Open data is fact now- when does the reuse start?

This paper was developed by Marc de Vries and Georg Hittmair as a contribution to the joint Share- PSI 2.0 and LAPSI 2.0 workshop in Lisbon December 2014. As more and more European public sector bodies release their data in compliance to the PSI directive 2013/37/EC the question comes up how to motivate commercial re-users to use, process and sell these data to end-users.

The paper gives a short overview about the structure of the data value chain and then it addresses measures to increase the economic effects triggered by the re-use of PSI. Finally it shows that the estimates of the European Commission regarding the economic effects are based on reliable figures and further gains are achievable.

1 Introduction

In 2011 the European Commission launched it´s Open Data Strategy for Europe. It´s first goal is the realisation of the economic growth resulting from open government data. The EU wide 2008 total market for public sector information was estimated at €28 billion and the overall economic gains from further opening up public sector information at 40 billion. Total direct and indirect economic gains resulting from PSI re-use across the whole EU27 economy are assumed in the order of € 140 billion annually [1]

The further goals like increased transparency and acceleration of the scientific progress are mentioned in the strategy papers, but the key element is the realisation of the untapped economic potential within the European Union. Innovative new enterprises are meant to create thousands of new jobs and give the European economy a strong boost by using public sector data. To intensify re-use of public sector information both directives contain charging provisions that are relevant to the data providing public sector bodies. The marginal cost principle, which is a key element of the directive 2013/37/EC, is meant to lower the entry barriers for commercial re-users. According to the underlying considerations possible revenue losses for the relevant public sector bodies will be compensated by taxation and employment effects.

The new PSI Directive (2013/37/EC, updating the ‘old’ one from 2003 (2003/98/EC)) has to be transposed into national law in July 2015. Already many public sector bodies prepare their datasets for publication and many of them claim that the European SMEs are not that keen to produce new digital products out of these datasets. These SMEs, on the other hand claim the opposite, so apparently there seems to be a mismatch between the two. This triggers a set of questions:

- who are these commercial re-users?
- how do their business models work and?
- how to incubate the open data market to start the whole process?

If one reads studies and articles regarding the re-use of public sector information you come to the conclusion, that “the re-users” are an extremely heterogeneous group with diverse business models. To increase the re-use of public sector information and encourage the formation and development of new businesses it is necessary to analyse those business models within the data value chain.

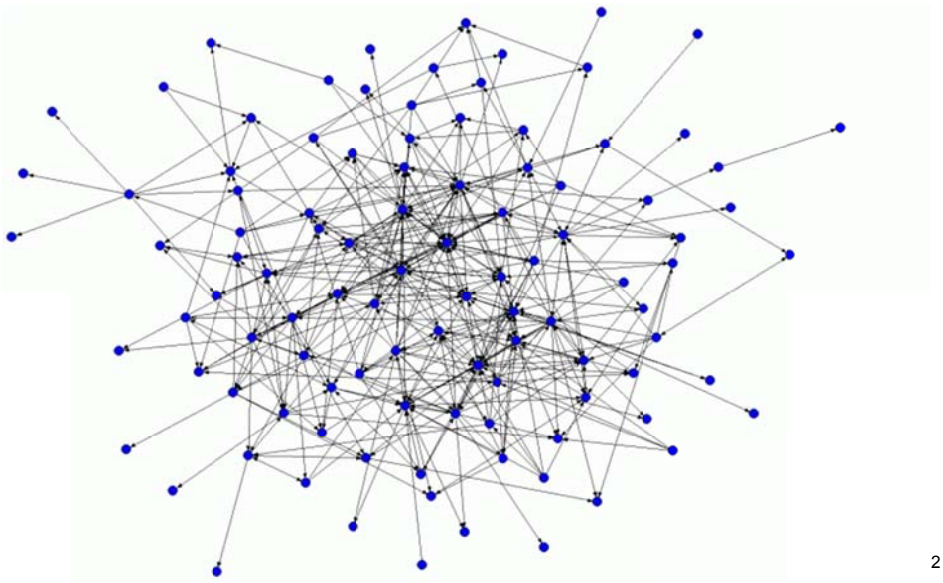
2 The data value chain and its elements

Both Directives aim to create added value by supporting SMEs to develop information products, on the basis of PSI. This value creation takes place within the “Open government data value chain” where every chain link is considered to be a beneficiary of the PSI policy. That includes both ends of the chain. So also the public sector body itself profits from transparency and availability of the data processed therein. The chain links in

[1] Digital Agenda: Commission's Open Data Strategy, European Commission, 2011

the middle of the data value chain are those who are supposed to create the economic boost. This common assumption of a linear chain leads to a misunderstanding when evaluating the PSI market.

Contrary to the linear approach, a well developed market for open public data looks more or less like a spider web. Different market players and end users use the data at every stage of development for different purposes and produce different results. Also the market players, who were meant to act at the ends of the chain can act in multiple roles (suppliers, intermediaries, end-users).



[2]

So let's take a closer look at the market characteristics and key functions of the participating players:

2.1 Market players und their functions

Players in the data value chain act in different functions. If one intends to incubate this market, their roles have to be distinguished, and the respective economic effects have to be considered.

Recently some attempts were made to identify the market participants. So Deloitte UK's research on the open data economy identified some archetypes of open data market players[3], a distinction that is also part of a World Bank report[4]. Also Enrico Ferro - Michele Osella described some archetypes when working on "Business models for PSI re-use"[5]. A "standard classification" does not exist, so the following list is not exhaustive and is meant to show key elements.

- **Suppliers**

Seen from the PSI perspective, suppliers are public sector bodies, opening their data to the public and allowing re-use. The open data definition includes also private sector data suppliers who open up their datasets in compliance with the open data framework. According to the new PSI directive suppliers should generate no profit from the data delivery as the marginal cost principle limits possible fees for re-use.

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[2] Zitationsnetzwerk der deutschen Humangeographieprofessoren, raumnachrichten.de, 2010, (as an example for a network)
[3] Open growth Stimulating demand for open data in the UK, Deloitte LLP, 2012
[4] OPEN DATA FOR ECONOMIC GROWTH, The World Bank, 2014
[5] Business Models for PSI Re-Use: A Multidimensional Framework, Enrico Ferro - Michele Osella, 2012

- **Aggregators**

Typical aggregators are open data portals run by local or federal authorities. They collect and aggregate open data. In case they do it as private entities their earnings arise from remuneration for aggregation itself and added-value data access services. Aggregators concentrate on data providing and not on data processing.

- **Enablers**

These are organisations which provide platform and technologies that other businesses and individuals use. Typical enablers are the big IT companies like T-System, IBM, SAP, Oracle and so on. Beside those major players a lot of SMEs were founded in the recent years who concentrate on data processing for open data purposes.

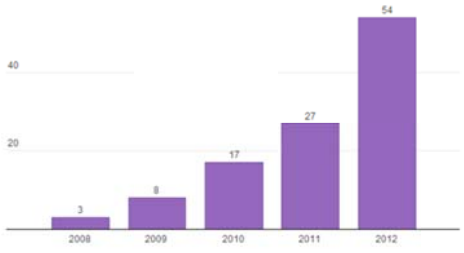
- **Enrichers**

Enrichers use open data as a basis and augment these data to provide new products. Other ones use the insight gained through open data to sell completely new services.

Beside these "door openers" typical enrichers are big data analysts, but also data publishers. Therefore many of the today active enrichers like publishing houses for legal texts existed before the first computer was built.

