Statistics Netherlands (SN) include computer software, mineral exploration and evaluation, and entertainment, literary or artistic originals[8].

Research by Corrado, Hulten and Sichel (CHS) (2004, 2005, 2006)9 suggests that the current SNA concept of gross fixed capital formation (GFCF) comprises only a small part of a more comprehensive list of intangible business investments that includes spending on innovative property (e.g. R&D) and economic competencies as well as software and other computerized information. CHS found that total business investment in intangibles in the USA was roughly the same as investment in tangible capital in 1999, i.e. approximately one trillion dollars. They argue that the magnitude of these estimates suggests that uncounted intangibles have a significant effect on the level of gross domestic product (GDP), as well as on the rate of investment and the level of labour productivity. This is confirmed by their growth accounting results, including this wider range of intangibles, as presented in their 2006 paper.

The research done by CHS, or part of it, has recently been replicated for several other countries including the UK (Marrano and Haskel, 2006), Finland (Jalava et al., 2007), Japan (Fukao et al., 2007), France and Germany (Xiaohui Hao et al., 2008) and Canada (Belhocine, 2008). In this paper we present the results of a similar kind of research carried out for the Netherlands. Unlike most of these country studies, for this research we had access to detailed national accounts data and business survey data. Researchers outside the domain of statistical agencies usually only have access to aggregated data. The use of this detailed data has two main advantages. First, contrary to some other studies, there is no need to pinpoint our estimates to the output of the main producers of intangibles. Such estimation methods are undesirable since intangibles, for example marketing or R&D assets, are frequently produced outside the main industry. Using more precise data on the actual purchases of intangibles rather than rough turnover measures should therefore be the preferred estimation method. Second, national accounts data allows us to directly estimate purchases of intangibles by industry whereas the estimates based on industry output require additional assumptions about the actual investors. The estimates presented in this paper include all investment in this broad range of intangible assets at the industry level.

In a previous paper we presented benchmark estimates of investments in intangibles for the years 2001-2004 (van Rooijen-Horsten et al., 2008). This paper proceeds with a more conceptual discussion on intangible capital with a direct reference to the asset boundary of the SNA (see also Van De Ven, 2000). Compared to the former paper investment estimates have been improved in several areas, the time series have been expanded covering the period 1987-2005 and the contribution to economic growth of investment in intangible assets is now being examined.

This paper consists of five sections. The next section comprises a conceptual discussion on the possibilities to expand the SNA asset boundary with a wider range of intangible assets. Section three discusses the estimation methods underlying the wider coverage of intangibles, including new estimates of investment, capital stocks and growth accounts.

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[8] The intangibles in the current Dutch national accounts further include transfer-of-ownership-costs on dairy quota, but these are currently excluded from the estimates presented in this paper.

[9] We highlight CHS here since we attempt to replicate their studies, but as they acknowledge, their work builds on work by Nakamura (1999, 2001, 2003); Brynjolffson and Yang (1999); Brynjolffson, Hitt, and Yang (2000); McGratten and Prescott (2000).

Section four presents the results of the Dutch growth accounts, including the broader range of intangible assets. Section five sums up with concluding remarks and future plans.

2. Intangible capital in a growth accounting framework

This section examines the theoretical basis for the claim that a much broader range of intangible assets than currently covered in the SNA should be treated as capital rather than as intermediate inputs. This section further discusses the necessary changes in the growth accounting framework that need to be made when introducing in the system a wider range of intangible fixed assets.

2.1 Are (all) intangibles really capital?

The first question to be settled is if intangible expenditures should indeed be regarded as investment. This section explores whether, and under what conditions, the (new) intangible asset categories identified by CHS truly satisfy the requirements of an asset as defined in the 1993 SNA Rev.1

2.1.1 Definition of a fixed asset

For expenditure on intangible entities, or intellectual property products according to the new SNA terminology, to be considered as capital investment they should satisfy the definition of fixed assets. This definition consists of two parts. First, the intangible should satisfy the general SNA criteria of an asset. Second, the intangible should comply with the specific criteria of a *fixed* asset. According to the 1993 SNA Rev. 1 (paragraph 3.30), the definition of an asset is:

An asset is a store of value representing a benefit or a series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of transferring value from one accounting period to another.

According to this definition, there are two requirements for an entity to be an asset.

1. The entity must have an (economic and a legal) owner. According to the 1993 SNA Rev 1 (paragraph 3.21), the legal owner of entities such as goods, services, natural resources, financial assets and liabilities is the institutional unit entitled in law and sustainable under the law to claim the benefits associated with the entities. Furthermore, it states in paragraph 3.21 that no entity that does not have a legal owner, either on an individual or collective basis, is recognised in the system.
2. There must be (possible) (economic) benefits to holding or using the entity.

Furthermore, in order to be classified as a fixed asset, an asset must fulfil a third requirement.

3. According to the SNA, fixed assets are *produced assets that are used repeatedly or continuously in production processes for more than one year.* Assets that can be used only once in the production process (inventories) or entities that are not used in a production process (valuables) are not fixed assets.

The most common examples of fixed assets are tangible assets such as buildings, machinery or transport equipment. For these types of assets it is quite easy to recognize that

they satisfy each of these three criteria. The SNA coverage of fixed assets is however not restricted to tangible assets. The (revised) SNA identifies several intangible fixed assets such as computer software, mineral exploration and research and development (R&D). However, not all spending on these intangibles satisfies the three above mentioned criteria. An example is (a part of) basic research at universities. Resulting knowledge, for instance about binary stars, may be used for several years by (other) researchers to build new theories upon. The third criterion is therefore fulfilled. There are however no expected economic benefits by using this knowledge. Research on binary stars is usually performed without the expectation of generating direct returns. It is performed in order to increase the general stock of knowledge to be used in subsequent research. The OECD Task Force on intellectual property products states that

For non-market producers,… R&D that is purchased or performed on own account should be treated as GFCF if it is expected to provide economic benefits for the unit or an affiliated unit, such as another government-owned unit. … R&D that is purchased or performed on own account without this expectation should be excluded from GFCF, even if it may later be used for the creation of other R&D (Aspden 2008).

For most university research the first requirement may not be fulfilled either. Results from university research are often published in scientific journals, making the knowledge freely accessible to the research community. When this knowledge is made freely available, its use is no longer restricted to the publisher and ownership does no longer exist. In our opinion, freely available knowledge does therefore not fulfil the first requirement and is therefore not a fixed asset in the SNA sense. The SNA Rev 1. however disagrees with this interpretation of ownership. In paragraph 10.102 it says about intellectual property products that *if despite making copies freely available, the owner still expects to obtain benefits, than the present value of those benefits should be recorded in the balance sheet*, what in effect means that ownership rights are deemed to exist. Summarizing, according to the (revised) SNA (and the OECD task force on intellectual property products), ownership rights are deemed to exist when others can not prevent the purchaser, or producer on own account, to claim the benefits associated with the use of the intellectual property product. Only when others can prevent the purchaser, or producer on own account, to claim the benefits, ownership rights do not exist. Despite the fact that we disagree with this interpretation of ownership, this new SNA interpretation will be followed in this paper.

In short, the above-mentioned three SNA criteria are used to decide whether specific types of intangible assets that are currently outside the (revised) SNA asset boundary, could be meaningfully identified as fixed assets in the (revised) SNA sense. The (revised) SNA explicitly recognises five different kind of intangible fixed assets, which are all listed under the name "intellectual property products": a) research and (experimental) development, b) mineral exploration and evaluation, c) computer software and databases, d) entertainment, literary and artistic originals, and e) other intellectual property products. This latter category is currently empty, but is reserved for *any such products that constitute fixed assets but are not captured in one of the specific items above*. The SNA apparently leaves open the possibility that it forgets some intangibles, which is exactly what CHS argue.

2.1.2 Intangible fixed assets not recognized by the SNA

Brand equity

Brand equity represents the commercial value of company or brand names. This value reflects the confidence consumers have in products or services with well established brand

names. This confidence is based on the (positive) image a consumer has about the company or the product. This positive image is being created by advertisement campaigns and market research on consumers' preferences.

Registered brand names are protected by law which restricts their use and leads to the enforcement of ownership rights. This is also reflected by sales and purchases of brand names which would not occur in the absence of ownership rights. The first (ownership) criterion of an asset is therefore fulfilled.

There are also clear economic benefits connected to the use of brand names. The Nike-logo on shoes allows Nike to sell shoes in higher quantities or for higher prices (or both) than similar shoes without the Nike-logo. These extra benefits are clearly the result of well established brand names. Therefore, the second criterion of an asset is also fulfilled.

Brand names will usually generate benefits for longer periods of time. Although most marketing activities generate short term effects, coordinated marketing strategies appear to generate effects for more than a year. Therefore, at least part of expenditure on brand names fulfils the third criterion.

Since all three criteria are being fulfilled, brand equity meets the SNA definition of a fixed asset.

Organizational structure

The profitability of companies may rise as a consequence of their well managed organizational structure, organizational structure being the blueprint of how the organization should be managed. An efficient management system and effective business plans help to minimize waste spending and allow businesses to quickly seize new business opportunities, and herewith increasing profits. These elevated current and future income streams resulting from good organisational structures mean that the second asset criterion is fulfilled. Since most organizational structures are in place for more than a year, the third requirement is also fulfilled.

Although it is questionable whether organizational structures have legal owners, companies are at least able to claim the benefits from their organizational structure. Other parties can not prevent them from managing production processes according to their successful organizational structure. Therefore, companies do enforce ownership rights over their organizational structure in the SNA sense. Thus, the first requirement is also fulfilled, making organizational structure a fixed asset according to the SNA definition.

This does not mean that all spending related to the organizational structure is spending on an asset. Most organizational structures require management and supervision. This (regular) spending on managers and supervisors is not part of the organizational structure itself. It is part of the cost of using the asset. Just as the labour costs of an operator to operate a new machine are not part of investment in machinery, remuneration of a manager to steer the organizational structure is equally not part of investment in organizational structure. Only spending aimed at producing organization blueprints should be considered capital spending.

Architectural and engineering designs

Architectural and engineering designs of for instance buildings, structures, machinery, apparatus and manufacturing processes are to some extent similar to R&D. As the ownership of R&D can be protected by patents, architectural and engineering designs can

be protected by copyright laws. When protected by copyright laws, ownership rights are enforced, and the first criterion holds. In addition, similar to R&D, ownership rights of designs can sometimes be maintained by way of secrecy.[10]

The (expected) benefits from architectural and engineering designs are also quite similar to those of R&D. The owner may develop new designs to make (new) profitable products or may licence others to use them. Therefore, the second criterion also holds.

The third criterion however, may not hold for all cases. The service life of a design of a machine usually corresponds to the number of years this machine is being produced. Equally manufacturing process designs may be in use for several years. Designs for buildings and structures may however in many cases only be used for the unique construction of a single building or structure. An example is the Freedom tower in New York. Its architectural design will be used only for this building. It does not fulfil the third requirement and should be considered as an intermediate input of the construction process. Part of the engineering design may however be used for other buildings as well, fulfilling the third criterion which makes it an asset. Other architectural and engineering designs can be used in the construction of several buildings and structures. In these cases, the capital service will become part of the production costs of these buildings or structures and their design fulfils all three criteria of a fixed asset.

