THE SOCIAL VALUE OF SCIENCE SHOPS: A COST-BENEFIT ANALYSIS

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Abstract: We describe and apply a method to determine the net social benefits of science shops. University departments operating as science shops coordinate research projects for individuals or civil society organizations (CSO) lacking the financial means to turn to professional consultancy bureaus. Three cases are analyzed; the science shops at Wageningen, Brussels and Eindhoven. After investigation, it appears that under the normal assumptions for the application of CBA, the science shops concerned show positive net social benefits.

Keywords: Science shops, welfare economics, net social benefits

1. Introduction

Over the past decades, science shops have been set up, closed, rebuilt and developed, not only in Europe, but also in Canada, the USA, Africa and Asia (CW, 2009). The main aim of these science shops is to provide access to (academic) knowledge to private persons, civil society organizations (CSO) and/or small and medium enterprises (SME). These individuals or organizations lack the financial means to turn to professional consultancy bureaus (Straver, 2008). One of the preconditions of the science shops in selecting projects is that public organizations should be able to use the research conducted by the science shops (Straver, 2010). The wider goal of science shops is in the impact that influencing research may have on citizen participation (Wachelder, 2003).

It is said that the increasing involvement of civil society organizations leads to an increasing amount of research questions posed by clients and a need to extend the number and capacity of science shops (PERARES, 2010). We will evaluate this argument by analyzing science shops with the help of a cost-benefit analysis (CBA) (Prest and Turvey; 1965). The central question of this research is therefore *whether or not science shops are economically efficient*. This analysis aims to be a substantive addition to the evaluation methods and models available for the evaluation of science shops and is intended to generate further discussion within the wider area of community based research.

Initially established in the Netherlands in the early 1970s, the concept of science shops is currently spread around the world (Wachelder, 2003). As a consequence, science shops developed in a large variety of ways; depending on the region, area of expertise, focus from policy makers and institute to which the science shop is connected (CW, 2009). Because of the different origins and transitions of science shops, there is a large variety in structure and way of functioning. So far, the literature on science shops often focused on the internal organization, local context and differences in ways of coping (Fischer *et al.* 2004; Leydesdorff and Ward, 2005; Wachelder, 2003). In this article, by contrast, we propose a uniform approach to treating science shops with the help of a cost-benefit analysis. In order to answer our research question, we will give an economic evaluation of science shops that differ in size, region, target groups and area of expertise; however, we will limit our research to science shops that are linked to a university or research institute. This led us to evaluate three different science shops; that of Wageningen (NL), Brussels (B) and Eindhoven (NL).

The remainder of the article is organized as follows. Section 2 describes the methodology used and section 3 provides an analysis of the three science shops. In Section 4, we will present the results. Finally, Section 5 contains the conclusion and the discussion.

2. Methodology

The economic evaluation of science shops can be best assessed with the help of a Cost-Benefit Analysis (CBA). This is a method to determine whether a project, program or policy is efficient given the objectives that have been stated and the assumptions that have been made (Prest and Turvey; 1965). Cost-benefit analysis has been applied in many different fields of research; however, science shops or more in general, research bureaus, have never been included. In general, a CBA aims at answering whether a project or program should be carried out and if funds are limited, which elements should be selected. In doing this, the specific project is compared to its next-best alternative (Mishan and

Quah; 2007). Boardman et al. (2006, p. 2) formulate it as follows: *"CBA is a policy assessment method that quantifies in monetary terms the value of all consequences of a policy to all members of society…More generally, CBA applies to policies, programs, projects, regulations, demonstrations, and other government interventions"*.