- **Developers**

These are organisations and individual developers who design, build and sell web or smartphone applications to deliver government open data to customers. They are regarded as the new stars of the open data scene, mostly by the public sector bodies. In the last years a lot of app contests took place all over Europe as this was also part of the European strategy to promote PSI datasets.



[6]

This strategy was so successful that today many PSBs seem to believe that creating a proper app for the data retrieval is the one and only way to use public sector data.

The main difference between the "new developers" and conventional it developers is the business model of the first ones: Very often it is based on a trial and error instead of traditional budgeting and planning. When one of the developed apps reaches high popularity, in most cases the app is sold. In outstanding cases the whole developers firm is sold in a share deal. The buyers of the apps usually stick to conventional business models.

Today more and more app developers work as service providers for other players within the open data ecosystem, so the border to the 'enablers' is a fluent one.

[6] Indicative number of open data contests by year EPSI-Platform topic report No. 2012 / 08

3 How to increase the economic effects

The whole concept of opening data and value addition is based on the multiplier effect. This principle says that every new extra income of private entities leads to more spending in total than the initial income. Therefore the summarised effects of the data value chain are a much higher spending than the sum of the value additions within the chain.

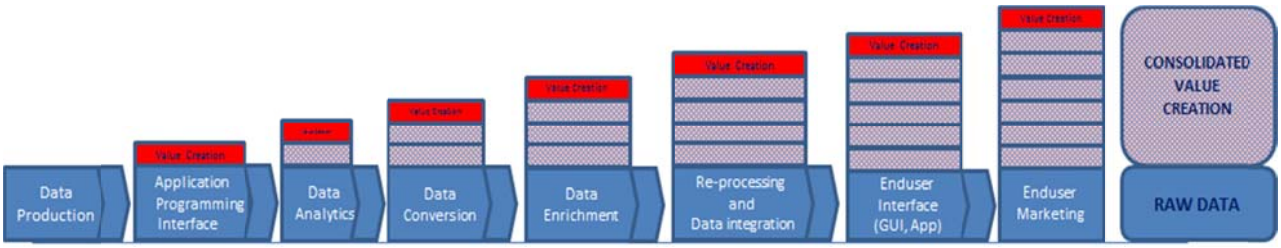


Figure [1]: The data value chain

To examine individual elements of a value chain primary activities and support activities have to be evaluated. The costs of these activities plus the margin of the relevant chain link result in the value addition. To keep it simple also a top down approach is possible which says value addition is revenue minus purchased goods. So the maximisation of value creation (=higher prices per intermediary) seems the right way to increase the positive effects of open data, but these positive effects depend on conditions that have to be fulfilled.

- The value additions need to meet the demands of the end-users (They have to pay the cumulated price)
- The value additions have to be cost effective for the chain links (=private entities within the value chain) to be sustainable

To incentivise the customers within the data value chain and to ensure fair competition, the European Union reduced the costs for the raw data to marginal costs, according to Article 6 of the Directive 2013/37/EG. The positive effects of multiplied spending are planned to exceed the negative effects for the member states resulting out of reduced fee income for data licensing by far.

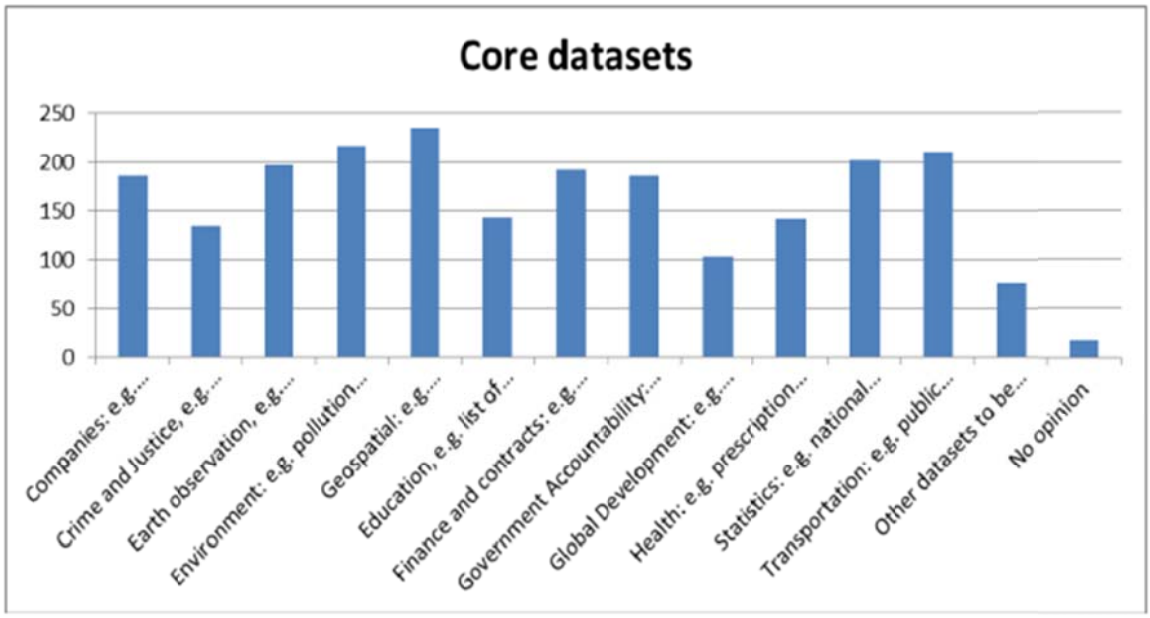
3.1 Follow the principle of supply and demand

The objective of untapping the economic potential of Open Government data is best attained when the intermediaries and the end-users within the value chain are willing to pay for the raw data together with the value additions that took place before the product was offered to them.

Mostly every service that commercial end-users are willing to pay for, depends on the category of raw data that relies to his business. It therefore makes sense to prioritise the release of datasets according to the end-user´s needs:

- **Listen to the User (Customer)**

In 2013 a public consultation online consultation on the guidelines on recommended standard licences, datasets and charging for the re-use of public sector information took place. The last element of this section of the online questionnaire included a pre-defined list of 'high-value' datasets, based on the Technical Annex of the G8 Open Data Charter.



[7]

Even before evaluating the results of that online consultation one can say that the European Commission and the G8 seemed to be fairly well informed about the needs of the customers. Member States have been encouraged to prioritise the release datasets touching the following categories (regarded as the most important ones and mentioned in the European Commission´s Guidelines).

- Geospatial data
- Earth observation and Environment
- Transport data
- Statistics
- Companies

Look at the existing access regimes of public sector data providers

As a result of New Public Management many public sector bodies regard themselves as profit centres, which are responsible for the funding of their activities. Therefore public sector bodies who impose fees for the access to relevant information often try to maximise those fees.

By evaluating the fees that customers are willing to pay for specific information one can estimate very precisely what datasets the intermediaries and end-users are really interested in. In case the fees for data access are high and re-use of accessible data is forbidden, the business model of the public sector body should be evaluated. The public sector bodies themselves know quite well which data commercial end-users are willing to pay for. These datasets are the perfect raw material for commercial PSI re-users and developing sustainable business models.

3.2 Take the quick wins first and follow beaten tracks

Re-use of public sector information is nothing new, publishers have been engaged in this kind of business for hundreds of years. If you want to increase the economic effects of PSI usage, the easiest way is to support those entrepreneurs who have a verifiably sustainable business model. Usually there is a lot of room for improvement when it comes to terms and conditions for those commercial re-users (see also 3.3).