In conclusion, if the architectural and engineering designs are used for several projects and not just for one single building or structure, they could be recognised as fixed assets.

The recognition of architectural and engineering designs as fixed assets may alter the value of own-account investment in buildings and structures. Currently, the costs of the architectural and engineering designs are included as intermediate inputs in the production costs. Since own-account investment is valued on the basis of production costs, the purchase value of the architectural and engineering designs is included in the own-account investments in buildings and structures. When these designs are recognised as an asset, only their capital services based on user cost of capital estimates should be included in the production costs instead. This will alter the value of the own-account investments in buildings and structures.

Firm specific human capital

Firm specific human capital is the human capital acquired by employees through job training. Except in cases in which such training is offered as a payment in kind, it can reasonably be argued that a company would not pay for it unless benefits of it are being expected. These benefits result from the increased productivity of the educated employee. This fulfils the second criterion.

The benefits of this training can be reaped for as long as the employee is willing to work for the company. Since this may be generally be more than one year, the benefits continue to exist for more than one year, fulfilling the third criterion.

It is questionable however, to what extent a company really exercises ownership rights over the newly created knowledge embodied in its personnel. A trained employee may choose at

[10] Maintaining ownership rights by way of secrecy is of course not applicable in case of designs of goods that are sold on the market. However, in the case of for instance designs of new production processes secrecy can be a way to maintain ownership rights.

any point in time to leave the company. From that point of view the employee is the true owner of its knowledge, not the employer. It is however possible for companies to demand compensation from recently trained employees when they leave shortly after being trained. In this way the benefits of job training are expected to be largely captured by the employer. Therefore in our opinion when the company is legally entitled to claim this compensation (for example because the employee has signed a contract), the definition of ownership is fulfilled. When such an entitlement does not exist, the company does not have ownership over the human capital.

When a company is legally entitled to claim compensation when an employee leaves shortly after receiving job training, all criteria of an asset are being fulfilled. Under this condition, the firm specific human capital should be included as a fixed asset in the national accounts.

Without this entitlement the employer does not seem to have any firm specific human capital asset. In practice however, firm specific human capital may still resemble an asset due to the rigidity of labour. Most employees stay with a company for longer time periods. In practice, the company will therefore in many cases receive the benefits it expects from its spending and may therefore treat firm specific human capital like any other asset used in its production process. For this reason, including this kind of firm specific human capital in the growth accounts may deliver useful information. For this reason, and to maintain comparability with the other country studies, we include all firm specific human capital as an asset in this paper, even though part of it does not meet all criteria of an asset.

One may argue that the benefits of firm education will usually be shared by both the employer and the employee. As a result, these human capital services may (partly) show up in the reward of labour since it is quite likely that company specific training and, as a result, more productive employees may lead to higher salaries. The additional full fledged imputation of firm specific human capital services may therefore give rise to double counting. On the other hand one may also argue that the capitalization of expenditure on firm specific training is a reasonable proxy of the current and future returns an employer is expected to gain in addition to the expected higher salaries of its employees. From that point of view the double counting issue does not seem to be very disturbing.

2.2 Insertion of intangible capital in our growth accounting framework

In the Dutch growth accounting framework, the volume change of consolidated output and value added are assigned to the inputs in the production process and to multi-factor productivity change. For consolidated output based growth accounting, capital (K), labour (L), energy (E), materials (M) and services (S) are taken as inputs. For value added based growth accounting, only capital and labour are taken as inputs. The growth accounts are fully consistent with the Dutch national accounts. They follow the guidelines from the OECD manual “Measuring Productivity” (2001). Details of our growth accounting system are given by Van den Bergen et al (2007).

When additional intangibles are recognized as capital, both inputs and outputs of the production processes, as well as multi-factor productivity change and the growth accounts, will change. The exact changes in the growth accounting framework depend on whether the intangibles are purchased or produced on own account.

2.2.1 Production on own account

The own-account production of the additional intangibles is currently not recorded as such in the national accounts. When the intangible is recognized as capital, the own-account production is instead recorded as an investment on own account. This has the following consequences on the national accounts.

- Investments increase with the production value of the intangibles.
- The value of capital inputs increases with the user cost on all past own-account production of these intangibles.
- For market producers, output increases with the production value of the intangibles.
- For market producers, value added increases with the production value of the intangibles.
- For non market producers, output increases with the consumption of fixed capital on all past own-account production of these intangibles. [11]
- For non market producers, value added increases with the consumption of fixed capital on all past own-account production of these intangibles.
- Government consumption decreases with the production value of the intangibles produced by non market producers less the consumption of fixed capital on all past own-account production of these intangibles.

2.2.2 Purchases of intangibles

The purchases of the additional intangibles are currently recorded as intermediate consumption of materials and services.[12] When the intangible is recognized as capital, the purchase is instead recorded as investment. This has the following consequences on the national accounts.

- Intermediate consumption decreases with the value of the purchase.
- Investments increase with the value of the purchase.
- The value of capital inputs increases with the user cost on all past purchases of these intangibles.
- For market producers, value added increases with the value of the purchase.
- For non market producers, value added increases with the consumption of fixed capital on all past purchases of these intangibles.
- For non market producers, consolidated output decreases with the value of the purchase less the consumption of fixed capital on all past purchases of these intangibles.

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[11] For a fully consistent growth accounting framework, non market output (and value added) should increase with the user cost on all past own-account production of these intangibles, not with the consumption of fixed capital. In order to stay consistent with the SNA however, only consumption of fixed capital in non-market output is to be included.

[12] Spending on newspaper advertisements is recorded as the purchase of materials. In this case, spending on tangibles creates an intangible.

- Government consumption decreases with the value of the purchases by non market producers less the consumption of fixed capital on all past purchases of these intangibles.

An exception is made when the intangible is purchased from a company in the same industry. Since in our growth accounts we work with consolidated output, these intra-industry deliveries are excluded from output and intermediate consumption. Such intra-industry purchases are therefore treated as investments on own account.

3. Methods: intangible investment, capital and growth accounting

This section discusses data and procedures with regard to investment, capital and growth accounting. The parts on capital and growth accounting are short because our capital measurement and growth accounting methods are described in detail elsewhere (van den Bergen et al., 2005 and 2007)

We follow CHS in identifying three main intangible asset classes:

I. Computerized information

II. Innovative property

III. Economic competencies

Table A1 summarizes our methods. It shows our choice of intangible assets, their data sources, investment figures, percentage of total intangible investment, their deflators and service lives. In general, we make as much as possible use of national accounts data series for the Netherlands. Computer software, computerized databases, mineral exploration and copyright and license costs are already recognized as fixed assets in the national accounts. For these types of intangibles national accounts investment data series are therefore used. For details with regard to their measurement in the Dutch national accounts we refer to van Rooijen-Horsten et al. (2008). The sections below focus on our procedures for estimating investment and capital for those types of intangibles that are currently not recognized as fixed assets in the national accounts.

3.1 Measuring investment in intangibles currently not recognized as assets

For computerized information, including its subcategories, national accounting data series could be used since these types of intangibles are already recognized as fixed capital in the national accounts. The second main category, innovative property, comprises four types of intangibles currently not recognized as fixed assets in the national accounts: (Scientific) R&D, new architectural and engineering designs, new product development costs in the financial industry and R&D in social sciences and humanities. As described in section 3.1.1, the latter two are assumed to be included in our R&D estimates. New architectural and engineering designs are described in section 3.1.2. All types of intangibles that fall within the third main category, economic competencies, are currently not recognized as fixed assets in the national accounts. Our procedures for estimating investment in economic competencies are described in sections 3.1.3 to 3.1.5.

3.1.1 Innovative property: R&D

Data on R&D capital expenditure are obtained from the Dutch satellite accounts on knowledge, the so-called knowledge module. The knowledge module is being developed to measure the role of knowledge in the economy in more detail. In anticipation of the upcoming revision of the SNA, R&D expenditure is capitalised in the knowledge module.

The main sources of the R&D data series estimated in the context of the knowledge module are three Frascati (OECD 1993 and 2002) based surveys of R&D performers: a survey of enterprises, one of research institutes and one of universities. R&D-supply and R&D-use according to national accounting conventions are obtained by translating the gross expenditure on R&D (by producer and by funder) from these surveys. The translation process comprises several steps including the revaluation of the R&D expenditure data in order to obtain R&D output according to SNA guidelines and the elimination of overlaps with software development. A more detailed description of the methods used to estimate R&D capital expenditure and the R&D capital stock in the Dutch knowledge module is given by Tanriseven *et al.* (2007) and by de Haan and van Rooijen-Horsten (2003, 2004 and 2007).

The revised SNA (and Frascati) definition of R&D, covered by the R&D survey, is a broader concept than the 'scientific R&D' in the CHS studies. In principle, therefore, the Dutch R&D survey data should capture not only scientific R&D but also R&D in the financial services industries as well as R&D in social sciences and humanities[13]. For 2005, R&D expenditure in the financial services industries is estimated at 0.1 billion euro. This figure is much lower than when using 20 percent of intermediate consumption of the financial services industry like CHS do. It is quite possible that financial companies do not regard their research as R&D and therefore exclude it from the R&D survey. However, there does not seem to be any hard evidence that R&D in the financial services industry is really as big as 20 per cent of intermediate consumption. Lacking this evidence, for the time being we stick to the R&D survey.

Unfortunately figures on R&D in social sciences and humanities cannot be separately distinguished. They are included in the total R&D estimates. However, it is possible that the Dutch R&D survey results in underestimations of R&D in these two industries, for example because R&D which is not undertaken on a systematic basis is excluded from the definition of R&D. Such "ad hoc" R&D is common in the financial services industries and in social sciences and humanities. We assume for the time being that the Dutch R&D survey correctly measures R&D in the financial services industries as well as R&D in social sciences and humanities.

R&D investment figures as presented in this paper are based on domestic R&D use (both purchased and produced on own-account). However, as discussed in section 1, in the draft version of the new SNA it is recommended that 'In principle, R&D that does not provide an economic benefit to its owner does not constitute a fixed asset and should be treated as

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[13] The Frascati Manual explicitly states examples of R&D in banking and insurance, e.g. 'Mathematical research relating to financial risk analysis and R&D related to new or significantly improved financial services (new concepts for accounts, loans, insurance and saving instruments)'. For R&D in the social sciences and humanities no explicit examples are mentioned. It is however stated that 'The social sciences and humanities are covered in the Manual by including in the definition of R&D 'knowledge of man, culture and society.'.

intermediate consumption'. We assume that in the case of non market R&D, no economic benefits to the owner exist. Therefore, non-market R&D is excluded from the R&D investment estimates.[14]

For 2005 total R&D investment is estimated at 5.1 billion euro.

3.1.2 Innovative property: New architectural and engineering designs

Architectural and engineering designs can be both purchased and produced on own account. In this paper, we have only estimated purchases of architectural and engineering designs. For own account production, no reliable data sources were available. In practice, we expect that this means that we only take designs of buildings and structures into account.

For designs of buildings and structures, we expect almost all investments to be purchases. Most of the own account production of buildings and structures will probably be used for a single building or structure. These designs should therefore be treated as intermediate consumption.

