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The paper identifies flaws in the treatment of Intellectual Property as an intangible asset in the current national accounts international standards. It is proposed that the treatment should revert to that of the 1968 System of National Accounts (SNA), where payments for access to Intellectual Property were classified as property income (income transfers) and not as payment for services as in SNA 2008 and the European System of Accounts (ESA) 2010. This dramatic change in treatment has had unfortunate results, most visibly in the case of the revision to GDP estimates for Ireland. In 2016, the estimate for Ireland's 2015 annual GDP growth was revised upwards from 7.8% to 26.3%. This was caused mainly by a relocation of a large multinational's registration of Intellectual Property from mainland Europe. The associated access payments were treated as a set of new exports of services, with the subsequent large increase in the GDP level and growth measures of the Irish economy.

This paper sets out how the current standards lead to this widely criticised change and proposes a model which is consistent with the 1968 SNA treatment.

Keywords: system of national accounts, intellectual property, intangibles

JEL classification: E01, E22

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Abstract

The paper identifies flaws in the treatment of Intellectual Property as an intangible asset in the current national accounts international standards. It is proposed that the treatment should revert to that of the 1968 System of National Accounts (SNA), where payments for access to Intellectual Property were classified as property income (income transfers) and not as payment for services as in SNA 2008 and the European System of Accounts (ESA) 2010. This dramatic change in treatment has had unfortunate results, most visibly in the case of the revision to GDP estimates for Ireland. In 2016, the estimate for Ireland's 2015 annual GDP growth was revised upwards from 7.8% to 26.3%. This was caused mainly by a relocation of a large multinational's registration of Intellectual Property from mainland Europe. The associated access payments were treated as a set of new exports of services, with the subsequent large increase in the GDP level and growth measures of the Irish economy.

This paper sets out how the current standards lead to this widely criticised change, and proposes a model which is consistent with the 1968 SNA treatment.

Introduction

Intellectual Property (IP) is defined as a creation of the mind and the result of general knowledge-seeking and creative behaviour. IP does not suffer wear and tear. IP is non-rival in nature – it can be shared by many without diminution of the original.

The OECD 2010 Handbook on Deriving Capital Measures of Intellectual Property Products (para 1.2) states "*IPPs are not subject to wear and tear, or any other form of physical deterioration*".

The 1968 SNA followed these principles, treating IP as non-produced assets and payments for access to IP as property income. The SNA 2008 and ESA 2010 do not follow these principles, treating IP as products, and so showing payments for use of the IP as service payments.

The current accounting standards follow the model that original Intellectual Property is created through economic production, and suffers real degradation in the production of copies of the original. These copies are also produced goods, and can then be sold. A key feature of the model used in the SNA 2010 is that when the original IP owner issues licences to others to use copies, "*The payments made for the licence may be described in various ways, such as fees,*

commissions or royalties, but however they are described they are treated as payments for services rendered by the owner."

Creation of Intellectual Property

The SNA 2008 states that IP is created as a result of economic production, and the definition of production is (paragraph 6.24):

"*Economic production may be defined as an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital and goods & services to produce outputs of goods or services*."

So the definition of the creation of Intellectual Property (an idea) as discovered, invented or "thought up" by a person with no economic inputs, is at odds with the SNA 2008 treatment. As no economic production of the idea is involved, then no economic good can be said to be produced and so no corresponding fixed capital formation recognized as the counterpart to production.

A cause of the confusion as to whether ideas can be "produced" in SNA terms is the carrying out of development as well as research in the creation and refining of Intellectual Property. Research and Development are two processes which are fundamentally different in nature, but often treated as one indivisible act in the literature. After the idea behind an IP has first been conceived, there is usually a period of complex interaction between refining the original idea and development of an effective access device.