This study is based on the theoretical principles of welfare economics (Brent, 2009), where we assume perfect competition, which implies a large number of companies, identical products sold by all, the freedom to enter in and out of the industry and perfect knowledge on prices and technologies (Krugman and Obstfeld, 1994). These assumptions imply that there are competitive alternatives to science shops; i.e. professional research bureaus. With this economic evaluation we try to assess the social desirability of science shops relative to its next best alternative; i.e. where clients of science shops would turn to if science shops would not exist.
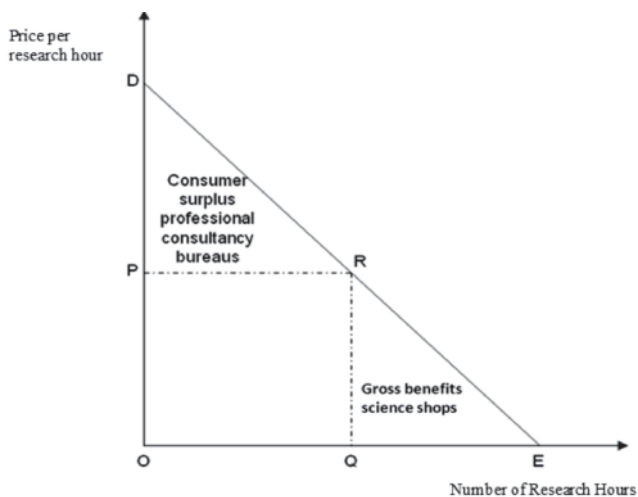

Figure 1: social benefits of science shop research

The entrance of science shops to the market may at first give the idea of price discrimination[1]; however, in essence we deal with market segmentation. Market segmentation is the distinction of a market in different groups of buyers and sellers and occurs when a sub-set of the market is made up of organizations that share one or more characteristics with the related market that cause them to demand similar products and/or services (Krugman and Obstfeld, 1994). Because of the financial restrictions of science shop clients, these clients would not engage in the market segment of professional consultancy bureaus if there would not be a science shop. Therefore, clients of consultancy companies effectively

engage in another segment of the market than clients from science shops. The different segments of the market are graphically represented in Figure 1, where area ODRQ represents the segment of professional consultancy bureaus and area QRE the segment of research conducted by students, under which science shop research falls, as will be explained in the following section.

Hence, the difference in price and provider results in two market segments; that of the professional consultancy bureaus and that of student research. In this study, we assume divisibility, which means that the benefits of research conducted by science shops can be measured by the amount of research hours conducted. The unit of measurement used in our analysis will therefore be one research hour, where its valuation will be based on the market price for a research hour conducted by a professional consultancy bureau. In the rest of our analysis, we will indicate a professional research hour by the abbreviation 'PRH' and a student research hour by 'SRH'.

The framework for quantifying the benefits and costs can be understood as encompassing the main actors in an economy: producers, consumers and the government. This determination follows the basic principles of welfare economics, where consumer surplus is measured by the difference between the willingness to pay for a particular good or service and the actual expenditure (Mishan and Quah; 2007). Clients of the science shops only have to put their own working hours in the projects conducted by the science shop. Therefore, we assume that they get the research for free. If point O to point Q represents the number of PRH against price P, then clients of a science shop will demand research hours from point Q to point E. Alterra, a research institute linked to Wageningen UR that conducts research for organizations from outside and thus acts as a professional consultancy bureau, charges an average market-rate of €147.- per hour (Holsteijn, personal communication, 29-9-2010). This means that in Figure 1, based on Mishan and Quah (2007), point P represents 147. This may be considered a low price, but the idea is not to overestimate the value of a research hour carried out by the science shops.

We do not know exactly how many hours are demanded in the market segment of professional consultancies, but according to the methodology as presented in Figure 1 above, the area ODRQ under the demand curve from point D to point R represents society's willingness to pay for these hours. The area OPRQ represents the total amount society has to pay for the hours of research conducted by professional consultancy bureaus and the area DPR represents what the clients would additionally have been willing to pay for. As mentioned before, we assume perfect

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[1]Price discrimination means that "*the sales of identical goods or services are transacted at different prices from the same provider*" (Krugman and Obstfeld; 1994). This leads to actions that give certain buyers advantages over others; namely clients from science shops, who do not have to pay for research conducted. However, because the providers of the service are different; professional consultancy bureaus versus science shops, it is not likely that the price discrimination will lead to its typical effects; lower prices for some consumers and higher prices for others together lead to an output expansion or decline. Because the price differentiation effectively occurs in a segment of the market, there would be no effect on either the efficiency or output within professional consultancy bureaus with the engagement of science shop research in the market. In essence, there are different firms that sell the same product, but against different prices.

competition, which means that consultancy bureaus will produce up to the point where marginal costs equal marginal revenues. Hence, the square OPRQ also includes the costs that professional consultancy bureaus have to make. The triangle DPR is also referred to as the consumer surplus of professional consultancy bureaus. This is the amount of benefit that consumers gain by being able to purchase a product for a price that is less than they would have been willing to pay. Subtracting what clients actually have to pay (area OPRQ) from the willingness to pay of buyers (area ODRQ) gives us the consumer surplus (Mishan and Quah; 2007).