[7] Results of an online consultation on the guidelines on recommended standard licences, datasets and charging for the re-use of public sector information, European Commission, 2013

If a PSB is keen to disseminate it´s data, the easiest way to do so lies in a cooperation with an experienced commercial data provider. Contact to commercial data providers and an exchange of views gives the PSB a clearer picture of the end-users needs.

If a business model works, higher prices are natural

High value creation by conventional entrepreneurs sometimes results in high end-user prices. If the end-users are willing to pay and the intermediary found a working business model (even when it is based solely on a high margin and no additional features) this is exactly how the value chain should work and should not change the PSBs attitude towards PSI re-use. According to the principles of the market other commercial re-users will copy the business model and the prices will shrink.

New business models have to be invented

Setting up a new business model or creating a new information product is more or less like setting up a new technical process. Most of the steps are logical and you follow a schema, but the key idea is an invention. As in technical areas you cannot force somebody to make an invention in economic areas. The only possible support is a reliable framework for the inventors work.

3.3 Support long lasting services to maximise the economic effects

To maximise the economic effects of a data value chain, the relevant PSBs should try to support the long lasting existence of the chain links. Only then the overall economic effects of the value chain can be harvested.

- **Commercial re-users need security of investment**

Every commercial intermediary has to make an investment decision before he creates a product that represents one chain link in the data value chain. Even smaller services require planning and administrative effort, bigger ones often request investment in IT soft- and hardware, ongoing editorial and technical support, marketing and sales efforts.

Every decision maker in the private sector bases investment decisions on Return of Investment (ROI) calculations. These calculations show the timespan that it takes to earn back the investment carried out in such a service. To be sure that an investment makes sense, the timespan of its existence has to be at least longer than the period to earn it back. Therefore, private sector entrepreneurs need security so that the circumstances they based their investment decision on, do not change.

To receive planning security, commercial re-users often request service level agreements or any other contracts that assures them that the PSB does not suddenly stop the data delivery. According to the PSI Directive (Article 5.3), public sector bodies cannot be required to continue the production of a certain type of documents with a view to the re-use of such documents by a private or public sector organisation. Commercial re-users are often willing to pay for a certain service level if it guarantees them planning security, so it could be a win-win situation for both sides.

- **Liability clauses**

A further critical success factor is liability for the delivered content. Standard licence terms usually don´t cover that aspect and the PSBs are not liable for content provided for re-use. If the commercial re-users sell this content to professional end-users this aspect is also crucial to them. Also in this case contractual relationships are a possible way to solve these problems.

3.4 Cheap support is not necessary really effective

App contests and young coders festivals are a perfect scenario for the PSBs to showcase transparency and openness towards PSI aspects, but simply supporting of the new developers groups does not meet the economic objectives of the PSI directive. The playful approach of the app developers does not usually result in any significant economic effect.

There is often a suspicion that public administrations concentrate their efforts on the “community app developers” as they do not express their demands for valuable data in the first place. This is because providing these valuable data for re-use in high-end business applications could cost the PSBs loss of access fees.

If we want re-use to result in economic growth, the support of commercial entities with high value creation is unavoidable. While this will cost money initially, only then will the positive effects be seen in the near future. At the moment many PSBs seem to act on the principle “we want the positive effects at no costs”.

3.5 Evaluate dependencies within the value chain and support roles not players

The steps within a commercial data value chain can also be distinguished by the business models behind the activities. The core activities rely on business models that are directly connected and determined by the content, the PSI itself. Support activities are based on conventional service provider business models. These support activities like data storage, data processing or developing, soft and hardware for PSI purposes are available at the market.

If an entrepreneur has an idea how to use the open government data for a reliable business model, he will find the providers of support activities and organise data processing up to his needs. The most important condition for a commercial intermediary is access to the requested re-usable data at reasonable costs.

The PSI ecosystem is a chaotic system where participating players take different roles in the same play. The ecosystem is no linear chain. Therefore support for the players can result inaccuracy and lost expenses when you want to incubate the ecosystem. Accuracy can be gained if you support roles instead of players. That means that you support a big IT company that is engaged in variable PSI activities just for the enrichment part, not for the enabling part, as this is standard business for an IT firm.

4 So where is the evidence?

So far so good, but is there any evidence on the value of PSI and the effects resulting from opening it up? Yes there is. In fact there has been quite some empirical research into economic effects of PSI, in particular in the last five years, where a steady stream of reports and studies has sprung from the academic world, policy makers and re-users. However, so far they have not been glued together and put into context. In this last paragraph we will do so. We will start off with studies that have tried to quantify the European PSI market. We will then move down to the meso and micro level covering sectoral studies and case studies, providing concrete figures on economic effects resulting from PSBs moving from a cost recovery towards marginal cost, or even zero cost and we will see an interesting chain of consecutive inter related effects over time!

4.1 European comprehensive PSI value studies

Before moving to the case studies – detailing the effects of lowered re-use prices – we first provide a snapshot of the efforts to assess the overall value of PSI within Europe.

PIRA - Although the notion that there is significant value in PSI has been gaining weight during the last decade of the previous century, best mirrored by the 1998 EC Green Paper on PSI[8], it was not until 2000 that the first serious attempt was made to somehow connect a figure to this value: the PIRA report.[9] PIRA estimated that the European market for PSI in 2001 (15 Member States) amounted to an 'investment value' of €9.5bn and an 'economic value' (market size in money) of €68bn, whereas for the United States these values amounted to €19bn and a staggering €750bn, respectively. Accordingly, the main message of PIRA is that compared to the EU, the United States has only twice the investment value for PSI but earns more than *forty* times from it. Although the PIRA figures were disputed later, the report paved the way for the first PSI Directive, providing the European (economic) rationale to legislate this matter.

MEPSIR - In 2006, seeking to benchmark the impact of the implementation of the PSI Directive, the European Commission assigned the MEPSIR study[10] to a Northern Ireland-Dutch consortium of Helm and Zenc. This study undertook a thorough baseline measurement of PSI re-use across Europe (including Norway), covering all major PSI sectors (but excluding scientific/research information and cultural information). Although the MEPSIR study came up with much lower figures than the PIRA study – a market size of €27bn, it nevertheless confirmed the value potential inside PSI.[11] The MEPSIR study relied on a large number of robust measurements from all PSI domains in all Member States and it is generally regarded as the best estimate.

Vickery - Then, in the autumn of 2011, upon request from the EC, Graham Vickery, former economist of the OECD, produced a report, again assessing the overall European market, based on the various figures presented in previous studies. Covering 27 EU Member States, the report

[8] Green Paper on "Public Sector Information: a key resource for Europe" (COM(1998) 585), adopted by the Commission on the 20th of January 1999. http://ec.europa.eu/information_society/policy/psi/archives/news/index_en.htm

[9] Commission of the European Communities, 30 October 2000. Commercial exploitation of Europe's public sector information: Final Report for the European Commission Directorate General for the Information Society. Pira International. ftp://ftp.cordis.lu/econtent/docs/2000-1558.pdf

[10] http://ec.europa.eu/information_society/policy/psi/docs/pdfs/mepsir/executive_summary.pdf

[11] PIRA used a markedly different approach from MEPSIR. PIRA relied on two distinctively different values: an 'investment value' (public sector investments in the acquisition of PSI) of €9.5bn and an 'economic value' (part of national income attributable to industries and activities built on the exploitation of PSI) of €68bn. The numbers in the MEPSIR study were solely based on the total added value by all first-order re-users (based on a much larger number of measurements than PIRA), as it considered the heart of the matter how much of the added value can be traced back to PSI (and not whether the information industry represents a significant part of a national economy (as is the case in the USA)). This (likely) explains why the PIRA base value (€68bn) is so much higher and the range so much wider (€28bn to €134bn).

assessed that (a) the market size of 2008 and of 2010 amount to €28bn and €32bn, respectively, (b) the market features an average growth rate of 7%, (c) total direct and indirect economic impact of PSI re-use lies between €70bn and €140bn and (d) the welfare gains from moving to marginal cost pricing reach up to €40bn.