A simple example is that of a book. The author imagines a story and writes it down. The story is the idea; the first written draft is an access device to that story. Producing further access devices by printing books and selling them, allows readers to share in the story. But there may be several redrafts of the story through interaction with editors, critics, etc. before the final form of the story is finished. The fact that there is significant production in this development period gives rise to a misconception that it is the IP that is being produced during the development phase. But the economic production is the development of an access device to the IP, and examining the IP through this device will generate a refined version of the original idea, until both idea and access device reach a stage where the commercial benefits can be realized. The notion of access devices is partially reflected in the new classification of goods or services as "*Knowledge-capturing products*" (SNA 2010, paragraph 6.22). However, in the SNA these are described in terms of produced copies of the original "master script" as the original IP rather than produced access devices which enable sharing of the original idea.

Pure research is the invention of an idea which can be recognised as an Intellectual Property asset – for example, the invention of cardboard milk

bottles using an ingenious origami of folding plasticised card into a square container (Tetrapak™). The invention of the use of cardboard in a carton shape capable of holding liquids such as milk is the new idea – the intangible asset to be registered and protected through patents. Associated with using the new concept in practice is the carrying out of development. This development explores how the plasticised cardboard cartons reflecting the idea can be produced. These access devices enable the original idea to be refined, but are not themselves a copy of the idea. They are the means whereby the original idea can be shared.

Another example is the creation of a new intangible asset such as a stage play. The original idea is Intellectual Property, and payments for sharing in the idea should be treated as income transfers. After the first concept of the play is created, and then the first access device produced, a process of refinement and improvement takes place. Other writers may offer suggestions for revision to the first draft. Early rehearsals can generate changes, and such changes may continue after the play is presented before a live audience. The key point here is that such productive activities in improving the access devices (the written script, the live performance) can result in a better original IP, but the economic production of the access devices is not directly producing a better idea, it is enabling a creative refinement to the original idea.

In the subsequent analysis, the 2008 SNA model of the creation and use of IPs is taken to be as follows:

The performance of Research and Development (R&D) is gross fixed capital formation of intellectual property products (IPPs). The result of the R&D is an original asset—the IPP, and copies of this original can be made. The sale or licensed use of copies called knowledge capturing products generates receipts, which are payments for services.

The alternative model consistent with SNA 1968 treatment of IP

The performance of Research can result in Intellectual Property which is not "produced" in the SNA sense of the word, but rather a creation of the mind, and so invented or discovered.

The original IP can be elaborated and refined through the production of a succession of prototype access devices which allow the idea to be accessed, tested and improved. This process is the Development in the label Research and Development.

Payments for access to IP are royalties, licence fees, payments for copyright - property income.

The underlying reason why the payments for access to the IP should be classed as income transfers rather than service payments is that the idea is "non-produced", and so unchanged through "use". Shakespeare's "Hamlet" does not suffer wear and tear through performance – each performance enables access to an idea which in itself is unchanged by the performance of the play as described in Sakuma (2013).

The benefits available from the intellectual property are obtained through access devices. Hill (2014) suggests the term host instead of access device, which works for goods but is less appropriate when it is a service such as performance of a play which provides access to the idea of "Hamlet".

Access devices are produced goods and/or services, and can be produced by copying a master access device. This master could also be designated as a blueprint, or the original prototype.

An issue that highlights the difference between the models is how the widely accepted phenomenon that IP does not suffer wear and tear is treated. The absence of wear and tear means that there is no real change in Intellectual Property over time.

Depreciation of assets – general principles for all economic assets

Before we address the specific challenge of estimating depreciation for IP, it is useful to set out a general model for estimating depreciation in assets. This topic has been extensively explored in a landmark report by Hill (2001) on the relationships between capital stock, capital services and depreciation.

Discussion of the issue is complicated by the terminology used in the current international standards for national accounts.

Hill suggests that loss of value in capital assets is best described by the term depreciation.

It is unfortunate that the term "capital consumption" is used in the SNA as a general term for loss of value. Most readers (and dictionaries) view consumption a measurable quantity reduction. A more appropriate description of how assets lose value is as follows:

Depreciation is the general loss of value in an asset over time, reflecting

1. The quantity of capital services decreases through use (*consumption: wear and tear, following an age-efficiency function*).

2. The asset is older and so there are less expected future returns from use (*vintage*).

3. The price charged for the capital services reduces in an expected manner due to foreseen obsolescence (*following a time-price function*).