The second segment of the market is represented by triangle QRE, which represents the research hours that are conducted by student research, where the science shop is a part of. The costs of the science shop projects are represented by the total costs, i.e. the variable and fixed costs, for the science shop. The surface of the triangle QRE corresponds to the maximum consumer valuation of the work conducted by student research. The maximum valuation for science shop research is, as represented in Figure 1 above, part of the triangle QRE and part of this maximum valuation is composed of the total costs paid by science shops. Therefore, this part of the triangle can be best referred to as 'gross benefits of science shop research'. For each of the total units of research hours purchased, there is a different maximum valuation; the straight line from point R to each of the axes represents the different prices that people are willing to pay given a certain quantity (Mishan and Quah; 2007). We will however value the price of the research produced by the science shop as the average of the triangle QRE, which is halfway on the straight line RE. We assumed the average of this price to be half of price P, which makes the average willingness to pay for an hour of student research €73.50.

Figure 1 above shows that the economic value of science shop projects is determined by the economic behavior in the context of demand and supply. The estimate of the gross benefits will be entered as benefits in the cost-benefit calculations. Hence, they represent the welfare gain from consumption gained by the clients of the science shop. Costs, on the other hand, represent the aggregate inputs measured in monetary units and compose the salary costs and other overhead costs. Another important cost factor is the added time involved in organizing collaborative, democratic processes among members of an usually diverse project team between CSO's and science shop researchers.

There are two lines of thinking in deciding upon the next best alternative for science shop clients. On the one hand, there are the critics of science shops who say that without science shops, clients and student researchers would have found each other just by demand and supply of the market. If this is true, the next best alternative would be student research without science shops acting as an intermediary. On the other hand, there are the proponents of science shops, who argue that without the interference of science shops to regulate demand and supply, the clients would not get their questions answered. In this latter case, the next best

alternative would be where civil society organizations would turn to if they would have the financial means to do so; hence, professional consultancy bureaus. Here, we would like to perform a cost-benefit analysis based on both views of the science shops. Therefore, we will first perform a cost-benefit analysis according to the methodology presented in the previous section, where the benefits are represented by a multiplication of the amount of science shop research hours by the average willingness to pay for these hours and the costs are represented by the total costs made by the science shop.

Hereafter, we will perform sensitivity analyses from two viewpoints; the first based on the assumption that if science shops would not exist, the only option left for its clients would be professional consultancy bureaus. With this sensitivity analysis, we will estimate the amount of SRH that can compose one PRH up to the point where the science shop breaks even. It can namely be assumed that one SRH does not have the same efficiency and productivity as one PRH has. This assumption is made partly because students do not have the experience and facilities that professional researchers have and partly because of the specific field in which science shops work. Science shops operate on the cutting point between science and society. This situation sometimes leads to conflicts in the means of presentation and analysis between students or researchers and civil society organizations. These conflicts take time and may lead science shops to become less efficient than professional consultancy bureaus. Therefore, we will analyze the benefits or losses that the science shop makes with the help of a benchmark for the rate of efficiency between a PRH and a SRH. Based on discussions with supervisors of science shop projects we can set this benchmark at one PRH representing three SRH (Heijman, Oude Lansink, Straver; personal communication, November 2010).

The second viewpoint will be based on the assumption that if science shops would not exist, student and clients would meet each other via the market. In this case, the costs that the science shop as a mediator would have made do not occur. This would obviously make research where science shops interfere less cost-efficient than when the client and the student meet each other without the science shop, namely by the amount of the costs for central coordination of the science shop. A side note here is that those involved in science shop work often argue that science shops do not only connect client and student, but also lead to a higher quality product, because they also supervise and support the whole research process. Here again, we will use a benchmark for the amount of SRH that would also have been conducted if the science shops would not exist. Based on discussions with science shop leaders, we decided to use a benchmark that without science shops, only 50% of science shop clients would get their research question answered (Sijtsma, personal communication).