The table below provides an overview of these studies and their main figures.

Year[12]	*Name of study* and author	PSI domain	Outline
2000	*Commercial Exploitation of Europe's Public Sector Information*, Pira International[13]	All PSI domains 15 EU Member States	For Europe (15 Member States) Investment value: €9.5bn Economic value (=market size): €68bn For the United States: Investment value: €19bn Economic value: €750bn
2006	*MEPSIR, Measuring European Public Sector Information Resources*, HELM and ZENC	All PSI domains 27 EU Member States + Norway	European market size: €27bn (27 EU Member States + Norway)
2011	*Review of Recent Studies on PSI Re-use and Related Market Developments,* Graham Vickery[14]	All PSI domains 27 EU Member States	Market size 2008 and 2010: €28bn and €32bn Average growth rate in PSI-related markets: 7% Total direct and indirect economic impact of PSI re-use: €70bn–€140bn Welfare gains from moving to marginal cost pricing: €40bn

Figure [2]: Overview of PSI case studies

In summary, all the studies acknowledged the economic value captured in PSI and the significant growth rates over the years when opened up under liberal re-use regimes. In the next paragraph, we will take a closer look at these effects.

4.2 Overview case studies

In the process, many Member States started to understand and appreciate the potential of opening up their PSI, in particular the United Kingdom, where the so called Trading Funds were a sore subject to many re-users (and likely also policy makers). Interest in PSI re-use was further boosted by the 'Open Data movement', which started to gain political weight in 2010, bringing forth a second wave of studies of which POPSIS, Koski and Houghton are of particular interest. The table below provides a (large) selection of relevant studies, and briefly outlines the essence.

[12] Meaning: year of publication.
[13] http://ec.europa.eu/information_society/policy/psi/docs/pdfs/pira_study/commercial_final_report.pdf
[14] http://epsiplatform.eu/content/review-recent-psi-re-use-studies-published

Year	Title and author + short name	PSI domain (+ short names)	Outline
2008	'*Models of Public Sector Information Provision via Trading Funds*', Newbery, Bentley and Pollock, Cambridge University, **Trading Funds study**[15]	A set of UK 'basic registers': Met Office Ordnance Survey Hydrographic Office Land Registry Companies House Driver Vehicle Licensing Agency	Relying on prior experiences of agencies adopting marginal cost pricing, the study provides estimates for the costs and benefits of marginal cost pricing in relation to bulk, digital PSI from big UK public data holders.
2009	'*The Economics of Public Sector Information*', Rufus Pollock, Cambridge University, **Pollock study**[16]	UK raw PSI in general	Relying on mathematical analysis the study assesses who should best finance PSI re-use and the regulatory structure needed.
2010	'*PSI in European Meteorology – an Unfulfilled Potential',* Richard Pettifer, PRIMET, **Pettifer 1 study**[17]	Meteorological information in general	Proceeding on the basis that, in general, meteorological PSI is available on a cost-recovery basis in Europe and on marginal or zero cost bases in the US, the study assesses the detrimental effects for Europe.
2011	'*Pricing of Public Sector Information Study',* Deloitte Belgium, **POPSIS study**[18]	21 case studies in the EU in all important PSI domains, including, the Dutch KNMI case (meteo), Norwegian MET.NO case (meteo), Danish Deca case (geographic), Spanish cadastre case (geographic), Austrian cadastre case (geographic)	Analysing 21 case studies, covering a wide range of PSBs and different PSI sectors, the study assesses different models of supply and charging for PSI and their effects on the downstream market, PSI re-users, end-users and impacts on the PSB itself.
2011	'*Does Marginal Cost Pricing of Public Sector Information Spur Firm Growth?*' Heli Koski, The Research Institute of the Finnish Economy, **Koski study**[19]	Geographic information	Assessing the performance of 14,000 firms in the architectural, engineering and related technical consultancy sectors, located in 15 different countries, the study analyses the effect of maximum marginal cost pricing for geographical PSI on the firms' growth performance during the years 2000–2007.

[15] http://www.berr.gov.uk/files/file45136.pdf
[16] http://www.econ.cam.ac.uk/dae/repec/cam/pdf/cwpe0920.pdf
[17] http://www.primet.org/file/EU%20PSI%20Working%20Groups/PSI%20in%20European%20Meteorology%20-%20an%20unfulfilled%20potential%20distribution%20copy.pdf
[18] http://ec.europa.eu/information_society/policy/psi/docs/pdfs/report/11_2012/models.pdf
[19] http://www.etla.fi/files/2696_no_1260.pdf

Year	Title and author + short name	PSI domain (+ short names)	Outline
2011	*Costs and Benefits of Data Provision – Report to the Australian National Data Service*, John Houghton, Victoria University, Australia, **Houghton study**[20]	Information from: Australian Bureau of Statistics Office of Spatial Data Management & Geoscience National Water Commission & Bureau of Meteorology	Presenting three case studies, the study explores the costs and benefits that PSI-producing agencies and their users experience in making information freely available and the preliminary estimates of the wider economic impacts of open access to PSI.
2011	'*Pricing of PSI in the Meteorological Sector blocks market development',* Richard Pettifer, PRIMET, **Pettifer 2 study**[21]	Meteorological information in general	Considering three hypothetical SMEs, in Luxembourg, Poland and France that wish to provide weather-related services but are confronted with cost-recovery pricing, the study concludes that these SMEs can never compete successfully.

Figure [3]: Overview of relevant PSI re-use case studies

In summary, we see a surge in interest in the economic effects brought about by more liberal PSI re-use regimes, mirrored by a wide array of studies at the national and sectoral levels, both inside and outside Europe. In the next paragraph, we will look at these effects in more detail and will refer to these case studies by using their short names.

4.3 Chain of economic effects of lowered PSI re-use charges

The challenge: putting the findings in context

Most of the studies referred to above work on the basis of an input–output relation, whereby the effects (output) of lowered charges for PSI (input) are assessed in isolation. What has not been done so far is to analyse the studies by interconnecting them and adding a sequence and timeframe to the effects, which will not only reveal the deadlock faced but also suggest the solutions at hand.

The sequence of effects and their beneficiaries

Our starting point (and that of most case studies) is a PSB lowering the charges for re-use of its PSI. This brings about a whole array of subsequent effects, which can be divided in three phases: (a) the *sowing* phase, (b) the *growing* phase and (c) the *harvesting* phase. Walking through, we will look at the subsequent effects taking place and substantiate them with the empirical research listed above.

4.3.1 The sowing phase

The sowing phase features two immediate effects: an uptake at the demand side by the re-users (following the price cut) and, in parallel, an income effect at the side of the PSB, where it loses revenues – it can no longer charge for its data – and sees its cost increasing, as mirrored in the illustration below.

