The effectiveness of the Innovation Voucher 2004 and 2005: effect on innovative inputs and innovative output of companies (The Netherlands)

1. Introduction

This case study presents an account of an evaluation of a Dutch pilot scheme to provide innovation vouchers to SMEs to encourage them to work more closely with the public research system in the Netherlands.

The Innovation Voucher pilot was launched in 2004 by the Ministry of Economic Affairs, Agriculture and Innovation in recognition that many smaller businesses were innovating only occasionally and in a rather incremental fashion. This was believed to be problematic (weaker overall global competitiveness) and policy makers considered that some improvement might be realised by strengthening the links between SMEs and the country's knowledge institutes, as partners in innovation. A voucher was seen as a novel and potentially powerful means by which to persuade businesses to try collaborating with the science base.

The Ministry of Economic Affairs, Agriculture and Innovation (EZ) commissioned the first evaluation of its Innovation Voucher scheme from the CPB Netherlands Bureau for Economic Policy Analysis. The evaluation was carried out in two rounds, in 2005 and in 2006. The ministry went on to commission a more qualitative evaluation in 2008, from a private consultancy, Dialogic.

The evaluation is presented in a published Dutch-language report the title of which, in English, is, *The effectiveness of the Innovation Voucher 2004 and 2005: effect on innovative inputs and innovative output of companies*.[1]

The CPB evaluation found clear evidence for a strongly positive effect on SMEs' willingness to commission work from a public-research institute, where the very great majority of those enterprises had not entered into such relationships previously. The review found no evidence of a positive or negative effect on innovation outcomes, however that was a result of the timing of the evaluation (just two years after the launch of the scheme) and the fact that a single €7,500 voucher was unlikely to immediately transform the innovativeness of an entire firm.

The CPB evaluation was intended to help the Ministry determine the effectiveness of this kind of innovation-support measure: could these mid-value and highly flexible vouchers cause SMEs to change their innovation behaviour and improve their innovativeness. The evaluation methodology was also deemed to be of particular interest, inasmuch as the decision to distribute the vouchers randomly by lottery provided the study team with an obvious treatment group *and* control group, which made possible the use of an experimental methodology that is unusual in this policy realm and promised a more robust analysis of the programme effects.

[1] De effectiviteit van de innovatievoucher 2004 en 2005: Effect op innovatieve input en innovatieve output van bedrijven, by Maarten Cornet, Marc van der Steeg en Björn Vroomen, CPB Document No 140, Centraal Planbureau (CPB), Den Haag, 27 February 2007. The report is available to download at www.cpb.nl/publicatie/de-effectiviteit-van-de-innovatievoucher-2004-en-2005-effect-op-innovatieve-input-en-inno.

2. Description of the evaluated measure

The Dutch innovation voucher was designed to stimulate increased interaction between small and medium-sized enterprises (SMEs) and public research institutes. With the 2004 pilot, the Ministry was seeking to test what was a new innovation-support measure for the Netherlands, in order to determine whether it might work in this setting. Specifically the Innovation Voucher set out to:

- Boost SMEs' innovative capacity;
- Stimulate knowledge exchange and direct connections between SMEs and Knowledge Institutes;
- Stimulate a demand-driven knowledge infrastructure (i.e. encouraging the research base to increase the proportion of its total research work that is oriented explicitly towards the knowledge and technology needs of smaller enterprises).

The pilot scheme was launched in September 2004 with first call offering 100 vouchers, each with a value of up to €7,500. In principle, the scheme was open to any SME no matter their size of previous innovation history. The credit note was valid for 6 months and had to be used to commission one or other universities or research institutes (from a defined group of institutes within the Netherlands) to answer an application-oriented research question. There were no restrictions on the level of the question or the technology field and recipients were not required to make any kind of matching contribution. The applications were screened for compliance (i.e. submitted by a resident SME and comprising an applied research question) and then the vouchers were awarded by lottery rather than the application of more formal quality or impact criteria due to the level of oversubscription. Some 1,400 eligible applications were received for the 100 vouchers initially offered, and two further calls were announced in response. Those two calls were issued finally in 2005, with an additional 400 and then 600 vouchers on offer (1,000 in total), each call attracted a further 2,500 applications, which amounted to around 5,000 unique applications in total for 1,100 vouchers issued through the pilot scheme.