These two viewpoints will lead to four different scenarios performed on the science shops, as they are represented in Table 1 below. In scenarios 1 and 3, we will use a positive

view on science shops, where 1 PRH represents 1 SRH. In scenarios 2 and 4, we will use the benchmark of 1 PRH represents 3 SRH. In scenarios 1 and 2 we will use the proponent's viewpoint that without the science shop, its clients would not get their questions answered. Scenarios 3 and 4 use the benchmark of 50% of SRH, that would also have been conducted if science shops would not exist.

Table 1. Different scenarios for sensitivity analyses on science shops

Scenario	1	2	3	4
SRH-PRH ratio	1 PRH:1 SRH	1 PRH:3 SRH	1 PRH:1 SRH	1 PRH:3 SRH
Without science shop	0	0	50%	50%

In this study, we will treat the student input and academic supervision without cost because they are considered to be part of the education process. It could however be argued that by having students conduct science shop research, the research is, at least in some countries, partially government financed (Sclove *et al.*, 1990). For example, part of the basic education of Dutch university students is government financed. This would mean that science shops would receive an effective government subsidy when they enroll student researchers. However, this argument can easily be rejected by the fact that the education of all Dutch university students is government financed, whether or not they are in that minority of students that choose to do a science shop project.

In the same way that universities are often specialized in certain research areas, science shops also focus on answering research questions from specific academic fields. It is possible that projects from different fields may bring different costs or benefits. Because each science shop focuses on its own field, they do not compete with each other. Therefore, we will treat each science shop as a separate segment of the market and compare this segment with that of professional consultancy bureaus. In the next section, we provide an overview of the results of the above mentioned methodology, applied to the three science shops.

3. Data

The difference in origin and structure of science shops is likely to cause variation in the costs and length of projects and research hours conducted at science shops. In order to overcome variation in costs or revenues between years, we tried to use a five year period for our analysis to measure the costs and benefits of research hours conducted for each science shop. For reasons of the date of establishment or large changes in structure, we did however sometimes have to use shorter periods of analysis. In this section, we will shortly introduce the three different science shops analyzed and give an overview of their costs over the past years.

Since its establishment in 1985, Science Shop Wageningen is the place for CSO's with research questions in the field of Wageningen University and Research Centre (Wageningen UR). In the 25 years since its establishment,, Science Shop Wageningen has conducted more than 260 research projects. It is the ambition of the science shop to start and finalize 10 projects per year. With an average of 13 projects per year over the past 5 years, it easily meets this aim. The science shop guides research projects for civil society organizations that do not have the financial means to turn to professional consultancy bureaus. The prerequisite is that these organizations are prepared to use the research results and that requests need to fall within the research fields of Wageningen UR: sustainable agriculture, food and health, a livable green environment and processes of social change (Aalbers, Padt; 2010). Table 2 below shows an overview of the costs of science shop Wageningen, where the overhead costs are the costs that are independent from the projects and the variable costs are connected to the projects.

Table 2: Costs and hours spent by science shop Wageningen over the past 5 years in euros

	2009	2008	2007	2006	2005	Total
Overhead Costs	14232	120595	121700	84015	78868	419410
Variable Costs	340442	420826	304060	280238	325000	1670566
Total Costs	354674	541421	425760	364253	403868	2089976
Total amount of SRH [a]						64200
Total amount of PRH [b]						16342

[a] Based on the number of credits that students receive. One credit = 28 hours.

[b] 90% of total variable costs are composed of salary costs. An internal tariff of €147/hour in 2010 is used.

In Belgium, science shops have been established since the academic year 2002/2003, initially with a pilot of 3 years initiated by the universities of Brussels and Antwerp and subsidized by the Belgian government. As of 2006, the government obliged every university to establish a science shop, which led to the network of Flemish science shops that coordinates all Dutch-speaking Belgian science shops. This network consists of two active science shops who together answered 40 research questions in 2009; those of Brussels and Antwerp, and three rather inactive science shops; those of Leuven, Hasselt and Gent, who together only answered one research question in the same year. The strength of the network of science shops is in the fact that five science shops possess the means to answer a question from society; however, with only two of the five science shops actively functioning, this may also become a weakness.