[20] http://ands.org.au/resource/houghton-cost-benefit-study.pdf
http://www.crcsi.com.au/Documents/ANZLIC-Economic-Study---Stage-2-Report.aspx
[21] http://www.primet.org/file/EU PSI Working Groups/Workshop Position paper final

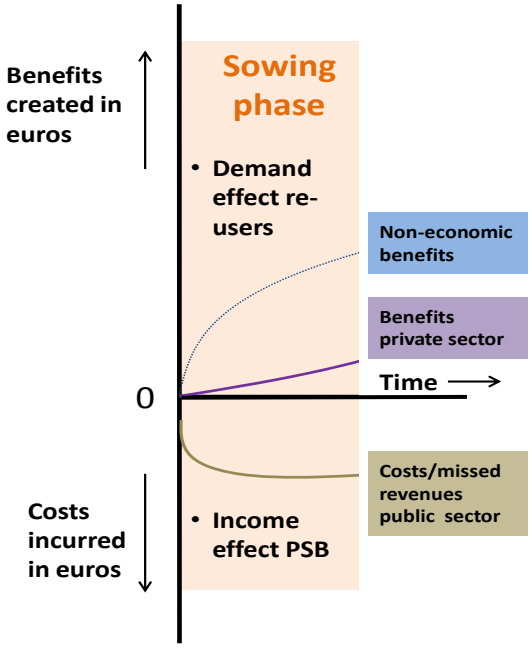


Figure [4]: Effects in the sowing phase

- **Demand effect re-users**

Spectacular increases in demand

All case studies report on, quite often really spectacular, increases in demand (both in terms of volume and numbers of users) following a decrease in re-use charges, as demonstrated in the table below. Interestingly, lowered prices also attract new categories of users, SMEs in particular, apparently previously unable to afford the required PSI. Both POPSIS and Koski report on this:

POPSIS: "Interestingly, some case studies demonstrate the use of variable pricing regimes such as 'pay per use' or 'percentage of turnover generated by PSI' without high fixed price elements. These regimes have led to increased re-use and facilitate new entrance of re-users, notably SMEs."[22]

Koski: "It seems credible that higher PSI prices create a barrier for SMEs using geographical information to develop new information products and services and to enter new market areas."[23]

We will look at the consequences thereof in more detail in the growing phase, where they materialize in full.

Case study	PSI domain	Price cut re-use charges	Increase in demand
Austrian Cadastre (POPSIS + Koski)	Topographical data	Up to 97%	Factor 2 – 7 in number of downloads[24]
DECA (POPSIS)	Danish address data	almost 100%	Factor 100 in number of re-users

[22] POPSIS, ibid. p. 32.
[23] Koski, ibid. p. 13.
[24] Cartographic products with a factor 2 – 15, digital ortho-images with a factor 70, digital cadastral map and elevation model with factor 2.5, the digital landscape model with a factor 10.

KNMI (POPSIS)	Dutch meteo data	80%	Factor 10 in number of re-users, 90% of them being SMEs
MET.NO (POPSIS)	Norwegian meteo data	100%	Factor 30 in numbers of unique weekly re-users, majority being SMEs
Spanish Cadastre (POPSIS + Koski)	Spanish topographical data	100%	Factor 80 – 100 in numbers of downloads Factor 25 in numbers of re-users
Houghton study	Australian: Topographical data Statistical data Hydrological data	 almost 100% 100% 100%	 172% Factor 3 in product downloads Factor 100 in data requests and Factor 2 for extractions of re-use

Figure [5]: Overview of increases in demand following lowered PSI re-use charges

PSI features relatively elastic demand

These figures confirm previous research (Trading Funds Study and Pollock Study) that suggested a price elasticity of demand (PED) well above 1 (in absolute terms), meaning that in case a PSB lowers its prices (so not dropping the charging all together) the relative increase in quantity outweighs the relative discount, generating higher revenues than before.[25]

Pollock notes that evidence on price elasticity is limited, and its value will be determined by the nature of the product at issue. Nevertheless, he estimates that elasticity is generally greater than 1, and the range for the kinds of products that are the subject of this study is between 0.5 and 2.5. According to the Trading Funds Study, elasticity of demand varies depending on the PSI, but for the products associated with the PSI, average elasticity is estimated at between 1 and 2.

The POPSIS findings confirm this in the Austrian cadastre case and the Dutch KNMI case.

POPSIS: "*[T]he Austrian Federal Office of Metrology and Surveying adopted a simplified and more market-oriented PSI pricing approach with drastic price cuts of up to 97% within strict budget constraints (there was no additional governmental funding). Due to the additional demand – notably from SMEs – triggered by lower prices, PSI sales revenues and the associated cost-recovery ratio could be kept stable or slightly increased. Without additional governmental funding, BEV could improve the situation for re-use business and secure a wider use of its public data.*"[26]

POPSIS: "*In 1999, at the peak of competition between the commercial activities of the KNMI and the private sector re-use activities, there were in essence two re-users of KNMI data. … About ten years later, after full implementation of the new re-use policy, this picture had changed quite dramatically. In 2010, the price level of a full KNMI dataset went down by 80%, from 0.1 M EUR to 0.02 M EUR (which included both license and distribution costs) and covered the facilitation of re-use costs only. At the same time, the number of re-users exploded, increasing to 50*[27]*.*"[28]

[25] The formula for the coefficient of price elasticity of demand (PED) is (dQ/Q)/(dP/P), whereby Q is the quantity, P is the price and d is the changes therein. Generally, if PED for a good is relatively elastic (-∞ < Ed < -1), the percentage change in quantity demanded is greater than that in price. Hence, when the price is lowered, the total revenue increases.
[26] POPSIS, ibid., p. 127.
[27] Among these fifty companies, five are companies that are so-called meteorological service providers (in 1999 there were just two). These companies have portfolios with direct meteorological forecasting products as basic meteorological datasets for customer processes (sea forecasting, wind energy and so on). General re-users deal with customer processes that are built on meteorological input datasets.
[28] POPSIS, ibid. pp. 273–274

- **Income effect PSB**

Lowering of the charges directly impacts (negatively) the income of the PSB, as revenues no longer come in. In fact, as the new charging regime needs to be implemented, costs may further rise, in particular as boosted demand may require additional investment. This double-edged knife requires the PSB to rely on its own reserves and, in the absence thereof, requires alternative funding (from general taxation funds).

Lost revenues appear to be limited in size

Interestingly, however, looking at the lost revenues in proportion to the PSB's total budget, in most cases the 'damages' appear to be fairly limited. The table below – directly taken from the POPSIS study – indicates that the 'PSI re-use cost-recovery ratio'[29] of more than half of the PSBs is less than 5%. In other words, if charges were dropped all together many would hardly notice, or at least, they would not have to shut shop. Only for a few the loss of income would appear to be of a fundamental nature, in particular in the field of business registers.