Figure 1 Background information

Name of the programme	Innovation Voucher
Type of measure	Direct financial support for innovation
National budget[2]	c. €7.5M (2004 and 2005 combined) c. 22.5M (2006) c. 22.5M (2007) c. 30.0M (2008)
Start / end date	Pilot Phase, 2004 to 2005 Phase 2, 2006 to 2008
Geographical coverage	All SMEs in the Netherlands

3. Designing the evaluation study

As with any important new scheme in the Netherlands, the approval and launch of the Innovation Voucher created an obligation from the parliament on the ministry to evaluate the scheme. However, this early evaluation was commissioned as a result of an unsolicited expression of interest made to the ministry by the CPB Netherlands

[2] Taken from a presentation given by Hans Simons, Manager SME knowledge networks, SenterNovem, and presented to a seminar on Innovation Vouchers held at NESTA in London, October 2008.

Bureau for Economic Policy Analysis.[3] A research group at the CPB had been made aware of the proposed new innovation-support measure through its routine information exchanges with the government, and this team had formed the view that the pilot scheme was an excellent candidate for carrying out a state-of-the art evaluation. The CPB put its proposal to the ministry very enthusiastically and overcame officials' initial wariness about allowing this very eminent group of social scientists to study the effects of what was a novel scheme in its startup phase. Intellectual curiosity prevailed, and as a result the ministry invited the CPB team to develop its proposal further, but placing a particular emphasis on the effects of the scheme on the participants' interactions with the knowledge base.

There was no formal tendering process, but rather an iterative process whereby the evaluation customer negotiated with the policy analysts at the CPB about the scope, methodology and budget for the work. It was the policy analysts rather than the ministry customer that pushed to use the experimental methodology, and asked that the ministry and SenterNovem (SN)[4] allocate the vouchers by lot so as to randomly distribute the assistance across the business population.[5] The ministry's internal economists provided an econometrician to review the quantitative methodology in discussion with the CPB analysts, which proved helpful to the clarification and agreement of the key parameters. An obvious lesson from this approach is that it is important for all parties to agree on the questions and methods, if the findings are going to be taken seriously and acted upon.

As noted already, the use of a lottery produced a natural experimental and control group for the evaluation. The CPB team was also given access to the content of the voucher application forms, which had captured important data on the SMEs, as regards their size and sector and their previous involvement with publicly-financed innovation-support measures. In addition, the delivery team at SenterNovem had been gathering data on recipients through its monitoring functions and participant surveys and these additional data were shared with the study team.

Chapter 2 of the evaluation report presents the central evaluation questions, as agreed between the ministry and the team at the CPB. From this one can see that the evaluation was designed to answer two questions, which were:

- The effect of the Innovation Vouchers on businesses' innovativeness (the number and type of innovations).
- The effect of the Innovation Vouchers on businesses' commissioning of innovation support from knowledge institutes (their willingness to partner with knowledge institutes).

What we have termed 'the evaluation' really comprised two rounds of evaluation, wherein the first round of the evaluation was carried out in 2005 and focused on the impact of the vouchers on SMEs' links with the knowledge base.[6] The second round of the evaluation was carried out some 12 months later, and was able to pose the same

[3] The CPB is an independent research group that carries out studies and provides advice to all parts of government, members of parliament, national trades unions and so on.

[4] SenterNovem was the national agency responsible for administering the pilot voucher scheme. At the time, it was an agency of the Dutch Ministry of Economic Affairs, Agriculture and Innovation with responsibility for the design and implementation of a range of schemes to support innovation and sustainable economic development. SenterNovem was reorganised in 2011, and is now called Agentschap NL (Agency Netherlands), however it remains the main delivery organisation and point of contact for innovation support. Readers can find more at www.agentschapnl.nl/nl

[5] The ministry declined to follow this advice originally. In the event, the first call attracted around 1,400 applications for just 100 vouchers and the imbalance between supply and demand was so great it was decided that a lottery was indeed the most equitable means by which to decide the allocation.

[6] This first-round evaluation – of the 2004 cohort – is presented in a CPB working paper, in English, which can be found at www.cpb.nl/publicatie/do-innovation-vouchers-help-smes-cross-bridge-towards-science

question to the businesses securing vouchers through the second, third and fourth calls (issued in 2005 and 2006), while also re-interviewing recipients (and unsuccessful applicants) of the first wave of vouchers in order to test the 'persistence' of the effects: did businesses commission subsequent work from the knowledge base after the first grant and without further assistance.