The coordination of the network, under the name "wetenschapswinkel.be", is in hands of a central unit connected to the *Vrije Universiteit Brussel* (VUB). The wetenschapswinkel.be is the central contact point for non-profit organizations which search for scientific support via

research or advisory services. It's most important tasks are in promotion and information, assembling and distributing requests of new organizations and supporting regional science shops and taking care of the national and international networks. As of 2008, the science shops are officially part of the range of responsibilities of "science and communication" in Belgium. Science and communication is financed by the Flemish government, but the exact method of financing depends, among others, on the size of the science shop. At least until 2011, the science shops will be financed by the government, but the budget is decreasing because of the economic crisis. Here, we will focus on the science shop Brussels, of which the costs can be found in Table 3 below.

Table 3. Costs and hours of research conducted in the science shop Brussels

	2009	2008	2007	2006	2005	Total
Overhead costs central unit [a]	6360	6360	6360	6360	6360	31800
Overhead costs science shop	66880	66880	66880	66880	66880	334400
Total Costs	73240	73240	73240	73240	73240	366200
Total amount of SRH[b]						71680
Total amount of PRH [c]						0

[a] Yearly labor costs of €25,000 between 2005–2007 (0.3 FTE) and €20,000 between 2008–2009 and other costs of €6800 divided by the number of science shops (5)
[b] Student research hours, all from master theses (20 ECTS)
[c] Professional research hours

At the science shops in Eindhoven in the Netherlands, research is completely conducted by students who, guided by scientists from the university, try to answer questions that mainly come from individual persons and small and medium enterprises (SME). The students are supported by the facilities of the university and their work can lead to for example a tangible product such as a technical tool for patients or a research report that analyses harmful substances in materials. There are four science shops in Eindhoven that conduct research for civil society organizations. These science shops are the architecture shop, the chemistry shop, the electro shop and the physics shop. Each of these science shops is linked to a faculty of the university. The different science shops meet once every two weeks to discuss the progress under the different science shops.

In this article, we focus on the Chemistry Shop Eindhoven. This science shop was established in 1973 under the name "*Milieu Aksie Groep T*" and changed names to Chemistry Shop Eindhoven in 1975. The aim of the chemistry shop is to function as an information center, specialized in chemistry and the environment, for society. Initially, the chemistry shop Eindhoven was based on the

idea to conduct research for individual persons against low costs. During the academic year 2006-2007, the chemistry shop started to also include cases from SMEs. The idea behind including this sector is that, because of the low costs of student work, it becomes affordable for small or new companies to have their research conducted by the chemistry shop. Apart from the attractiveness for its clients, the chemistry shop provides possibilities for students to apply their knowledge to other areas of chemistry and development. Table 4 below shows the costs for the science shop Eindhoven.

Table 4. Costs and hours of research conducted in the chemistry shop Eindhoven

	2009–2010	2008–2009	2007–2008	2006–2007	Total
Salary Costs	26281	31086	27653	28556	113576
Other Costs	2840	4523	5767	4008	17138
Total Costs	29121	35609	33420	32564	130714
Total amount of SRH[a]					16459
Total amount of PRH					0

[a] 0.9 FTE for 5 board members €16.- / hour for executive work

4. Results

For the three science shops mentioned, we performed a cost-benefit analysis and a sensitivity analysis based on both views on the next-best alternative for science shops. In the comparison between science shop research and that of professional consultancy bureaus, we estimated the number of SRH that can compose one PRH up to the point where the science shop breaks even. This based on the idea that students at science shops are often less efficient than researchers working for professional consultancy bureaus; partly because students do not have the experience and facilities that professional researchers have and partly because of the specific field in which science shops work.