Country	Public sector body	PSI domain	Budget (M EUR)	PSI sales revenues (M EUR)	Cost-recovery ratio
Italy	Infocamere	Business register	93.6	31	31.31%
Netherlands	KvK	Business register	243	6	19.50%
United Kingdom	Companies House	Business register	74.8	15.5	20.73%
Austria	BEV	Geographic information	85.0	22.5	26.5%
Germany	BKG	Geographic information	33.8	0.08	0.24%
Germany	SenStadt	Geographic information	9.1	0.945	10.38%
Denmark	DECA	Geographic information	31.6	0.26	0.82%
Spain	IGN-CENIG	Geographic information	52.0	2.1	4.12%
Spain	Spanish Cadastre	Geographic information	108.0	0	0.00%
France	French cadastre	Geographic information	162.5	0.9	0.55%
Italy	Italian cadastre	Geographic information	666.0	3.3	0.50%
Netherlands	Dutch cadastre	Geographic information	261.0	17.15	6.57%
United Kingdom	Ordnance Survey	Geographic information	127.0	21	16.54%
Germany	DWD	Meteorological information	214.9	2	0.93%
Netherlands	KNMI	Meteorological information	56.0	0.25	0.45%
Norway	Met.no	Meteorological information	58.0	0	0.00%
Slovenia	ARSO	Meteorological information	6.0	0.36	6.00%

[29] The cost-recovery ratio is defined as: (PSB's revenues from sale of raw PSI to re-users / total budget of the PSB) * 100%

Country	Public sector body	PSI domain	Budget (M EUR)	PSI sales revenues (M EUR)	Cost-recovery ratio
Spain	CENDOJ	Legal information	9.0	1.5	16.67%
France	DILA	Legal information	135.0	0.9	0.67%
France	SIRCOM	Fuel prices information	1.1	0.179	15.91%
Germany	DeStatis	Statistical information	177.7	0.2	0.11%

*Figure [6]: Cost-recovery ratios 2010 of PSBs measured in the POPSIS study*30

Equally, Houghton concludes that the greatest cost to agencies lies in the loss of revenue when information that was previously sold is provided at marginal cost. Moving to standard licences and formats may have some transitioning costs for agencies but is unlikely to have a material impact on costs once the standard systems are in place. Ultimately, the use of standard licences and formats should reduce agency costs by reducing the support required by re-users.

4.3.2 The growing phase

In the growing phase, more indirect effects start to kick in, both at the market end (for the re-users and more broadly on the downstream market) as well as for the PSB itself, in the form of increased efficiency, as the figure below illustrates.

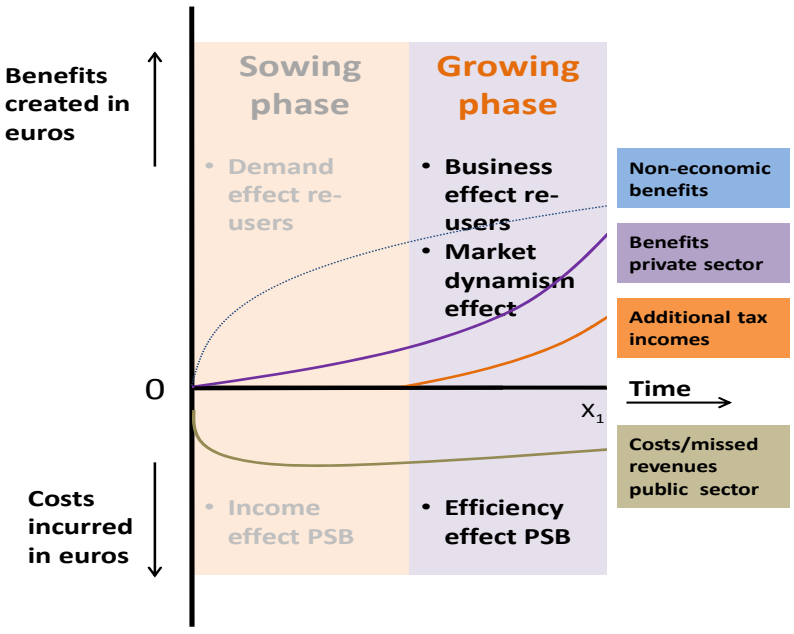


Figure [7]: Effects in the growing phase

[30] Although only six cases from the POPSIS study were explicitly mentioned above, the table demonstrates all 21 POPSIS's case studies, as the percentages are quite illustrative.

- **Business effect for re-users**

The costs of purchasing PSI from the government will decrease, which is (partly) translated into lowered prices in the successive parts of the chain, leading to larger quantities sold, and as the price cuts do not affect profits (but are a result of lowered costs), profits of re-users rise. Furthermore, transaction costs diminish, in case re-use is made free all together.

Koski has looked extensively at profitability of companies following lowered re-use charges. Assessing the performance of 14,000 firms in the architectural, engineering and related technical consultancy sectors, located in 15 countries, she analyses the effect of maximum marginal cost pricing for geographical PSI on the firms' growth performance during the years 2000–2007.

Koski: "*The reported empirical findings clearly show that the PSI pricing scheme does matter for the firm growth particularly from the perspective of small and medium sized enterprises. The firm-level data concerning potential re-users of geographical information in business services sector from 15 countries during the years 2000–2007 suggests that the pricing of GI strongly relates to the firms' sales growth. Firms functioning in the countries in which public sector agencies provide fundamental geographical information either freely or at maximum marginal costs have grown, on average, 15 percent more per annum than the firms in the countries in which public sector GI is priced according to the cost-recovery principles. The difference-in-difference estimations further show that positive growth impact materializes already one year after switching to the marginal cost pricing scheme but a stronger boost to the firm growth takes place with a two year lag.*"[31]

Three POPSIS cases also report increased turnover of re-users following a move to marginal costs charging models: in the Danish address case (DECA), the turnover of re-use market (first and second tier re-users) increased by 1,000%; in the Dutch meteo case (KNMI), the turnover of the downstream market increased by 400%; and in the Norwegian re-use meteo market case (MET.NO) there was a 200% growth, money-wise. Many case studies also demonstrate new parties entering the market, which is obviously the result of increased profitability (see Figure 3-6 above). We will look at these new entrants in more detail in the next section (market dynamism).

- **Market dynamism effect**

Attracted by low (or non-existent) PSI re-use charges, lowering market entry barriers, and increasing profits of existing re-users, new parties enter the market, resulting in more market dynamism: existing re-users need to innovate and upgrade their services. Conversely, parties no longer adding value and not able to keep pace, leave the market.

SMEs entering the market spur dynamism

Koski's research demonstrates that the market dynamism and growth is spurred by the new comers rather than the existing body of re-users, bringing about a subsequent set of economic effects. This is confirmed by a wide range of case studies.

Koski: "*Interestingly, marginal cost pricing has not generated notable growth among the large firms;*

it has been SMEs that have benefited most from cheaper geographical information. It seems credible that higher PSI prices create a barrier for SMEs using geographical information to develop new information products and services and to enter new market areas. The switch to the marginal

[31] Koski, ibid. p.13.

cost pricing may thus not only result in growing markets but also intensify competition and challenge the large incumbent companies. Cheaper public sector GI is thus likely to benefit consumers by producing more product variety and also cheaper prices."[32]

Distinction between high- and low-end markets

POPSIS addresses another important aspect of the market dynamism brought about. It notes that 'the new kids on the block knocking on the door' are fundamentally different from the 'old' re-users (the high-end market re-users), as the figure below demonstrates.[33]

Figure [8]: High-end and low-end re-use markets

The high-end market typically consists of re-users that provide their PSI-based services to professional clients. Substantial value is added by re-users serving the needs of specific professional clients. A typical example is a meteorological company that provides very detailed weather forecasts to oil rigs, based on its own high-tech forecast models. The high-end market services are highly targeted, the number of clients is relatively low and yet the value of each transaction is high.

Conversely, in the low-end market, business models are based on reaching out to large volumes of (generally non-professional) consumers who use high traffic web services and maybe apps on mobile devices. Typically, these re-users merely mash up the PSI with other free content and integrate it into services, not adding much value, other than distributing it widely. The re-users' revenues come from third-party advertisements, not from its users.