4. The price charged for the capital services changes due to unforeseen obsolescence – e.g. an unexpected new invention (electric cars) or market condition (Dirty fuels no longer acceptable) results in a holding loss. (In the case of an unexpected new benefit from an existing asset, holding gains can also occur.) (*Holding gains/losses*).

So in order to generate a measure of depreciation over time, we must hypothesise the following:

a. How does the quantity of capital service reduce as the asset gets older? (*age-efficiency*)

b. How does the expected price for this capital service change over time? (*time-price*)

c. How long will the asset provide useful services before retirement? (*service-life*)

d. Are there unexpected price changes in payments for use during the asset life and so a revaluation of the asset at a point in time is required (*holding gains/losses*), together with a new starting point for the model assumptions regarding points b. and c. above.

Depreciation of Intellectual Property

Using the above terminology, we can describe depreciation in Intellectual Property as follows

1. IP is not subject to wear and tear, it is not consumed in this sense. So there is no loss of value due to quantity reduction.

2. The price for sharing in the idea, through licence payments, will reduce over time

3. This reduction in price effectively determines the useful economic life of the intangible asset.

The 1968 SNA model recognises that there can be no capital service provided by the IP as there is no wear and tear, but there can be depreciation of the access device to the IP. The 2008 SNA treatment assumes that there is a measurable capital service provided through use of the IPP, reflecting the consumption of fixed capital. But this poses the question: If there is no wear and tear, how can there be a reduction in the quantity measure of the IPP, and how can there be a corresponding measure of real capital consumption?

The OECD Handbook on measuring IP as a capital asset (OECD 2010) does not provide guidance on how to estimate the real capital consumption of IP. Given the Handbook accepts there is no wear and tear or indeed any physical deterioration in IP over time, it is not at all clear what the efficiency-age profile represents. The Handbook states "*The age-efficiency function is usually unobservable*" – a remarkable observation given the key role that real IP capital services play in the Jorgenson and Schreyer (2013) model of productivity analysis. In the absence of degradation, two factors in the depreciation of value are identified: obsolescence – reflected in price, and the end of patent protection: enabling free access to the IP, and once again a pure (and presumably dramatic) price effect.

What are the practical implications of the difference between the two models?

Estimates of GDP

The SNA 1993 began reclassification of royalties to service payments for artistic creations, and this set of intangible assets was expanded to cover all IP in the SNA 2010. This has directly affected estimates of GDP. Multinationals can arrange their global operations so that IP patents are registered in low profit tax jurisdictions. The associated payments to the country holding the patents can be large and transitory. The very large upward revision to the annual 2015 GDP estimates for Ireland has caused doubt on the probity of the current national accounts and the international standards. An example is an article in The Economist (July 2016). This is part of the increasing vulnerability of national accounts to be downgraded as reliable official statistics, as set out by Lynch and Thage (2017).

Under the alternative model proposed in this paper, the payments are shown as property income (royalties, consistent with the 1968 SNA) and so affecting the Gross National Income, but not the Gross Domestic Product.

Productivity analysis

Under the SNA 2008 treatment, the benefits from IP are treated as providing a real flow of capital services as an endogenous input to the production function. This is consistent with the Jorgenson and Schreyer (2013) recognition of capital services from IP as part of the SNA accounting framework, and that IP (the outcome of R&D as intangible assets) provides nominal and real capital services to the production function. The possibility that IP causes technical change, consistent with Solow (1957) rather than a stream of ongoing capital services is not considered by Jorgenson/Schreyer (2013).

In the Solow approach, IP does not contribute capital services to a production function, but alters its form through technical change.

Example of the IP effect on production functions

Consider a cook with a recipe for tomato soup, with ingredients of tomatoes, water, salt and sugar. A hob and large pot are capital assets used to cook the soup. It is distributed by ladle through a street stall.

The cook explores how to improve the soup, and tries various possibilities such as adding basil, and chillies. This is successful with the customers, and the new recipe (the IP) is adopted and the new tomato soup is sold as “spicy tomato soup”.

The change to the production function is not the addition of capital services from the new recipe (how can the idea suffer real change?), but rather a change to the form of the production function, through recognising changes in the pattern of ingredients to make the soup.