For product and process designs however, we expect most designs to be produced on own account. Most large companies have departments for developing new products, product packing and/or processes. Instead of purchasing new designs, these departments produce them on own account. This expectation is confirmed by the virtual absence of intermediate consumption of architectural and engineering designs by manufacturing industries in the national accounts.

The Dutch innovation survey would be a good starting point for estimating own account production of designs. In the innovation survey, companies are asked about the development and implementation of new products, product packing and production processes. Unfortunately, the innovation survey only asks whether new designs are produced or implemented. No questions on the cost or the number of employees involved are included. For measuring own account production of these designs, such quantitative data are necessary.

For purchases of architectural and engineering designs, we have assumed that two third of all designs that are used in the production of other capital goods are used to produce several of these capital goods. These two third are treated as investments in architectural and engineering designs. The other purchases of architectural and engineering designs remain registered as intermediate consumption. This leads to estimated investments in architectural and engineering designs of 3.1 billion euro in 2005.

For estimating the investments by industry, it is important to know where the ownership of the designs lies. When the ownership of the design lies with the purchaser, the design should be capitalised on the balance sheet of the purchasing industry. If however the ownership of the design lies with the architectural agencies, the design should be capitalised on the balance sheets of these agencies. In this case the purchasing company would purchase a licence to use. For the purchasing company, the only thing that changes

[14] This implies that all own account R&D output by publicly funded R&D institutions (ISIC 73) and universities is excluded from R&D investment. When international guidelines from the OECD and Eurostat with regard to this topic are finalized we will change our procedures accordingly.

would be a reclassification from the purchase of an architectural service into a licence to use.

No information on the ownership of architectural and engineering designs is currently available. More research is required to determine where the ownership lies. For now, we have assumed that the ownership always lies with the purchasing company. The main reason for this assumption is that if the designs were to be capitalised on the balance sheet of the architectural agencies, capitalising designs would only affect this industry. Future research may of course change this assumption.

3.1.3 Economic competencies: Brand equity

Not all expenditure on marketing and advertising has the main purpose of strengthening a brand name. Employment advertisements, for example, have the recruitment of new personnel as a primary goal. While the brand name may be strengthened as a by-product, this can hardly be seen as the primary goal of the employment advertisement. Another example is government advertisement on ethical issues or public safety. A government campaign to stimulate drivers to buckle up is in no way strengthening a brand name. It should therefore be excluded from the investments in brand equity. We use the following definition of investment in brand equity:

Investment in brand equity is that part of the expenditure on marketing and advertisement that has as the primary goal to increase the value of a brand name or to increase output over a period of more than one year.

This definition does not entail that spending on brand names needs to show an observable effect on strengthening the brand name or that output must be seen to increase for more than a year for the expenditure to be labelled as an investment. Like other assets, such as R&D and mineral exploration, the spending may fail in its goal, but can nonetheless be treated as an investment. The criterion is that on average the spending has an effect for more than one year.

In most cases, using output (or turnover) of the advertising industry will lead to an underestimation of all advertising expenditure in an economy. Often, advertisement agencies will design advertisements, but will leave the actual printing or airing of the advertisements to their client companies. In addition, companies often directly purchase advertisements in papers or on television, without interference by advertisement agencies. As a result, company spending on advertisement will usually be much larger than the advertisement agencies turnover. Another bias is caused by the fact that the Netherlands is a net importer of advertisements, probably caused by large international campaigns of multinationals. As a result, output of the Dutch advertisement agencies will be lower than the actual purchases from (domestic and foreign) advertisement agencies. Finally, advertisements are also produced as a by-product by some companies registered in other industries. By using only the output of advertisement agencies, these by-products are not represented in the data.

Total underestimation when output of the advertising industry is used can be quite large. In 2005, the output of the advertisement agencies was 6.6 billion euros, whereas total advertisement expenditure (according to the Dutch national accounts) was about 13 billion euro (excluding possible double counting, see text below).

We base our estimates of brand equity on the Dutch national accounts. In the national accounts, business survey data, for example on output of advertisement agencies, are used

in combination with other data sources to arrive at industry expenditure by commodity. The Dutch national accounts distinguish eight different expenditure categories of marketing and advertisement, seven types of advertisement expenditure and one type of market research. They are

a) Advertisements in newspapers

b) Advertisements in specialist journals

c) Advertisements in other journals

d) Free local papers

e) Advertising pamphlets / brochures

f) Other spending on marketing and advertisement

g) Market research services

h) Public relation services

Free local papers are included since these papers are published with the main goal of advertisement. The other spending on marketing and advertisement includes for instance spending on services from advertising agencies, advertisements on radio and television and advertisements in sporting clubs, pubs and cinemas. Since public relation services are used to strengthen brand names, we have included this category. In the tables it is listed under advertisement expenditure. For the year 2005, total spending on the eight expenditure categories of marketing and advertisement is almost 16 billion euro, excluding value added tax. This includes however some double counting and some spending that does not meet our definition of investment. We exclude the following spending.

- Spending by advertising agencies. We assume that all spending on marketing and advertisement by advertising agencies is done on behalf of their customers. Spending on marketing and advertisement by advertising agencies is therefore considered intermediate input of the advertising agencies. The value of this spending is included in their output, which is considered capital spending by its buyer. Including spending by advertising agencies as capital spending would lead to double counting of these costs. It is therefore excluded from the investment estimates.
- Spending by public administration and defence services and by public sewage and refuse disposal services. We assume that their spending is aimed at either recruiting personnel or increasing public awareness about certain issues, and that none is aimed directly at increasing sales. It is therefore excluded from our investment estimates.
- Spending on free local papers[15] and advertising pamphlets/brochures. We assume these advertisements to be primarily aimed at increasing short term output, for example by highlighting special offers. According to research by Luijten, et al. (2008) special offers do not affect brand equity on the long-term; the consumer makes a choice based on the price of a product instead of the brand name. Price promotions have an effect of approximately 10 weeks, the long term impact is

[15] Advertisement in free national newspapers (e.g. Metro) is not included in the spending on free local papers but is included in advertisement in newspapers.

essentially zero (Nijs, 2001). Therefore we exclude the spending on free local papers from our investment estimates. However, part of the spending on advertisement pamphlets/brochures comprises more fancy brochures and catalogues instead of advertising leaflets that only highlight special offers. We do want to include these fancy brochures and catalogues in our investment estimates. However, we have no information about their share in total spending on advertisement pamphlets / brochures. For the time being we therefore exclude half of the spending on advertising pamphlets from our investment estimates.

- Part of the spending on advertisement in newspapers and specialist journals. According to Nielsen Media Research (2008), 13 per cent of the non-household advertisements[16] in newspapers in 2005 concerned employment advertisements. In addition, with regard to specialist journals Nielsen Media Research reported 5 percent of the advertisements to be employment advertisements. Therefore, we exclude 13 percent of spending on advertisement in newspapers and 5 percent of the spending on advertisement in specialist journals from our investment estimates.

Although some of the other spending on marketing and advertisement (category f) may also have mainly a short term goal, like advertisement on television, for now we make no correction for this.

Purchases of market research services and public relation services (categories g and h) are calculated using the same method as for the estimation of investment in organizational structure. The description of the method is therefore included in the section about organizational structure (section 3.1.5). Results for these market research services and public relation services deviate less than 10 per cent from output of the market research industry and the public relation industry respectively. For these services, the output estimate of the corresponding industry therefore seems to give a good approximation of total investment, although this still doesn't allow for a breakdown by industry.

Data on value added tax is only available at a more aggregated level. Some crude estimates were used to determine the value added tax on investment in brand equity. Investment in brand equity, including value added tax, is estimated at 11.9 billion euro in 2005.

3.1.4 Economic competencies: Firm specific human capital

As explained in section 2.1.2 we include all firm specific human capital as an asset in this paper, even though part of it does not meet the criteria of an asset.

Following CHS the firm-specific human capital category of intangibles reflects direct firm expenses (outlays on trainers, tuition reimbursement and the like) as well as wage and salary costs of employee time in formal and informal training.

As with R&D, data series with regard to firm-specific human capital are obtained from the Dutch knowledge module. Five different expenditure categories are estimated:

1. Purchases of 'market' education
2. Travelling expenses and accommodation in connection with education

[16] Household advertisements include advertisements in the births, marriages and deaths column. We consider them spending by households and they are therefore excluded here.

3. Costs of (internal) teachers/ training personal

4. Material expenses in connection with education

5. Costs of forgone working hours (compensation of employees).

These estimates are mainly based on the 'Continuing Vocational Training Survey' (CVTS).[17] It is held every five years and is currently available for the years 1993, 1999 and 2005.[18] The estimates for the years in between are based on the extrapolation of the CVTS data using a volume indicator. This volume indicator is based on data from the Institute for Labour Studies (OSA) concerning the two-yearly development of the proportion of employees having attended a training, yearly labour volume data from the national accounts and the six-year development (available for 2005 on 1999) of training hours per course participant from the CVTS-survey. In the period 1990-1999 the development of the training hours per course participant is assumed to be zero. In combination with an input-based price-index the extrapolated series fit very well with the current price levels of the 1999 and 2005 CVTS-survey. Therefore the chosen method seems to be appropriate.[19]

A few industries are not included in the CVTS: public administration and social security, defence activities, subsidized education, and Health and social work activities.

For the industry public administration and social security estimates are based on annual reports published by the Ministry of the Interior (annual social report) and annual reports of the police organization. In the annual reports of the police organization training expenditure per full time equivalent jobs (fte's) is given. In the annual social report of the Ministry of the Interior an average expenditure is given for each ministry. In the years in which these expenditures per fte are unknown (1993-1998 for the police force and 1993-

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[17] This is a survey carried out by Statistics Netherlands under the authority of the statistical office of the European Communities (Eurostat). In the regular national accounts different sources of information are used for different industries to measure purchases of market education and the CVTS is not one of these sources. For the sake of consistency, in the present paper the CVTS is used as the main source of information for the measurement of both purchases of market education as well as other expenditure on (internal) training within enterprises. Therefore, figures on purchases of market education in this paper do not coincide with the corresponding figures in the regular Dutch national accounts.

[18] It should be noted that the surveys only include costs of so-called external and internal courses/education, comprising expenditure on courses that are attended by several participants at a time and that are held outside the direct working environment. Expenditure on other forms of training or education like "training on the job", "job rotation" and "attending conferences" is not included. Furthermore, only firms with 10 or more employees are included in the CVTS. This latter omission is partly reduced by adding estimations for firms with 5-9 employees in the estimates for the Netherlands.

[19] For the period 1987-1995 only crude estimates of expenditure on firm specific human capital are made. They are based on input-based price-indices together with volume indicators estimated based on a combination of the (two-yearly) development of the proportion of employees having attended training and (yearly) labour volume data from the national accounts. Because information with regard to the development of the proportion of employees having attended training is not available before 1990, these volume indicators are only estimated for the period 1990-2005. For the remaining period 1987-1989 volume indicators are derived from national accounts data on market education.

2002 for the ministries), training expenditure per fte is extrapolated based on the development of the wage costs in the corresponding industry from the national accounts. The number of fte's from the national accounts is used to estimate total expenditure on training.