Figure 2 below presents the net-benefits of the science shops with different rates of efficiency of a PRH relative to SRH when other things remain equal. In the most extreme case, where a student hour is not of any use, all science shops would make a loss. It is however very unlikely that a student hour would not be of any use. Therefore, in analyzing the cut-off point of the efficiency of a student hour, we can see that the break even ratio of 1 PRH represents between 5 and 6, 19 and 20 and 9 and 10 SRH for respectively science shop Wageningen, Brussels and Eindhoven. Here, the science shops break even in their costs and benefits; costs and benefits respectively equal €417,995, €183,100 and €32,679.
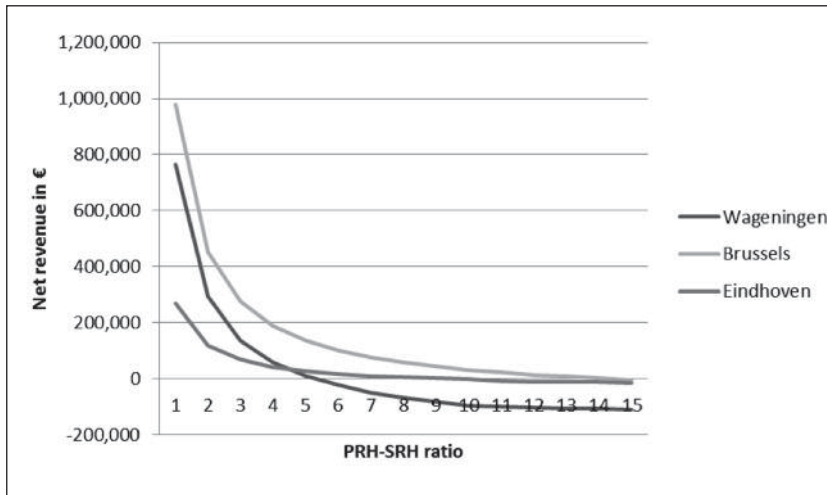
Figure 2. Comparison of science shop revenues with changing SRH/PRH ratio

All science shops end up with negative results under the scenario that one PRH equals 3 SRH and 50% of the SRH would also occur without the help of the science shop. Most striking in these losses is the small loss for Wageningen. This result is due to the fact that the science shop acts for a relatively large part as a professional research bureau and therefore the loss of 50% of the SRH does not have a large effect on the science shop Wageningen compared to the others. However, again the ratio of 1PRH: 3 SRH combined with the 50% of SRH that would also have occurred without the science shop is probably quite a strict calculation in the cost-benefit analysis. We can therefore conclude that the best guess of the economic efficiency of the analyzed science shops would be halfway between the most positive scenario (Scenario 1) and the most negative scenario (Scenario 4). This conclusion would lead to the net benefits as presented in Table 5. From this table, we can conclude that both large and small science shops can be economically efficient.

Because of the large difference in size and structure of the science shops, it is difficult to compare their costs and benefits. Table 5 below does however show that the CBA on the science shops Wageningen and Brussels result in much larger benefits. This result can be easily explained by the size of the science shops. With an average of 13 projects per year over the past 5 years and a maximum working budget of €35,000.- per project, science shop Wageningen is one of the larger science shops. This situation also counts for Brussels, characterized by a central coordination point that oversees all Belgian science shops and a budget of nearly €70,000 per year. There is however quite a large difference in annual budget between these two science shops, which is reflected by the difference in PRH-SRH ratio. This difference in fixed costs for coordination can mainly be explained by the fact that also researchers of Wageningen University conduct research for the science shop, where research of science shop Brussels is only conducted by students.

Table 6. Best guess of economic efficiency of science shops

Science shop	Annual Net benefits (€)
Wageningen	215 457
Brussels	365 800
Eindhoven	93 335

From Table 6 above, we can also conclude the financial risk of a small science shop like Eindhoven, being measured as the absolute value of the net benefits of the least beneficial scenario (Scenario 4) is smaller than the risk of larger science shops like Brussels and Wageningen. The net benefits of the most positive scenario (Scenario 1) are bigger for the larger science shops.