Differences between 2008SNA and alternative model

Table 1. The Different Effects of the SNA 2008 Model and the Alternative Model for the Performance of R&D Creating Intellectual Property

Concept / measure	SNA 2008	Alternative (consistent with SNA 1968)
Intellectual Property	produced	Non-produced
Research	Capital formation	Asset creation and appearance
Development	Capital formation of IP	Capital formation of access device, refinement of IP
Payments for use/access	Payments for services	Royalties, property income
Role of IP in productivity	Provision of capital services	Technical change

IP and the tangible/intangible terminology

The tangibles/intangibles dichotomy is not an appropriate description of the underlying economic reality. In the current literature, intangibles are taken to be both the algorithms dictating software, and the software itself in the form of computer programs. But the software is different in nature from the IP: it is the access device that allows the underlying ideas to be put into practice. Software is analogous to a reference book holding technical guidance. The book is a tangible access device, in the same way that computer programs are stored on tangible forms of electronic media – Compact Disks, hard-drive memory, etc.

It is the unusually long life of IT products, and the dominating role that obsolescence plays in the reduction in value of these products, that enables IT software to be bundled together with the algorithm and treated as one asset having the same economic characteristics as Intellectual Property.

The measurement challenges.

Valuation of Intellectual Property where it is not made available on the market through licensing or outright sale is extremely difficult. Most IP is created and used in multinationals, without ever being sold on the market. The only time an

observable value of such IP is usually when a company is subject to a take-over bid, and the associated goodwill component of the value of the company is revealed.

Can statistical offices, as compilers of national accounts, carry out surveys on IP assets in the economy, obtaining estimates of the value of the IP by company? A significant barrier is that under Financial Reporting Standards (FRS), the relevant standard (IAS 38) requires companies to score all research and most development at cost in the company accounts.

A first estimate of the value of the IP may be made as the sum of costs for all the research and development, clinical trials, marketing, etc. undertaken to bring a new drug to the market, and including the costs of unsuccessful R&D in a project with the same general objective. This initial estimate can be revised as market performance and the observed monetary returns become available, giving a firmer basis for estimating asset value as the sum of future discounted economic benefits.

But these valuation methods presume that specific research projects can be distinguished, where the costs and profitability of each one will eventually be known. Even more difficult is the allocation of unsuccessful projects to successful ones, to ensure all the R&D costs are fully accounted for. Probably the closest to statistical observations would be variations in the market value of the medical firm caused by expectations on the performance of the new medicine, but again the market value will be influenced by other factors making allocation of the values to a specific medicine extremely difficult.

It follows that there are no easy ways to obtain a reliable market valuation of IP. The value of the IP is the net present value, determined by expected future receipts for access to the IP. In theory this value would be reflected in the market price for a similar asset (SNA, 2008 6.251). But the unique nature of IP (if it is not unique, then it must be the same as an existing IP asset, and so of no extra value) means that unlike produced tangible capital assets, there can be no similar assets with comparable basic prices.

According to 2008 SNA 10.99 "*the knowledge remains an asset as long as its use can create some form of monopoly profit for its owner. When it is no longer protected or becomes outdated by later developments, it ceases to be an asset*". As IP assets have no material existence there is no wear and tear, and no accidental damage, and therefore their service life is wholly determined by their becoming obsolescent – i.e. when the price for access to the IP becomes zero. IP can increase in value over certain periods of their life time, as the idea "catches on", rather than just showing a continuous decline. But as noted above, the lack

of identifiable units and specific prices reduces these valuation principles to an academic exercise.

Given the essential role that IP plays in driving economic growth, estimates of the value of IP are badly needed. One approach is to require companies to keep estimates of fair market value of their IP assets, and use the information to seed a model of the sum of future discounted revenues to give an estimate of the asset values. Such exercises are not part of the FRS standard, but are surely good business management to determine the future strategies of a company.