Training expenditure in the industry defence activities is estimated with the help of an annual report of the Ministry of Defence. This annual report provides training expenditure per fte for the year 2006 in four divisions[20] of the industry defence activities. The training expenditure per fte in the other years is extrapolated based on the development of the labour costs per fte in the industry defence activities from the national accounts. The number of fte's from the national accounts is used to estimate total expenditure on training in this industry. For civilians that work in the industry defence activities it is assumed that the same average training expenditures per fte hold as for employees in the industry public administration and social security.

For the industry subsidized education the only available source of information on employer-provided training expenditure is a survey of continuing education within the education industry carried out in the school year 1994-1995. Employer-provided training expenditure for the year 1999 and 2005 is estimated with the help of data on growth of compensation of employees from 1993 to 1999 and from 1999 to 2005 as observed among the enterprises in the CVTS.

For the industry health and social work activities, survey data (from the survey statistics on health care providers) concerning the industry branches hospitals, nursing homes and municipal health care are used. The fraction of the training expenditures in total production costs of these branches is used to estimate training costs in the branches in which those training costs are not distinguished.

For 2005 total investment in firm specific human capital is estimated at 5.9 billion euro (including both direct firm expenses as well as wage and salary costs of employee time).

As indicated by Marrano and Haskel (2006) (MH), the CVTS uses a narrow definition of job training and therefore misses part of the expenditure on job training. We recognize that a broader definition of job training will lead to larger estimates of investment in firm specific human capital. Lacking other data, we use the CVTS definition of job training for the time being. Future work may lead to estimates that fit in better with the definition used by CHS and MH.

3.1.5 Economic competencies: Organizational structure

Organizational structure consists of two parts. The first part is the purchase of organizational advice from consultancy firms. The second part is the own account creation of organizational structure by the management of the company itself. The Dutch innovation survey would be a good starting point for estimating (purchased and own account) expenditure on organizational structure. In the innovation survey, companies are asked about changes in organizational structure. Unfortunately, the innovation survey only asks whether such changes have been implemented. No questions on the cost or the number of employees involved are included. For measuring expenditure on organizational structure, such quantitative data are necessary. In addition, the innovation survey does not distinguish

[20] Land forces, air forces, navy and the military police.

between purchased and own account produced changes in organizational structure. In the sections below our methods for estimating investment in organizational structure, both purchased and own-account produced, are described.

Purchased organizational structure

In principle the output of consultancy agencies could be used as a proxy for determining purchases of organisational structure. This method however has some disadvantages. First, this method does not take into account the fact that consultancy agencies may have by-products, or that other companies may have consultancy as a by-product. Second, this method does not take into account that part of the consultancy services purchased by non-market producers. As a result the consultancy services purchased by the market sector do not necessarily equal total output of the consultancy agencies. Third, companies that produce tax-exempt services, for example financial industries, have to pay value added tax over their purchases. When using industry output, this tax is not taken into account. Fourth, imports and exports are not taken into account either. The Netherlands is a net exporter of economic consultancy services. Using output totals may therefore lead to upward biases in investment estimates. Last, this very rough macro approach does not allow us to readily make a breakdown by industry.

Instead, we use data from the Dutch national accounts with regard to production and purchases of economic advice by industry. In the Dutch national accounts, business survey data are combined with other detailed information to get a fully consistent set of data. This full integration is however done at a higher aggregation level. We therefore have to make some additional assumptions to arrive at the investments in organisational structure.

The starting point is the purchases of economic advice, excluding value added tax from the national accounts. These purchases are about 8.6 billion euro for the year 2005. As said above, this is a higher aggregation level than we need. Spending on economic advice consists of more than improving organizational structure only. To get an estimate of the purchases of organizational structure, (micro) data from the four industries that together make up the economic advice industry are used. These four industries are:

Organizational consultancy

Market research agencies

Public relation agencies

Other economic research and consultancy.

The division of purchases of economic advice into the four commodities corresponding with these industries is based on the ratio between the output of these four industries, excluding by-products. For example, in 2005 the industry organizational consultancy produced 66 percent of the combined output of these four industries. Therefore, we assume that for each industry 66 percent of the purchases of economic advice consist of organisational consultancy. Using this method purchases of the commodity economic advice are subdivided into the four commodities organisational consultancy, market research, public relation services and other economic consultancy.

Next, we have to determine which commodities to include in our organizational structure investment figures. Purchased organizational consultancy is included as investment in organizational structure. Purchased market research is considered the purchase of brand equity, and not the purchase of organizational structure. It is therefore included as

investment in brand equity (see section 3.1.3). Purchases of public relation services are also considered spending on brand equity. They are aimed at creating a positive image which adds an extra value to a brand (Van Woerden, 1994). Therefore spending on public relations supports and enlarges brand equity, creates and maintains brand value and enlarges brand preference. Public relations and advertisement will strengthen each other if tuned in to each other properly. For these reasons purchased public relation services are also included as investment in brand equity (see section 3.1.3).

Purchases of other economic consultancy should partially be included in organisational structure investments. Part of the output of the corresponding industry consists of the production of consulting on sales techniques, logistics and product-management, which should be included in the organizational structure investments. Another part of the industry comprises management Ltd-s, which usually consist of only a director, and wields the management of another company. Purchases from management Ltd-s should be excluded from investment in organizational structure. However, no information is available about the breakdown of the output of this industry into these two parts. We assume that the economic consultancy produced by companies without employees is produced by management Ltd-s, and are therefore excluded. Economic consultancy produced by companies with employees is included in the organizational structure investment figures.[21]

Data on value added tax is available on an even more aggregated level only. Some crude estimates were used to determine the value added tax on purchases of organizational structure. The capital spending on purchased organizational structure, including value added tax, is subsequently estimated at 6.8 billion euro in 2005.

In a similar way, in this case however weighing with data from the industry market research agencies, the part of economic consultancy that is considered the purchase of brand equity is estimated at almost 1.6 billion euro in 2005.

Results for both organisational structure and brand equity deviate less than 10 per cent from output estimates of the relevant industries. Therefore, using the output of the concerning industries may in these cases be a good approximation of the total investments (a breakdown by industry is of course still not readily available then).

Own-account organizational structure

The own-account investment in organizational structure in CHS is derived from the value of an assumed fraction of senior executive time (20%). Since at SN, no broad statistical information on own account organizational structure is available, we follow CHS'assumption.

No information on average earnings in management occupations (ISCO 1) in the Netherlands is available. For this reason data on the average earnings in management occupations (ISCO 1) in Germany (1995-2006) is used. In order to arrive at the average earnings in management occupations in the Netherlands, the ratio of the average earnings in management occupations to the average earnings of the total of occupations as for Germany is applied to the average earnings of the total of occupations of the Netherlands. The estimated average earnings in management occupations in the Netherlands are then

[21] For this purpose, the same method is used as described above for the subdivision of purchases of economic advice into the four commodities organisational consultancy, market research, public relation services and other economic consultancy.

multiplied by the number of managers in the Netherlands according to Dutch Labour Force Survey (LFS). The relevant statistics on the labour force are only available from 1996-2003 and are therefore extrapolated in order to get the desired time series 1987-2006. For the missing years the development of total employees from the national accounts is used for the extrapolation. A deflator is used to arrive at the constant price time series. This deflator is based on the changes in gross wages in the total economy from the national accounts. With the help of the LFS of the years 2000-2006 an occupation by industry matrix is constructed. Subsequently, the distribution of the resulting estimates of own-account organizational structure over the different industries is made using the proportions resulting from this matrix.

Finally, the resulting estimates of own-account organizational structure by industry are multiplied by 0.20 on the assumption, following CHS, that 20% of executive time is spent on organisation building activities.

For 2005 the total investments in own-account organizational structures is estimated at 2.2 billion euro.

3.2 From intangible investment series to capital stocks

The new intangibles are treated like any other fixed asset in the Dutch national accounts and growth accounts. The Perpetual Inventory Model (PIM) is used to convert the investment time series into capital stocks.

The Dutch PIM is fully consistent with the guidelines from the OECD handbook "Measuring Capital" (2001). For the survival distribution, a Weibull function is used, while the age-efficiency pattern is represented by a Winfrey function. The Weibull function is defined by two parameters: the average service life and a shape parameter α. For most intangibles, α is set at 2.5, giving a bell-shaped survival distribution. The Winfrey function is a hyperbolic function that is defined only by a shape parameter β.

For most, if not all, intangibles, there is little information on the shape of the survival function and the age-efficiency function. Therefore, a geometric depreciation profile will give results with the same quality, while being simpler to use. However, in order to treat the intangibles exactly the same as the other fixed assets, we have chosen to use our PIM for the intangibles as well and we therefore do need data on the shape-parameters of survival and age-efficiency functions.

Finally, an initial capital stock is required. Since we have an investment time series starting at 1987, an initial capital stock estimate for 1986 is needed.[22] This initial capital stock estimate is based on some basic assumptions with regard to the ratios between capital stock and investments. These assumed ratios are based on the average service lives of the intangibles. Since the capital stock estimate for 1986 is not based on actual data, the resulting capital stocks for the first years after the initial capital stock will be of lower quality. We assume capital stock data to be of good quality from 1995 onwards.

A more detailed description of the Dutch PIM is given by Van den Bergen et. al. (2005).

[22] For R&D, the investment time series go back to 1953. For R&D, we therefore need a capital stock estimate for 1952.

3.2.1 Service lives and amortization patters

As mentioned above, average service lives are important parameters in the calculation of survival distributions and capital stocks. Table A1, column 7, shows the average service lives for all intangible assets. In this section we only discuss the service lives of those types of intangibles that are currently not recognized as fixed assets in the national accounts.

Brand equity

Little data is available on the average service life of brand names. Anecdotal evidence in the Netherlands points at a service life of about 2 years for marketing campaigns. Since this corresponds reasonably with the CHS' depreciation rate of 60 percent, for the time being a service life of 2 years is used for brand equity.

R&D

Like all intangibles, knowledge is not subject to wear and tear. The reason why knowledge asset values decline over time is because their contribution to company profits will inevitably fall in time. Eventually knowledge will be shared by others or may simply become obsolete due to new knowledge creation.

Unless patented there is almost no empirical evidence on the service lives of knowledge capital. The amortisation of patents gives a useful impression of the service lives of knowledge capital. However it is uncertain whether patent lives are representative for the service lives of all (patented and unpatented) R&D assets. This needs further investigation. For the purpose of the present paper R&D service lives as calculated in the context of the knowledge module are used.

In the knowledge module the age distribution of patents as obtained from the Dutch Patent Registry[23] is used to calculate an *unweighted* and *a weighted* average service life of patents. One may assume expensive patents to have on average longer service lives than cheaper patents; therefore an *unweighted* average service life of patents is expected to be downwards distorted. The *unweighted* average service life should therefore be seen as a lower bound[24]. The *weighted* average service life takes the value of the patents into account. To calculate an average service life weighted with patent-values, information on the distribution of patent values derived from the PatVal report (2005)[25] is used. The connection of average patent values to mortality probabilities is based on an assumed perfect correlation between patent age and values. However, it is also unlikely that patent values and service lives are fully correlated. Therefore the weighted average service life should be regarded as an upper bound estimate. One expects the correct average patent service life to be somewhere between this lower and upper bound.