5. Conclusion and discussion

A previous study conducted by Sclove *et al.* (1990) has shown that, compared to professional consultancy bureaus, community-based research is relatively efficient. One main reason for this is that science shops often rely on student or community volunteers. Obviously, the studies would be

Table 5. Comparison of CBA results and sensitivity analyses between science shops

Scenario	1	2	3	4
SRH-PRH ratio	1 PRH:1 SRH	1 PRH:3 SRH	1 PRH:1 SRH	1 PRH:3 SRH
Without science shop	0	0	50%	50%
WAGENINGEN				
With science shop (€)	765,972	136,812	765,972	136,812
Without science shop (€)	0	0	471,87	471,87
With – Without (€)	765,972	136,812	294,102	-335,058
BRUSSELS				
With science shop (€)	980,456	277,992	982,016	277,992
Without science shop (€)	0	0	526,848	526,848
With – Without (€)	980,456	277,992	455,168	-248,856
EINDHOVEN				
With science shop (€)	269,755	68,132	269756	68,132
Without science shop (€)	0	0	151217	151,217
With – Without (€)	269,755	68,132	118539	-83,085

much more expensive if citizen groups would have to pay professional researchers.

In this paper, we analyzed whether science shops are efficient from an economic perspective according to two views on the next-best alternative; the first one professional consultancy bureaus, the other one the assumption that if science shops would not exist, students and clients would find each other via demand and supply of the market. Here, we provide a conclusion on the results obtained and highlight some important items for further discussion and improvement in order to rightfully assess the social desirability of science shops.

We analyzed the social desirability relative to its next best alternative; where clients of science shops would turn to if science shops would not exist. The analysis has been based on the assumption that science shops provide scientifically valid services for groups of people that would otherwise not be served. For proponents of the science shops, this means that the next-best alternative for clients of science shops would be the market of professional consultancy companies. Science shops offer their services against much lower prices than professional consultancy bureaus do and thereby fulfill another segment for the market of answering research questions of society. Without this segment, CSOs or SMEs would not enter the market because of their financial restrictions. However, this difference in pricing does imply price discrimination in the market.

Critics of science shops argue that without science shops, clients and students would have found each other just by demand and supply of the market. In this case, the next best alternative would be student research without science shops acting as an intermediary. It is however quite unlikely that without the existence of the science shops, all clients would be able to find a student to conduct their research. However, if this would be true in theory, it is still likely that science shops do not only connect client and student, but also lead to a higher quality product, because the science shop supervises the whole research process of the student.

The analysis provided in this study gave some useful insights in the costs, benefits and efficiency of science shops. There are however a number of other important aspects to keep in mind when evaluating the social desirability of science shops. Here, we will touch upon the most important of these.

In our CBA, the benefits have been represented by a multiplication of the amount of science shop research hours by the average willingness to pay and the costs have been represented by the total costs made by the science shop. We used €147.- as the threshold value of price P for an hour of research conducted at a professional consultancy bureau and assumed from this that the demand curve was a straight line to each of the axes. We are however aware that another threshold value as the price for a professional research hour or another slope of the demand curve would lead to very different results.

The CBA analysis only took the direct costs and benefits into account. Costs and benefits can however be disaggregated into three categories: direct, indirect and intangible. Direct are those costs which are directly related; such as overhead and labor costs, which are taken into account in related markets. Indirect costs refer to the inputs and outputs that occur outside the science shops. These indirect effects could be measured by the earnings foregone or enhanced due to the work of the science shops. These are reflected by the value of production lost or gained by society. Intangible costs or benefits refer to the internal valuation of people to costs incurred or benefit obtained by science shop work (Brent, 2009).

It can easily be assumed that the projects conducted by science shops have not only led to direct costs and benefits, but also to indirect ones. These indirect costs and benefits are however very difficult to measure in monetary terms. Including all costs and benefits of the projects conducted by science shops will be very hard. Not only is it difficult to indicate a monetary value to all costs and benefits, but also to measure externalities. In economic theory, different techniques to measure non-market valuation have been developed. Among these are the stated and revealed preference techniques. The stated preference techniques rely on answers from surveys where revealed preference techniques draw statistical inferences on values from people's market behaviour. (Brent, 2009). However, science shops often do not possess these kinds of data and acquiring them is outside the scope of this research.

Moreover, science shops themselves do not only focus on answering research questions for clients, but do also bring a valuable contribution to the education of students by offering practical topics for, amongst others, master theses. In this way, they not only aim at answering research questions of private persons, CSOs or SMEs in realizing their future plans, but also bring a valuable contribution to the training, and possibly motivation, of students for their further jobs. Moreover, the fact that science shops are generally linked to universities makes them the ideal bridge between science and society and allows them to often bring new, innovative approaches to answer research questions.

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