Annex

Excerpts from an article in “The Economist”, European print edition, July 2016

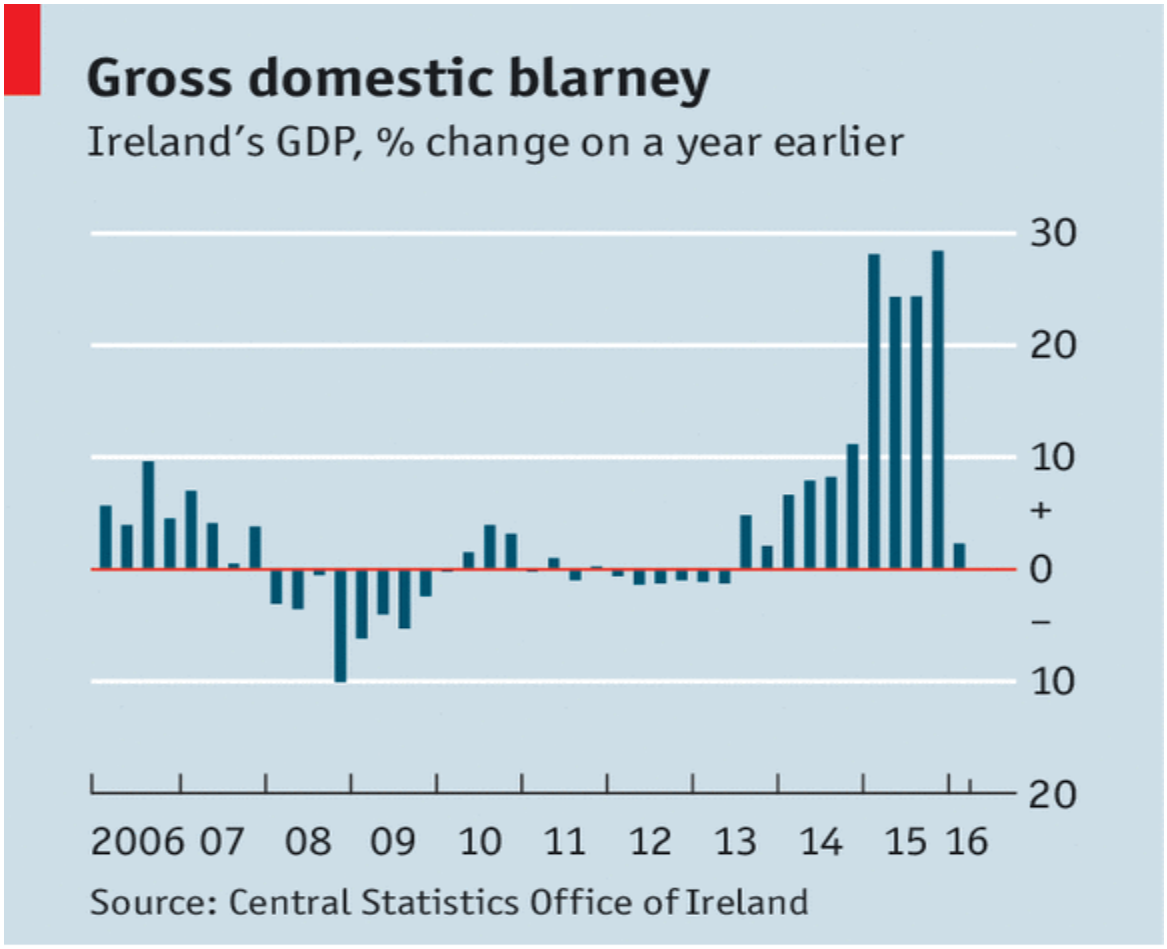
Not the full shilling

Why GDP growth of 26% a year is mad

Few economists take the revised figure seriously. “It’s complete bullshit,” says Colm McCarthy, an economist at University College Dublin. “It’s Alice in Wonderland economics.” But while the 26.3% figure may distort economic reality, it has real political consequences.

The CSO calculations are not flawed, [government statistician] Mr McCarthy says. The change stems from a Europe-wide shift in the way investment is treated in GDP statistics.

Fairy-tale GDP statistics will worsen their [*users*] scepticism. One can hardly expect voters to embrace sound economics when the statisticians seem to be living in virtual reality.



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