The *unweighted* average service life of patents (the lower bound) is a little bit over 7 years. The weighted average service life of patents (the upper bound) amounts to almost 18 years. As a result 12 years is taken as the average service life of patents and subsequently for all

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[23] This register provides annual information on the number of patents granted from the year 1968 onwards

[24] Unweighted averages suggest that patent values are totally uncorrelated with service lives.

[25] To obtain a measure of the expected value of the patent, inventors are asked to give their best estimate of the value of the innovations that they contribute to develop.

R&D assets. For two industries an exception is made. The average value of patents in the chemical manufacturing industry appears to be above average while in the electro technical manufacturing industry it seems to be below the average. Based on this information, we expect the service lives in the chemical manufacturing industry to be higher and in the electro technical manufacturing industry to be lower than average. Therefore, service lives of the chemical and electro technical manufacturing industries are set at 15 and 9 years respectively.

Firm specific human capital

A company reaps benefits from its investments in firm specific human capital for as long as the employee, who received the training, remains with the company. The years of employment with the same company after a specific training could therefore be seen as the service life of the firm specific human capital associated with the training.

We therefore used data on the average duration of jobs by industry (from OSA) to estimate the average service life of firm specific human capital. We assumed that training starts after one year of employment, which gives an average service life of firm specific human capital equal to the average duration of jobs less 1 year. Table 1 shows the average duration of jobs in different industries and the corresponding estimate of the average service life of firm specific human capital.

Table 1, Firm specific human capital: average duration of jobs and average service lives used.

Industry	Average duration of jobs	Average service life used
	years	
Agriculture, forestry and mining	12	11
Manufacturing	12	11
Construction	9	8
Trade, hotels, restaurants and repair	8	7
Transport, storage and communication	11	10
Financial and business activities	8	7
Public administration and social security	14	13
Education	12	11
Health and social work activities	9	8
Other service activities	10	9

Architectural and engineering designs

Little data is available on the service life of architectural and engineering designs. We have therefore taken an average service life of 8 years, which corresponds with the depreciation rate of 20 percent used by CHS.

Organizational structure

Organizational structure can be used in the production process for as long as the structure is in place. Usually, when organizational structure is replaced, a reorganisation of the company takes place. The average time between subsequent reorganisations is therefore taken as the average service life of investments in organizational structure. Most expenses on organisational structure are made by large enterprises. Based on anecdotal evidence we estimate that these enterprises have a major reorganisation every five years. Therefore, a service life of five years is used for investment in organizational structures.

3.2.2 Age efficiency patterns

As said, little data on age-efficiency functions is available. For the regular fixed assets, the value of β is set at 1 (constant performance), 0.75 (normal decline in performance) or 0.5 (faster decline in performance). For most new intangibles, we have selected a β value of 0.75. Only for brand names, we expect the age efficiency to decline fast over time. For brand names, we have therefore selected a β value of 0.5.

3.2.3 User cost of intangible capital

For the inclusion of the new intangibles in the growth accounts, their user cost of capital have to be estimated. Once again, we have treated the intangibles like any other fixed asset in the growth accounts of SN. As a consequence, an exogenous ex-post interest rate is used. This interest rate is based on the average interest rate that companies must pay on outstanding bonds. The same (time-dependent) interest rate is used for all industries.

Furthermore, both expected and unexpected holding gains are included in the holding gains. The expected holding gains are based on the consumer price index, whereas the unexpected holding gains are based on the ex-post producer price indices.

A more detailed description of the calculation of the user cost of capital is given by Van den Bergen et al. (2007).

3.3 Growth accounting

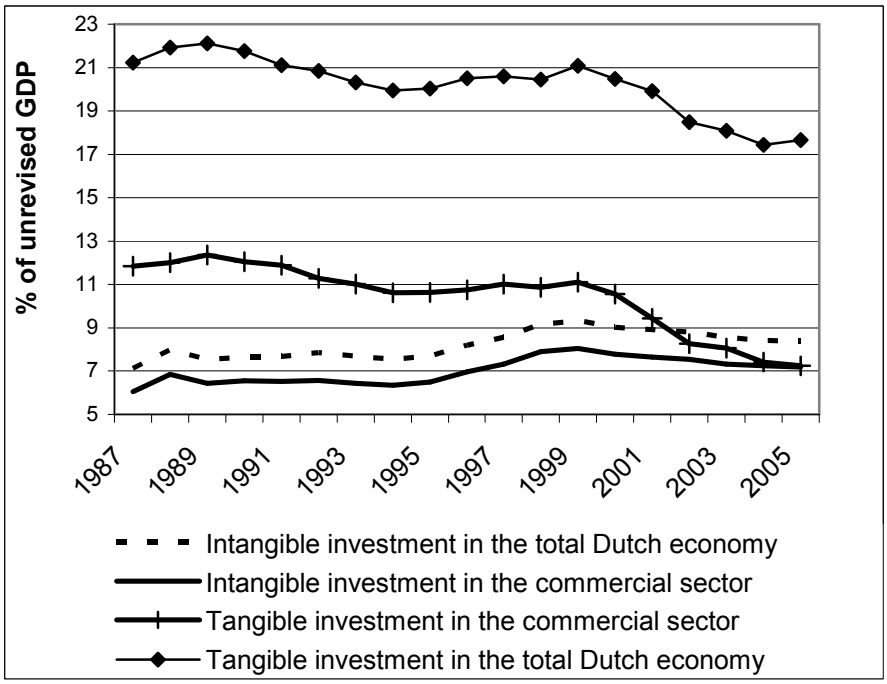
The official Dutch growth accounts provide our baseline figures, in which the 'new intangibles' are not capitalized.[26] The Dutch growth accounts provide both value added-based and output-based growth accounting results. However, as in the present paper, the focus is on output-based growth accounting. As already stated an exogenous ex-post interest rate is used. As a consequence, output does not match inputs. A new balancing item is therefore introduced: clear profits.

[26] Baseline figures differ slightly from the official Dutch growth accounts because data on R&D expenditure and purchased firm specific human capital differ form official national accounts data.

The Dutch growth accounts are based on consolidated output. For the purpose of consolidation, symmetric input-output tables by commodity are used. For the estimation of the labour income of self-employed, it is assumed that self-employed earn the same yearly wage as employees in the same industry. The methods behind the Dutch growth accounts are described in detail in van den Bergen et al. (2007).

In order to include the 'new intangibles' as capital inputs in the growth accounts, adjustments of output, intermediate consumption, investments and user cost of capital are necessary (see section 2.2 for an explanation of the adjustments made). After these adjustments are made, the new intangibles are incorporated in the Dutch growth accounting model and treated just as any other fixed asset, resulting in a new set of growth accounts.

Figure 1, Tangible versus intangible investment.



4. Summary of findings

Table A2 shows our estimates of intangibles investment by asset type for the total Dutch economy at four benchmark years. In 2005 intangible investments totalled 43.1 billion euro, amounting to 8.4 per cent of (unrevised) GDP at market prices. Although this was only 7.1 per cent in 1987, it was higher in the late nineties, with a peak of 9.3 per cent in 1999. As shown in Figure 1, a similar trend is visible for the Dutch commercial sector which comprises the total economy excluding the industries general government, real estate activities, renting of movables and private households with employed persons.[27] For the

[27] Some of the activities (real estate activities, renting of movables and private households with employed persons) excluded form the commercial sector should in principle be (partially) included.

commercial sector intangible investment also peaked in 1999, when it amounted to 8.1 per cent of (unrevised) GDP.

However, the decline at the beginning of the century, when the Dutch economy slowed down, is much steeper for the tangible investment share as compared to the intangible investment share. As shown in Figure 2, intangible investment as a percentage of tangible investment increases from 51 per cent in 1987 to 99 per cent in 2005 in the commercial sector.[28]

Figure 2 Intangible as a percentage of tangible investment

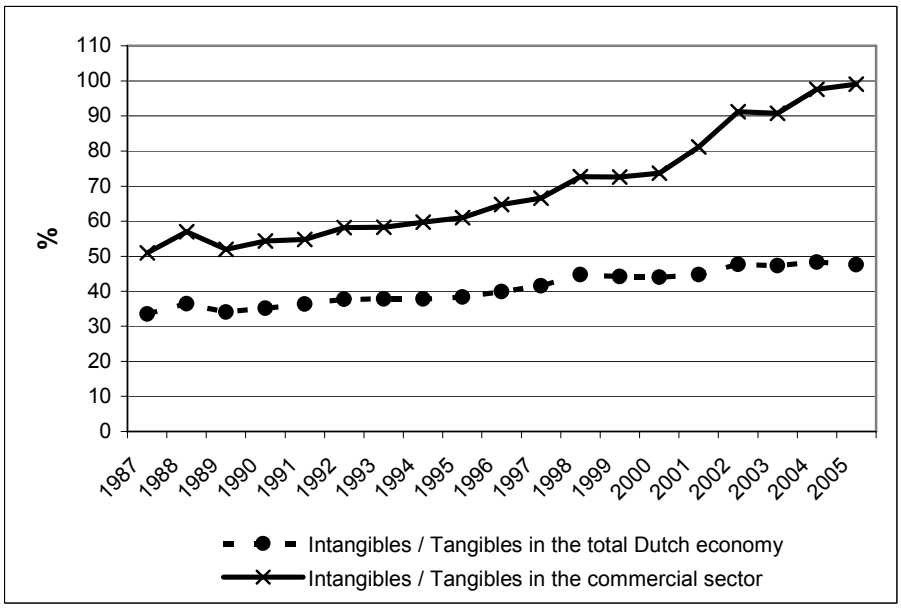


Figure 3 shows, for the commercial sector, total investment figures computed according to current conventions together with revised total investment figures, both as a percentage of unrevised GDP.[29] The capitalization of intangibles increases the level of GDP as well as

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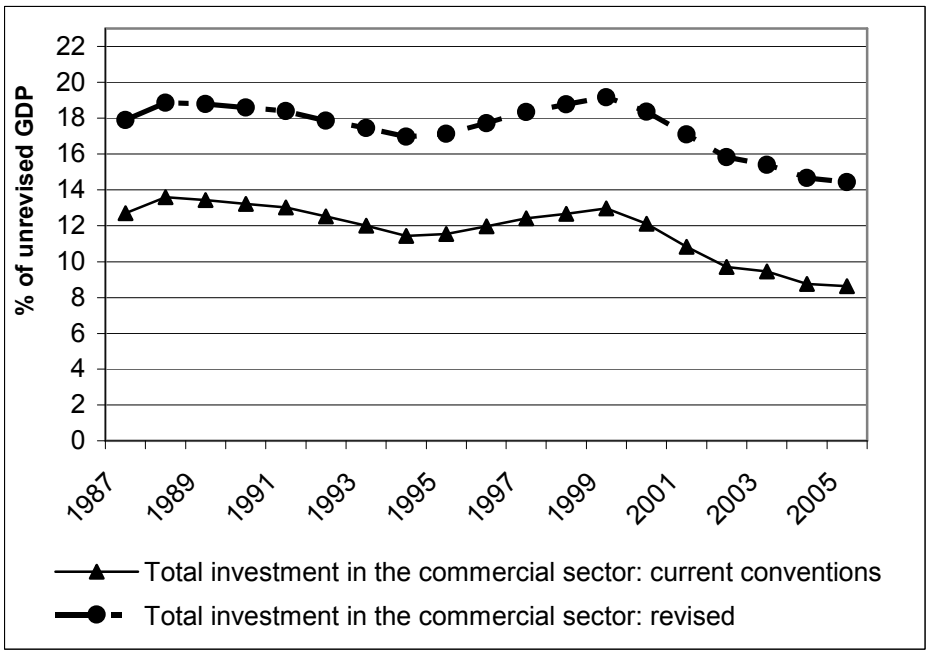
However, for various reasons, mostly related to the absence of independent output measures, we are not able to estimate or interpret multi-factor productivity growth for these activities. We have excluded these activities in order to enable reliable estimates of the effect on multi-factor productivity for the commercial sector.