Backing this up, in the Dutch KNMI case, the POPSIS study reports:
"*The lowered price level increased competition and sparked innovation: second-tier users of meteorological information were offered smart, new products. For instance, the greenhouse sector in the Netherlands was able to save about 10% on its energy costs due to its access to real-time detailed forecasting of rainfall services. This allowed the sector to maximize the length of time that the greenhouses can remain open to the air. This not only very beneficial for the crops but also for the environment, since it reduces carbon dioxide emission quite considerably.... New business models emerged: a new re-user entered the market and launched an innovative service under the name 'Rainfall Radar' (Buienradar). Anyone can use the service to determine whether it is going to rain in the current location in the next few hours. This service is provided completely free of charge. It generated around 300 million hits per year throughout Europe in 2010. As a result of this high*

[32] Koski, ibid. p.13.
[33] POPSIS, ibid. pp. 26–27.

traffic, it is paid for through advertising revenues. Finally, since all KNMI data products are license free, almost no restrictions in use or distribution are set. Some of the re-users have started activities as distributors."[34]

Stifling effects of strong PSB presence in the market

One may also ask what the consequences are when prices are not lowered. The two Pettifer studies provide evidence of the consequent damage being incurred in the meteo domain: not lowering its re-use charges and its own downstream market activities, the national Met Offices trifles with the market, where high charges block SMEs from entering.

In his first paper '*Pricing of PSI in the Meteorological Sector blocks market development*', Pettifer considers three hypothetical SMEs, in Luxembourg, Poland and France that provide weather-related services relating to forecasting, highways and energy, and uses 2010 prices on a cost-recovery basis. The absolute minimum PSI meteorological data required to provide basic weather-related services, with a market value of €6,000 to €20,000 per contract, would cost a typical SME between €84,000 and €400,000. Pettifer's conclusion therefore is that SMEs cannot operate successfully or compete with large firms when partial or full cost-recovery pricing principles are used: cost-recovery pricing principles are likely to create barriers to market entry because SMEs are probably unable to find the 20 contracts required to operate profitably.

In Pettifer's second paper, '*PSI in European Meteorology – an Unfulfilled Potential'*, he assesses the damage from this current practice, by comparing the European market figures with those of the US.

"*Recent estimates of the size of the 2006 market in value-added meteorological products of all*

types in the USA and Europe are of the order of $1.4 billion per annum and $372 million (€530 million) per annum respectively. ... It would appear therefore that [on the basis of GDP] only about 0.3% of the potential European market in this sector is currently being supplied whereas in the US the equivalent figure is around 0.7%. Moreover recent estimates suggest that in real terms, after allowing for growth in GDP, the US market has grown at an average rate of around 17% per annum over the past six or seven years while the European market has been growing at closer to 1.2% per annum in the same period. This type of difference can be seen in specific market sectors as well as in the overall market. ... There are other characteristics of the European meteorological market that bear examination and raise questions over the structure and operation of the sector. For example, although the real overall annual market growth in Europe has been languishing below 2% over the past five years, the small part of it (now about 28%) that falls to the private sector has been growing at around 25% per annum whereas the 75% that is in the hands of the dominant NMHS has actually declined by around 1.5% per annum. This large growth in the private sector component of the market (albeit from a very low base) is doubtless to some extent due to capture of business from the NMHS but the NMHS, despite their greater resources and strong brand positions, appear unable to develop the market and to grow the meteorological economy overall. It is interesting to note that much of this increase in the private sector component of the market has arisen since a few of the NHMS relaxed their PSI supply policies partly or completely towards the US model and made some key meteorological PSI available at the marginal cost of distribution. This suggests that if a major overall structural change in this direction, whether political

[34] POPSIS, ibid. p. 274.

or commercial, can be made it will encourage the growth of the private sector, stimulate genuine competition and foster the development of the total market."[35]

- **Efficiency effects in the PSB**

The last effect in the growing phase concerns the efficiency gains made by the PSB. Having implemented the new re-use policy, efficiency gains start to kick in where fewer resources are consumed to run operations, administrative staff are no longer needed and transaction costs savings are cashed in. Furthermore, the PSB's remaining downstream market activities are seized or carved out, as the PSB cannot keep up with private sector competitors (no longer being able to rely on upstream advantages).

Direct efficiency gains cover significant part of revenues lost

Houghton compares the PSB's revenue lost with the costs saved as a result thereof: (Efficiency gains PSB / Lost income PSB) * 100%. Accordingly he arrives at a percentage of 32% (for the Australian Bureau of Statistics). He also reports on Western Australia's Landgate agency, which estimates their transaction and support-related costs at around 17% of fundamental data revenue.[36]

POPSIS reports on several cases where efficiency gains are being perceived. The Dutch KNMI case demonstrates the move to a marginal costing charging regime had a significant impact on the efficiency of the organisation. In 1999, the commercial arm of the KNMI comprised 25 FTEs. This amounted to a cost of around €0.65m (in both direct and indirect costs) and a turnover of PSI sales of about the same amount, so breaking even. In 2010, the 're-use department' of the KNMI ran at a total cost of around €0.25m a year by 1.5 FTE, whereby the number of re-users had gone up with a factor 10. The Danish address case (DECA) assessed that opening up address data against marginal cost led to a total savings of around €5m over a period of five years, by estimating the time saved from not having to deal with licensing and administrative issues anymore. That amount alone already outweighed the loss of PSB income. The re-use department is now run by 0.5 FTE against a cost of €0.2m.

4.3.3 The harvesting phase

As Figure [9] demonstrates, in the harvesting phase the investments really pay off: increased tax returns outweigh the costs incurred by the PSBs and market dynamism has led to economic growth, resulting in more employment. And of course there are other non-economic benefits, all adding up to increased welfare.

[35] Pettifer, ibid. pp. 5–6.
[36] Houghton, Ibid. pp. 19, 34.