[28] For the total Dutch economy, this percentage is much lower. This is caused by large investments in dwellings and public infrastructure. Together, these assets represent over 40 percent of tangible assets.

[29] Since our growth accounts are calculated (for 1995-2005) for the commercial sector and not for the total Dutch economy, only revised value added for the commercial sector (from 1995-2005) and not revised GDP has been calculated for the purpose of the present paper. However, data on (intangible) investment as a percentage of unrevised GDP will not be very different from (intangible) investment as a percentage of revised GDP because revised GDP will be about 6 or 7 percent higher than unrevised GDP for all years. Therefore, trends will remain fairly similar, only levels will be a bit lower.

value added of the commercial sector. It should be kept in mind though, that several of the items outlined in table A2 are already counted as investments by existing national accounting practice (computerized information, mineral exploration and evaluation and copyright and license costs). In 2005, the increase in intangible investments was therefore 29.7 billion euro for the commercial sector (and not the 36.9 billion euro total intangible investment shown in Table A4). Nominal commercial sector value added computed according to current conventions amounted to 92 per cent of our revised estimates in 2005 (the US ratio in 2000-2003 was 0.89; CHS, 2006 and for Finland the ratio was 0.89 in 2005, Jalava et al., 2007).

Figure 3 total investments according to current conventions and revised



CHS' results for the US are on a higher level than the Dutch ones. Their unrevised GDP to total non-farm business intangible investments ratio was 11.7 per cent in 1998-2000. Their intangible to tangible investments ratio was 1.2 in the same period (CHS, 2006). MH found these figures to be 10.1 per cent and 1.1 for the UK in 2004 (MH, 2006). For Canada, Belhocine reported average intangible investment to be 9.6 per cent of GDP for the period 1998 to 2004 (Belhocine, 2008). Estimates for Finland are somewhat closer to those for the Netherlands. Jalava et al. (2007) estimated business intangible investment to be 9.1 per cent of unrevised GDP in 2005 and 8.4 per cent in 2000 (compared to 7.2 and 7.8 per cent for the Dutch commercial sector in 2005 and 2000 respectively). However their intangible to tangible investments ratio was higher, 1.0 in 2000 and 1.2 in 2005. Xiaohui Hao et al. estimated that the market sectors of France and Germany respectively invested 8.2 per cent and 6.9 per cent of GDP in intangible assets in 2004 (Xiaohui Hao et al., 2008). Finally, Fukao et al. found that in Japan the intangible investments to GDP ratio was 8.3 per cent in 2000-2002. As for now, it seems that the differences between the Netherlands on the one hand and the US, UK, Canada, Finland, France, Germany and Japan on the other cannot unambiguously be ascribed to true differences though. They may also be the result of remaining differences in measurement of investment data-series and demarcation of the

(non-farm) business sector (in this paper the commercial sector). It is clear however that all these studies of intangibles find that countries invested substantially in intangibles.

With regard to type of intangible investment, as in most of the similar studies, economic competencies are clearly dominant. In 2005, investment in economic competencies comprised 64 percent of total investments in intangibles in the commercial sector, compared to 19 and 17 per cent respectively for innovative property and computerized information. Results by industry (tables A3-A5)[30] however, show that the importance of the different types of intangibles varies among industries. An advantage of the strong national accounts-based approach to obtaining intangible investment estimates is the relative ease by which the estimates can be disaggregated to industry level. In table A3 and A4 intangible investment estimates are shown by industry and main type of intangible for the whole economy and the commercial sector respectively. In table A5, intangible investment estimates by industry are shown as a percentage of value added and tangible investment. The results shown in tables A3 to A5 clearly demonstrate the dominance of the industries manufacturing, and financial and business activities with regard to investment in intangibles. For the industries trade, hotels, restaurants and repair, and transport, storage and communication intangible investment, is also relatively important. However in the latter industry it is mainly the share in value added that is high. Intangible investment as a percentage of tangible investment is relatively low in this industry. Interestingly, in manufacturing innovative property is the dominant type of intangible while in all other industries[31] economic competencies are by far the most important type of intangible.

The negative average volume changes in the period 2001-2005 in Tables A3 and A4 confirm the finding that intangible investment has been declining since the late nineties, as shown in figure 1. However, this decline is not equally distributed over industries. Care and other service activities, and agriculture, forestry and fishing, and mining and quarrying, and trade, hotels, restaurants and repair all show a positive average volume change of total intangible investment in this period.

Tables A6 and A7 show intangible net capital stock estimates by industry for the Dutch economy as a whole and for the commercial sector respectively. As is clear from the bottom line of these tables, the ratio of intangibles and tangibles is much smaller when comparing net capital stocks than when comparing investments. The reason for this is the fact that intangibles generally have much shorter service lives than tangibles. The industries financial and business activities and mining and quarrying however do have a relatively high share of intangible net capital stock. Their intangible as a percentage of tangible net capital stock is 64 and 78 percent respectively. The intangible as a percentage of tangible net capital stock in the manufacturing industry is only 28 per cent (2005, commercial sector, data not shown).

[30] Results in Table A5 are shown as a percentage of unrevised value added for the sake of consistency. However, results as a percentage of revised value added are very similar and do not change the conclusions.

[31] Except for the industry mining and quarrying where the investments in mineral exploration and evaluation of course dominate and therefore innovative property is the most important type.

4.1 Growth accounting results

Given that our investment time-series start in 1987, the growth accounting results are considered reliable from 1995 onwards. The growth accounting results presented here are therefore confined to the period 1996-2005.

Table A8 shows contributions to consolidated output growth both following current conventions (excluding the new intangibles from capital) and including the new intangibles as capital. As mentioned in section 2.2, treating the new intangibles as capital input changes output. In the period 1996-2000, consolidated output growth increases by including the new intangibles. In the period 2001-2005, consolidated output growth decreases when the new intangibles are included as capital. This is caused by decreasing own-account investments in intangibles in this period.

In addition, the contributions of labour, tangible capital and intermediate consumption to consolidated output growth decrease when the new the intangibles are capitalized. For intermediate consumption, the main reason for this is that purchases of intangibles are no longer treated as intermediate consumption. For labour and tangible capital, the decrease is caused by a decreasing share of labour and tangible capital in total cost. Capitalizing intangibles causes an increase in total cost. Therefore the labour and tangible capital share in total cost decreases, causing a smaller contribution of labour and tangible capital to consolidated output growth.

In the period 1996-2000, intangibles contribute on average 0.5 percentage points per year to consolidated output growth. This is about 80 percent of the contribution of tangibles. In the period 2001-2005, the contribution of intangibles decreases to 0.15 percentage points per year. This is however still 76 percent of the contribution of tangibles. The contribution of innovative property is quite small, in the period 2001-2005 it is even virtually absent. The intangible type economic competencies has the largest contributions to consolidated output growth. In the period 2001-2005 however, it is mainly the subtype organizational structure that contributes to consolidated output growth.

Surprisingly, for the period 1996-2000, capitalizing intangibles does not decrease multi-factor productivity growth. This is contrary to results from for example CHS in the US (2006) and Jalava et al. (2007) in Finland. In the period 2001-2005, capitalizing intangibles results in a lower multi-factor productivity growth. After capitalizing intangibles, the multi-factor productivity growth rate is slightly higher in 1996-2000 than in 2001-2005. Before capitalizing intangibles, it was lower.

Tables A9a and A9b show the growth accounts by industry for the periods 1996-2000 and 2001-2005. As is clear from these tables, large differences between industries exist. The contribution of intangibles is the largest in the industry financial and business activities, 1.2 percentage points per year in 1996-2000. In this period its contribution is 50 percent higher than the contribution by tangible capital. This shows that in this period intangibles were a more important driver of output growth than tangibles in the industry financial and business activities. In the period 2001-2005, the contribution of intangibles to output growth in this industry decreases to 0.2 percentage points per year. Its contribution is however still as large as the contribution of tangible capital.

Although intangible investments in the manufacturing industry are almost 14 percent of value added (2005), intangibles' contribution to consolidated output growth is very small. Apparently, most intangible investments in manufacturing comprise replacements of older intangibles.

In summary, it is evident that in the Netherlands too, intangibles have an important contribution to output growth. Their importance however, varies across industries.

5. Conclusions and future work

Following CHS, this paper explores, compared to the (revised) SNA asset boundary, a broader range of intangible investment in the Netherlands, both conceptually and a quantitatively. The paper elaborates on previous work in which benchmark estimates of the investments in intangibles are presented (van Rooijen-Horsten et al., 2008). In this study investment estimates have been improved where possible, the investment time series extended to the period 1987-2005, the intangibles capitalized and their contribution to economic growth by industry examined.

We first explored if and under what conditions the intangibles identified by CHS satisfy the asset definition in the 1993 SNA Rev.1. We conclude that generally all types of intangibles identified by CHS could qualify. However, parts of the expenditures on some types of intangibles do not meet all requirements and should therefore be excluded from capitalization. In this respect the intangible category firm specific human capital is a special case. In this paper it is concluded that it seems very difficult to assign the ownership of this piece of human capital to the employer when the newly educated employee is freely able to provide her labour services to others. In addition, it seems hard to understand why company training should add to human capital while non-company education is left untouched in terms of (human) capital measurement. However for the sake of comparability with similar country studies referred to in this paper we included all firm-specific human capital as an asset in this paper.

According to our estimates intangible investment in the Dutch commercial sector totals 36.9 billion euro in 2005, amounting to 7.2 per cent of (unrevised) GDP. Although this was only 6.0 per cent in 1987, it increased in the late nineties, with a peak of 8.1 per cent in 1999. Intangible investment as a percentage of tangible investment increases from 51 per cent in 1987 to 99 per cent in 2005 in the commercial sector. In general these figures are lower than those reported for other countries. However, we conclude that as for now, these differences cannot unambiguously be ascribed to purely economic differences. They may also be the result of remaining differences in measurement of investment data-series and demarcation of the (nonfarm) business sector (in this paper the commercial sector). It is clear however that all the studies of intangibles confirm that countries invest substantial amounts of money in intangibles. Furthermore, it is striking that investments in intangibles in the Netherlands are declining since the beginning of the century.

Surprisingly, for the period 1996-2000, capitalizing intangibles does not decrease multi-factor productivity growth. This is contrary to results from for example CHS for the US (2006) and Jalava et al. (2007) for Finland. In the period 2001-2005, capitalizing intangibles did decrease multi-factor productivity growth by 0.18 percentage points. Furthermore, when capitalizing intangibles, the multi-factor productivity growth rate is higher in 1996-2000 than in 2001-2005. Without capitalizing intangibles, the reverse pattern emerges.

Unlike most of the similar studies, detailed data on national accounts and business surveys were used in our study. The use of this detailed data has at least two advantages. First, the estimates presented in this study do not solely rely on turnover data from the main

intangibles producing industries. Second, national accounts data allow us to directly estimate purchases of intangibles by industry whereas estimates based on industry output require additional assumptions about the actual investors. The estimates presented here include investment at the industry-level. From our results it is evident that intangible capital is not evenly distributed over industries. Large differences between industries are found with regard to intangible investment, intangible capital stock as well as intangible capital's contribution to consolidated output growth.

The industry financial and business activities is clearly dominant with regard to intangible capital. This industry has the highest intangible to tangible investment ratio (246 per cent in 2005), the second highest intangible to tangible net capital stock ratio (64 per cent in 2005) and the highest contribution of intangibles to consolidated output growth of all industries (1.2 per cent in 1996-2000).

In summary, it is evident that in the Netherlands too, intangibles have an important contribution to output growth. Their importance however, varies across industries. Although our results should be regarded as tentative and exploratory, it is clear that this method has merit. In particular when national accounts are supported by satellite accounts on knowledge and innovation, this is the best way to obtain consistent estimates of intangibles. In future work we aim to further improve our estimates. As mentioned, our goal is to include a decomposition of labour into age, gender and educational level. Furthermore the estimates of investment in organizational structure (on own account), architectural and engineering designs (on own account), firm specific human capital and new product development costs in the financial industry need further research. The former two because no broad statistical information is available and the latter two because it seems that the available data result in underestimations. New statistical information is necessary in order to really improve our current estimates of investments in these intangibles. The Dutch innovation survey could play an important role in providing the necessary information if it were changed to include quantitative information with regard to changes in organizational structure and the development and implementation of new products, product packing and production processes.

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Annex

Table A1 Overall classification and methods intangibles

	Type of intangible investment	2005 data sources	Time series	Investment billion euro, 2005	% of total intangible investment, 2005	Deflator	Service life
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Computerized information						
(1)	**Computer software**	National accounts	National accounts	7.0	16.3	The purchased pre-packaged software deflator is calculated with the help of BEA (Bureau of Economic Analyses) and BLS (Bureau of Labor Statistics) data. No correction is made for exchange rates. For the own-account software deflator the labor costs index of automation personnel is used. The purchased custom-made software deflator is calculated as a weighted average of the two deflators mentioned above.	3 years
(2)	**Computerized databases**	National accounts (included in computer software estimates)	National accounts (included in computer software estimates)	--	--	National accounts (included in computer software estimates)	3 years
(3)	**Total**			**7.0**	**16.3**		
	Innovative property						
(4)	**(Scientific) R&D**	Current expenditure on R&D, based on R&D survey but translated to R&D use according to national accounting conventions. Estimations of R&D capital expenditure exclude government consumption of R&D and market-R&D use in the R&D- and universities industry.	Estimated time-series of supply-side are used in order to arrive at the R&D-use and R&D-investment time-series. R&D-use series from 1999-2005 are used in order to estimate the structure of R&D-use over the different industries in the period 1970-1998.	5.1	11.8	Weighted average of the price changes of the production costs of R&D (input-prices).	12 years. In the chemical and electrotechnical industry 15 respectively 9 years are used.
(5)	**Mineral exploration**	National accounts	National accounts	0.1	0.3		40 years
	Other innovative property			4.0	9.2		
(6)	Copyright and license costs	National accounts	National accounts	0.8	1.9		5-10 years
(7)	New product development costs in the financial industry	Assumed to be included in R&D figures based on R&D survey (see above).		0.1	0.1		12 years
(8)	New architectural and engineering designs	Based on national accounts data series concerning the intermediate input of these designs in the production of capital goods. Investments are 2/3th of this value.	National accounts	3.1	7.3	National accounts deflators of architectural and engineering designs. These are based on PPI's.	8 years
(9)	R&D in social sciences and humanities	Included in R&D figures based on R&D survey (see above).	Included in R&D figures based on R&D survey (see above).	--	--	Included in R&D figures based on R&D survey (see above).	12 years
(10)	**Total**			**9.3**	**21.5**		
	Economic competencies						
	Brand equity			11.9	27.6		
(11)	Advertising expenditure	Expenditure, according to national accounts, on marketing and advertisement, excluding spending by advertising agencies. Further exclusions, based on industry and type of advertisement, to arrive at estimates of capital spending.	Prior to 1995, it is assumed that the ratio between the different types of advertisement in journals and papers remains constant, as well as the ratio of the spending that has to be excluded.	10.6	24.5	Weighted average of the national accounts deflators for each type of marketing and advertisement. These are based on PPI's.	2 years
(12)	Market research	Based on national accounts data series concerning total production and purchases of economic advice as well as more detailed (micro-) data.	Prior to 1995, it is assumed that the ratio between the purchase of economic advice and purchased market research is constant.	1.3	3.1	National accounts deflators of economic advice. These are based on PPI's.	2 years
(13)	**Firm specific human capital**	Based on the Continuing Vocational Training Survey (CVTS) 1993,1999 and 2005.	Extrapolated to 1970-2005 using estimated volume indicators in combination with input-based price indices. Missing industries are based on other surveys and annual reports.	5.9	13.7	Price-indices of the different cost components (input-prices).	7-13 years. Exact life length per industry is given in table 1 in paragraph 3.2.1.
	Organizational Structure			9.0	21.0		
(14)	Purchased	Based on national accounts data series concerning total production and purchases of economic advice as well as more detailed (micro-) data.	Prior to 1995, it is assumed that the ratio between the purchase of economic advice and purchased organisational structures is constant.	6.8	15.8	National accounts deflators of economic advice. These are based on PPI's.	5 years
(15)	Own-account	No broad statistical information. Estimated as 20% of value of executive time using labour force data on wages in managerial occupations. Wages are based on German data on the difference between average earnings in management occupations (ISCO 1) and average earnings for total of occupations.	The development of total employees from the national accounts are used in order to get the desired 1987-2006 time-series.	2.2	5.1	Changes in gross wages for the total of industries from the national accounts.	5 years
(16)	**Total**			**26.8**	**62.3**		
(17)	**Grand total**			**43.1**	**100.0**		

1) In the current paper the category 'Scientific R&D' is renamed 'R&D' because in principle, the Dutch R&D survey data capture not only scientific R&D but also R&D in the financial services industries as well as R&D in social sciences and humanities.

Table A2 Intangibles: Total investments in the Netherlands

Type of asset	Investment in intangibles				Investment in intangibles			
	1987	1995	2000	2005	1987	1995	2000	2005
	billion euro				*% of GDP* [1]			
1. Computerized information	**1.4**	**2.3**	**6.1**	**7.0**	**0.7**	**0.7**	**1.5**	**1.4**
a) Software and databases: purchased	1.1	1.7	4.2	4.9	0.5	0.6	1.0	1.0
b) Software and databases: own account	0.4	0.6	1.9	2.1	0.2	0.2	0.5	0.4
2. Innovative property	**4.7**	**6.0**	**8.2**	**9.3**	**2.2**	**2.0**	**2.0**	**1.8**
a) R&D [2]	2.6	3.3	4.3	5.1	1.3	1.1	1.0	1.0
R&D in the financial industry	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
b) Mineral exploration and evaluation	0.4	0.2	0.2	0.1	0.2	0.1	0.0	0.0
c) Other innovative property	1.6	2.5	3.7	4.0	0.8	0.8	0.9	0.8
Copyright and license costs	0.3	0.5	0.8	0.8	0.1	0.2	0.2	0.2
new architectural and engineering designs	1.4	2.0	2.8	3.1	0.7	0.6	0.7	0.6
3. Economic competencies	**8.8**	**15.2**	**23.4**	**26.8**	**4.2**	**5.0**	**5.6**	**5.2**
a) Brand equity	4.3	7.2	10.8	11.9	2.0	2.4	2.6	2.3
Advertising expenditure	4.0	6.7	9.7	10.6	1.9	2.2	2.3	2.1
Market research	0.3	0.5	1.1	1.3	0.1	0.2	0.3	0.3
b) Firm-specific human capital	2.1	4.2	5.2	5.9	1.0	1.4	1.2	1.2
Direct firm expenses	0.9	1.7	2.3	2.6	0.4	0.6	0.6	0.5
Wage and salary costs of employee time	1.3	2.5	2.9	3.4	0.6	0.8	0.7	0.7
c) Organizational structure	2.4	3.9	7.4	9.0	1.1	1.3	1.8	1.8
Purchased	1.5	2.6	5.5	6.8	0.7	0.9	1.3	1.3
Own account	0.9	1.3	1.9	2.2	0.4	0.4	0.5	0.4
Total investment in intangibles	**14.9**	**23.5**	**37.7**	**43.1**	**7.1**	**7.7**	**9.0**	**8.4**

1) Unrevised GDP at market prices

2) Including social sciences and humanities

Table A3 Intangibles in the Netherlands: Investments by industry

	Computerized information			Innovative property			Economic competencies			Total intangible investment		
Industry	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**
		average			*average*			*average*			*average*	
	billion euro	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*	
Agriculture, forestry and fishing	0.0	41.7	-0.5	0.2	4.0	5.0	0.4	6.4	-0.1	0.7	7.1	1.4
Mining and quarrying	0.1	26.4	0.7	0.3	-3.5	1.0	0.1	6.0	0.5	0.4	0.6	0.9
Manufacturing	1.3	12.3	0.7	4.3	2.8	-0.3	3.6	1.2	-2.5	9.2	3.1	-1.1
Electricity, gas and water supply	0.1	9.3	0.6	0.1	-6.2	-11.7	0.2	3.2	2.4	0.3	1.0	-1.9
Construction	0.1	21.9	0.1	0.1	-1.2	10.6	0.8	9.4	-2.0	1.0	9.9	-1.0
Trade, hotels, restaurants and repair	0.6	15.1	0.9	0.3	2.5	0.4	5.8	6.9	0.0	6.7	7.3	0.1
Transport, storage and communication	0.9	31.2	0.4	0.3	10.4	-2.8	1.9	10.3	-0.7	3.0	14.4	-0.6
Financial and business activities	2.9	26.5	0.8	2.5	7.4	-2.2	9.6	9.7	-1.0	15.0	11.5	-0.9
General Government	0.8	17.7	2.6	0.7	4.9	-0.3	2.6	-0.1	-1.3	4.1	3.1	-0.4
Care and other service activities	0.3	21.1	3.0	0.5	-0.4	6.4	1.8	3.0	2.8	2.6	3.9	3.4
Total economy	7.0	20.8	1.0	9.3	3.8	-0.5	26.8	6.0	-0.8	43.1	7.3	-0.4
Percent of tangible investment	**8%**			**10%**			**30%**			**48%**		
Percent of (unrevised) GDP	**1.4%**			**1.8%**			**5.2%**			**8.4%**		

Table A4 Intangibles in the Dutch commercial sector: Investments by industry

	Computerized information			Innovative property			Economic competencies			Total intangible investment		
Industry	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**
		average			*average*			*average*			*average*	
	billion euro	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*	
Agriculture, forestry and fishing	0.0	41.7	-0.5	0.2	4.0	5.0	0.4	6.4	-0.1	0.7	7.1	1.4
Mining and quarrying	0.1	26.4	0.7	0.3	-3.5	1.0	0.1	6.0	0.5	0.4	0.6	0.9
Manufacturing	1.3	12.3	0.7	4.3	2.8	-0.3	3.6	1.2	-2.5	9.2	3.1	-1.1
Electricity, gas and water supply	0.1	9.3	0.6	0.1	-6.2	-11.7	0.2	3.2	2.4	0.3	1.0	-1.9
Construction	0.1	21.9	0.1	0.1	-1.2	10.6	0.8	9.4	-2.0	1.0	9.9	-1.0
Trade, hotels, restaurants and repair	0.6	15.1	0.9	0.3	2.5	0.4	5.8	6.9	0.0	6.7	7.3	0.1
Transport, storage and communication	0.9	31.2	0.4	0.3	10.4	-2.8	1.9	10.3	-0.7	3.0	14.4	-0.6
Financial and business activities [1]	2.8	26.8	0.8	1.1	10.0	-6.2	9.0	9.9	-1.0	12.9	12.5	-1.2
General Government												
Care and other service activities [2]	0.3	21.1	3.0	0.5	-0.4	6.4	1.8	3.0	2.8	2.6	3.9	3.4
Commercial sector [3]	6.2	21.2	0.8	7.1	3.6	-0.9	23.6	6.8	-0.7	36.9	7.9	-0.5
Percent of tangible investment	**17%**			**19%**			**63%**			**99%**		
Percent of (unrevised) GDP	**1.2%**			**1.4%**			**4.6%**			**7.2%**		

1) Excluding real estate activities and renting of movables
2) Excluding private households with employed persons.
3) Comprises the total economy excluding general government, real estate activities, renting of movables and private households with employed persons.