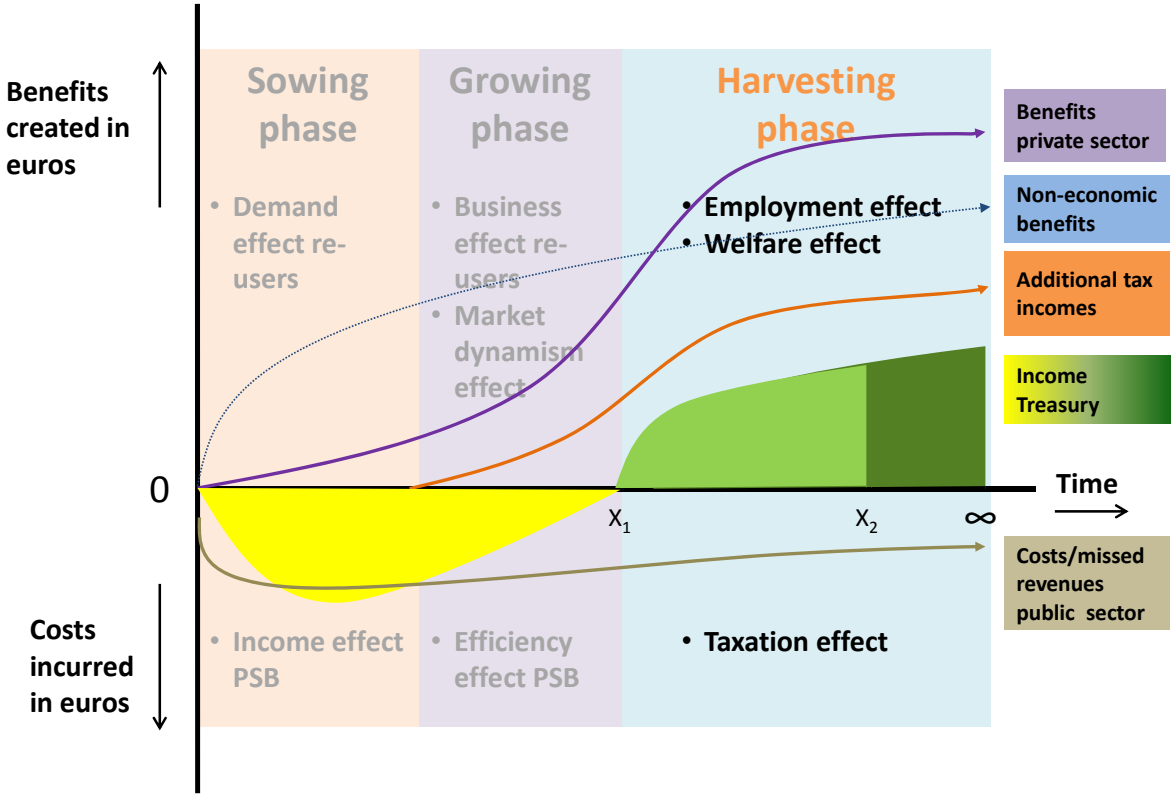


Figure [9]: Effects in the harvesting phase

- **Employment effect**

Due to increased economic activities, new and old re-users (and their clients) require additional staff, which they can now afford to hire due to increased profitability. This positive effect on employment largely outweighs the possible redundancy at the PSB level.

Although the strong increase in usage and the numbers of re-users suggest that there must be positive effects on private sector employment, only two cases hold hard evidence. The Dutch KNMI case demonstrates that in the eleven years since 1999 following the policy change that entailed the shift to cost recovery of re-use facilitation costs only, there were significant developments. The number of re-users went up by 1,000%, turnover increased by 400% and employment was boosted by 300%. In the Danish DECA address data case, which also shifted to a re-use facilitation cost-recovery model, the number of re-users went up by at least 5,400%, turnover by 1,000% and employment by first and second tier re-users by 800%.

- **Taxation effect**

Although already taking off in phase 2, the treasury starts to benefit from the entire movement: (a) VAT returns increase, (b) profit taxation increases as the GDP goes up and (c) social security taxes increase where more people are employed. These returns start to outweigh the initial investments made, having to fund the budget gap of the PSB in phase 1 and part of phase 2.

Again, few cases hold hard figures on the taxation effects. In the KNMI case, the additional corporate tax gains amount to €35m over a period of eleven years, based on an 'investment' (= lost revenues + re-use facilitation costs) of around €7m , thus giving a return on investment of 500%. The Danish DECA address case suggests a similar return on investment (corporate tax only) of 450%, where the GDP increase amounts to €14.25m over nine years against an investment of €3m. Obviously, at a macro level, and in absolute terms, these amounts are modest but become significant when scaled to a European level.

Pettifer, in his paper, '*PSI in European Meteorology – an Unfulfilled Potential*, points to the potential tax gains missed out on:

"The failure to realize the potential in this market place is costing the national treasuries in the EU dearly in terms of lost revenue from taxation. If the European meteorological market were as well penetrated as that of the USA, then the actual market size would be around €1,390M per annum. According to Eurostat the overall taxation return for EU countries in 2005 was 39.6% of GDP. To a first approximation then we might expect that the gross overall tax revenue from this sector would increase by around €340M. If, to generate this, the NMHS were to lose all of their income from the sale of PSI, and all of their direct value added retail sales (which are assumed to be diverted to the private sector and are thus still within the total market size), then the net benefit to the EU central treasuries from this change in the trading structure of the market would be in the order of €290Mper annum and would be, if the US is any guide, growing at about 17% per annum in real terms, rather than at about 1.2% per annum as they now are."

Treasury implications

Returning to Figure [9], the yellow and green planes represent the cash implications for the Treasury. During the sowing phase, the loss of income and investments needed to kick start and implement free re-use are not set off yet by taxation gains, which start to kick in only in the growing phase. At point x_1 the positive cash flow outweighs the loss of income and accordingly, the cash needs accumulated in the previous period ($0 – x_1$) start to diminish rapidly. At point x_2 the net gains start to come in, where these cash needs accrued are outweighed by the positive effects (tax gains and PSB efficiency gains). As of this point, the investment decision towards a free or marginal costs charging model will yield a constant and structural return.

So the balance of Treasury = $\int_{X_2}^{0}$ *f*(Additional tax incomes) – *f*(Costs + missed incomes public sector)

where:

x_1 = point where tax revenues start to outweigh the PSB's total costs and income lost

x_2 = point where total tax revenues collected outweigh the PSB's total costs and income lost

$x_2 - \infty$ = total taxation profits

So ultimately, the cases looked into promise high returns. However, where PSBs have become reliant on income from re-use, the turnaround may not be easy, particularly if the proportion of user fees is relatively high. In those cases the Treasury will need to finance the transition, making up for the initial losses.

- **Welfare effects**

Finally, it is likely that the societal gains will be much higher than just the financial ones we have been focusing on.[37] Many reports underline the positive externalities from opening up PSI (for re-use), which will likely result in wider economic impacts and benefits for society or the public at large. The benefits may look trivial – e.g. localized weather forecasts help people to stay dry – but they are obvious: less flu, more productivity, happier citizens, etc. Equally, we have only started to understand the potential network effects of opening up PSI, in terms of innovation and the development and introduction of new products, services and processes that, in turn, generate new economic activity, new business opportunities, better informed and potentially better government and business decisions. Making sure we do not forget, these effects are represented by the blue dotted line in Figure [9].

[37] See in particular Velde te, R.A. (2009), Public Sector Information: Why bother? in: Uhlir, P. (ed.). The socio-economic effects of Public Sector Information on Digital Networks. Towards a better understanding of different access and reuse policies. Washington DC: National Research Council (Ch.6. pp.25–28) and on the same note: http://www.oecd.org/dataoecd/12/49/40064800.pdf

5 Conclusion

The politicians responsible for the transformation of the PSI directive in the Member States within the next month should keep in mind, that a progressive approach and a strict marginal cost regime without exemptions has to be seen as an investment.

This investment does not only pay off in terms of taxation gains but also in efficiency effects in the public administration. Beside these effects transparency gains will enhance citizen's participation and the cooperation between public and private actors.

As nearly every other any investment also PSI measures take a certain time till the harvesting phase starts. In this timespan till the investment pays off, the relevant PSBs will suffer losses in their revenues. Therefore many civil servants responsible for the short term revenues of their PSBs will oppose strict PSI measures and they are not to blame for that, as they act in a responsible way within the limits of their PSBs.

So its up to the responsible politicians to keep the overview of the big picture and to detain from diluting the necessary national provisions. Only then the European Member States and the EU as a whole will benefit from the right path they have taken.

Marc de Vries has degrees in both law and economics. He has been working in the field of PSI re-use for more than 15 years at national and European level. He is one of the founders of the Green Land, a boutique firm in the field of Open Data. For any questions, please contact: marc@thegreenland.eu.

***Georg Hittmair* is head of the legal department at the Compass publishing group. He studied law in Innsbruck and Vienna. Since 1988 he is involved in electronic publishing. Hittmair is member of the legal advice group of the ISPA (Association of Internet Providers Austria) and represents the PSI Alliance in various projects. For any questions, please contact: georg.hittmair@compass.at**