Table A5 Intangibles in the Dutch commercial sector: Investments by industry, 2005

Industry	Percentage of (unrevised) Value Added				Percentage of Tangible Investments			
	Computerized Information	Innovative Property	Economic Competencies	Total	Computerized Information	Innovative Property	Economic Competencies	Total
Agriculture, forestry and fishing	0.4	2.3	4.1	6.9	1.4	7.3	13.1	21.9
Mining and quarrying	0.7	2.4	0.5	3.6	7.6	27.2	5.6	40.4
Manufacturing	1.9	6.5	5.5	13.9	20.3	67.6	57.4	145.2
Electricity, gas and water supply	1.3	0.7	1.9	4.0	7.9	4.5	11.6	24.1
Construction	0.5	0.3	3.4	4.2	9.2	6.8	66.9	82.9
Trade, hotels, restaurants and repair	0.9	0.5	8.5	9.9	11.2	5.7	105.1	122.0
Transport, storage and communication	2.7	0.8	5.7	9.1	12.6	3.6	26.7	42.9
Financial and business activities [1)]	3.1	1.2	10.3	14.7	52.6	20.5	172.5	245.6
General Government								
Care and other service activities [2)]	0.5	0.8	3.3	4.7	4.6	7.1	28.6	40.3
Commercial sector [3)]	1.7	1.9	6.5	10.1	16.6	19.0	63.5	99.1

1) Excluding real estate activities and renting of movables
2) Excluding private households with employed persons.
3) Comprises the total economy excluding general government, real estate activities, renting of movables and private households with employed persons.

Table A6 Intangibles in the Netherlands: Net capital stock by industry

	Computerized information			Innovative property			Economic competencies			Intangible net capital stock		
Industry	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**
		average			*average*			*average*			*average*	
	billion euro	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*	
Agriculture, forestry and fishing	0.1	38.4	-1.2	0.9	1.7	4.3	1.0	4.6	1.9	1.9	4.0	2.8
Mining and quarrying	0.1	24.4	0.6	13.2	3.8	1.2	0.2	2.6	1.5	13.6	4.0	1.2
Manufacturing	2.2	13.3	0.9	24.1	2.1	1.3	8.2	2.9	-0.8	34.6	2.9	0.8
Electricity, gas and water supply	0.2	7.7	0.6	0.5	0.0	-5.3	0.4	4.2	0.5	1.1	2.4	-2.3
Construction	0.2	22.6	0.7	0.4	2.4	3.3	2.1	8.6	0.8	2.7	8.6	1.1
Trade, hotels, restaurants and repair	1.1	14.4	2.2	1.6	2.4	0.6	8.7	6.9	1.0	11.3	6.7	1.0
Transport, storage and communication	1.6	29.9	3.1	1.0	7.6	0.3	4.4	6.4	1.6	7.0	9.6	1.7
Financial and business activities	5.0	24.6	2.5	12.1	9.7	-2.4	19.3	8.5	0.5	36.5	10.6	-0.3
General Government	1.4	15.9	1.5	3.0	1.2	2.8	12.9	0.7	-0.9	17.2	1.7	-0.1
Care and other service activities	0.5	18.8	4.6	1.4	1.7	4.1	5.1	4.6	3.6	7.0	4.7	3.7
Total economy	12.4	19.8	2.1	58.1	4.1	0.5	62.4	5.0	0.4	132.9	5.6	0.6
Percent of tangible capital stock	**1%**			**4%**			**4%**			**8%**		

Table A7 Intangibles in the Dutch commercial sector: Net capital stock by industry

	Computerized information			Innovative property			Economic competencies			Intangible net capital stock		
Industry	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**	**2005**	**96/00**	**01/05**
		average			*average*			*average*			*average*	
	billion euro	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*		*billion euro*	*% volume changes*	
Agriculture, forestry and fishing	0.1	38.4	-1.2	0.9	1.7	4.3	1.0	4.6	1.9	1.9	4.0	2.8
Mining and quarrying	0.1	24.4	0.6	13.2	3.8	1.2	0.2	2.6	1.5	13.6	4.0	1.2
Manufacturing	2.2	13.3	0.9	24.1	2.1	1.3	8.2	2.9	-0.8	34.6	2.9	0.8
Electricity, gas and water supply	0.2	7.7	0.6	0.5	0.0	-5.3	0.4	4.2	0.5	1.1	2.4	-2.3
Construction	0.2	22.6	0.7	0.4	2.4	3.3	2.1	8.6	0.8	2.7	8.6	1.1
Trade, hotels, restaurants and repair	1.1	14.4	2.2	1.6	2.4	0.6	8.7	6.9	1.0	11.3	6.7	1.0
Transport, storage and communication	1.6	29.9	3.1	1.0	7.6	0.3	4.4	6.4	1.6	7.0	9.6	1.7
Financial and business activities [1]	4.9	24.9	2.5	6.7	13.9	-5.5	18.0	8.7	0.3	29.5	12.1	-0.9
General Government												
Care and other service activities [2]	0.5	18.8	4.6	1.4	1.7	4.1	5.1	4.6	3.6	7.0	4.7	3.7
Commercial sector [3]	10.8	20.4	2.2	49.7	4.3	0.2	48.2	6.4	0.7	108.7	6.3	0.6
Percent of tangible capital stock	**2%**			**10%**			**9%**			**21%**		

1) Excluding real estate activities and renting of movables
2) Excluding private households with employed persons.
3) Comprises the total economy excluding general government, real estate activities, renting of movables and private households with employed persons.

Table A8 Contributions to consolidated output growth in the Dutch commercial sector

	Excluding new intangibles		Including new intangibles	
	1996/2000	2001/2005	1996/2000	2001/2005
	percent			
Consolidated output	4.75	1.24	4.82	1.12
	percentage point			
Labour	1.21	-0.19	1.15	-0.18
Capital	0.85	0.25	1.12	0.34
Tangible capital	0.65	0.20	0.62	0.19
Intangible capital	**0.20**	**0.05**	**0.50**	**0.15**
Computerized information	**0.16**	**0.06**	**0.15**	**0.06**
Innovative property	**0.04**	**-0.01**	**0.08**	**0.01**
a) R&D, including social sciences and humanities	-	-	0.02	0.02
b) Mineral exploration and evaluation	0.00	0.00	0.00	0.00
c) Other innovative property	0.04	-0.01	0.05	-0.01
Economic competencies	-	-	**0.28**	**0.08**
a) Brand equity	-	-	0.14	0.01
b) Firm-specific human capital	-	-	0.05	0.01
c) Organizational structure	-	-	0.09	0.07
Intermediate consumption	1.86	0.27	1.71	0.22
Multi-factor productivity	0.83	0.91	0.83	0.74

Table A9a Average contributions to consolidated output growth, 1996-2000

	Consolidated Output	Contribution labour	Contribution capital	Contribution tangibles	Contribution intangibles [4]	Contribution intermediate consumption	Contribution multi-factor productivity
	percent	*percentage point*					
Agriculture, forestry and fishing	1.5	0.8	0.2	0.1	0.1	0.7	-0.1
Mining and quarrying	0.0	-0.1	1.1	0.7	0.4	2.3	-3.4
Manufacturing	3.6	-0.1	0.4	0.2	0.1	2.4	0.9
Electricity, gas and water supply	1.5	-0.4	0.4	0.4	0.1	1.6	-0.1
Construction	4.1	1.1	0.4	0.3	0.1	2.8	-0.4
Trade, hotels, restaurants and repair	6.4	0.8	0.8	0.5	0.4	2.7	2.1
Transport, storage and communication	8.5	0.9	1.5	1.0	0.5	3.9	2.2
Financial and business activities [1]	7.3	2.9	2.0	0.8	1.2	2.7	-0.4
Care and other service activities [2]	3.0	1.2	0.7	0.5	0.2	1.6	-0.5
Commercial sector [3]	4.8	1.2	1.1	0.6	0.5	1.7	0.8

1) Excluding real estate activities and renting of movables
2) Excluding private households with employed persons.
3) Comprises the total economy excluding general government, real estate activities, renting of movables and private households with employed persons.
4) Including the intangibles already included in national accounts as well as the 'new' intangibles

Table A9b Average contributions to consolidated output growth, 2001-2005

	Consolidated Output	Contribution labour	Contribution capital	Contribution tangibles	Contribution intangibles [4]	Contribution intermediate consumption	Contribution multi-factor productivity
	percent	*percentage point*					
Agriculture, forestry and fishing	0.2	-0.6	0.2	0.1	0.1	-0.1	0.8
Mining and quarrying	1.0	-0.5	-0.5	-0.7	0.1	3.1	-1.1
Manufacturing	-0.2	-0.5	0.1	0.0	0.0	-0.3	0.6
Electricity, gas and water supply	2.9	-0.2	0.2	0.2	0.0	1.0	2.0
Construction	-1.1	-0.4	0.1	0.1	0.0	-0.5	-0.3
Trade, hotels, restaurants and repair	1.0	-0.3	0.3	0.2	0.1	0.1	0.9
Transport, storage and communication	2.3	-0.3	0.5	0.3	0.2	0.5	1.6
Financial and business activities [1]	0.9	-0.2	0.4	0.2	0.2	0.1	0.6
Care and other service activities [2]	2.6	1.7	0.4	0.3	0.1	0.9	-0.4
Commercial sector [3]	1.1	-0.2	0.3	0.2	0.1	0.2	0.7

1) Excluding real estate activities and renting of movables
2) Excluding private households with employed persons.
3) Comprises the total economy excluding general government, real estate activities, renting of movables and private households with employed persons.
4) Including the intangibles already included in national accounts as well as the 'new' intangibles