Chapter 2 of the evaluation report also makes it clear that the study did not set out to address a series of other interesting questions, which might very well have been tackled. The team at the CPB and the clients within the ministry wanted to focus their efforts and finite resources on robustly answering the key 'operational research' question, which is to say, did the Innovation Vouchers improve SMEs' links with the knowledge base and improve their innovativeness. The study did not attempt to:

- Quantify the net economic impact of the vouchers (i.e. monetise any resulting commercial benefits attributable to the voucher), and judge its value for money through an overarching cost-benefit analysis.
- Determine the extent to which the Innovation Voucher scheme was more or less effective at making those connections and driving innovation than any other policy option. Equally, the evaluation did not consider the relative efficiency of a voucher as compared with any analogous measure.
- Detail the effect of the voucher on the internal culture, attitudes and capacities of the scheme's beneficiaries (with this approach, businesses' innovation processes remained a black box).

The two rounds ran concurrently and each lasted for 12 calendar months and each involved a budget of around €100K, to pay for the 3-person team within CPB.[7] Staff at SenterNovem carried out the telephone interviews under CPB instruction and this work was paid for separately, perhaps amounting to another €50K for the two rounds of telephone interviews, which makes a total budget of some €250K.

4. Implementing the evaluation: methodology and process

The commissioning of the evaluation went hand-in-hand with the design of the specification, wherein the CPB policy analysts defined the study in negotiation with the ministry and its delivery agency. The work was procured through a negotiated procedure, rather than the kind of restricted or open procedure that might be used under other circumstances.

The evaluation process followed the CPB's standard model, rather than the ministry's, wherein the study team worked closely with several lead contacts in the ministry and SenterNovem, with three or four review meetings being held across the life of the study to follow progress and discuss / resolve any matters arising. The full meetings focused on the key milestones of questionnaire design, the draft report and the final report, with numerous smaller ad hoc gatherings and telephone / email exchanges. This level of interaction is seen as being extremely important for the detailed design of for example the questionnaire survey and its successful implementation. In addition to the tripartite evaluation working-group, the CPB innovation voucher team was required to submit its interim report to the CPB director and an ad hoc scientific committee that included peers from within the think tank itself and other domain and methodology experts.[8] The scientific committee also 'peer reviewed' the draft final

[7] The CPB component of the evaluation was paid for out of the CPB budget, rather than the ministry directly. Although, as an agency of the ministry of economic affairs, the CPB budget does ultimately originate with the ministry.

[8] The process might involve two internal peers, one of whom is the director of CPB, the other person is typically invited by the director, in line with his or her area of specialist interest. The external reviewers

report. The ministry was not part of this peer review process. The evaluation report was subsequently published and the results and the methodology have been presented at numerous conferences and seminars within the Netherlands and internationally.

Turning to the study design, the evaluation might best be described as an experimental methodology that made full use of the scheme's natural creation of a treatment group and a control group. The approach comprised four main activities, namely (1) desk research, (2) a questionnaire survey directed to a sample of voucher holders from the first three calls (the experimental group), (3) a questionnaire survey directed to a sample of SMEs that applied for vouchers but were not selected to receive an award (the reference or control group), and (4) an interview round with businesses, knowledge institutes and other stakeholders in order to better understand the results.

The desk research consists primarily of collecting and analysing existing data and information about the innovation voucher. In the second round of the evaluation, the resources were more substantive and in addition to the meta data from the applications and applicants, included the first round evaluation of the innovation voucher, SenterNovem progress and monitoring reports on the innovation voucher and other publications and websites on the voucher (articles, letters to, etc.). The desk research provided several critical inputs, beginning with the questionnaire and results of the first evaluation and the comprehensively profiled database of SMEs – recipients and non-recipients – as well as important baseline information on businesses' pre-existing relationships with the research base.

Around 7,000 SMEs were awarded vouchers across the first four calls, from 2004 – 2006, which provided an excellent starting point for a sample survey of the experimental group. SenterNovem provided information on all voucher holders, which the CPB team used to create a cleaned and consolidated database of 6,923 cases (voucher holders from 2005 and 2006). Subsequently, the team converted any multiple awards into single cases (the rules allow firms to be granted one voucher each year) and removed all firms that had bee interviewed for an earlier telephone campaign by SenterNovem in June 2007 in connection with a review of service quality. The remaining set was then divided and randomised into one set for 2005 (559 companies) and one set for 2006 (3,844 firms). Finally, the 2006 cohort was split in two, to create one database of almost 2,000 SMEs for the impact evaluation and a second database for a customer satisfaction survey SenterNovem was planning to implement. The sampling procedure ensured good coverage and was fully stratified across a spectrum of characteristics such as type of voucher, firm size and industry sector. The target response for the experimental questionnaire was 500 businesses, with 150 from the 2005 cohort of awards and 350 from the 2006 recipients. Ultimately, SenterNovem secured responses from 518 firms (149 for cohort 2005 and 369 for cohort 2006).

To complement the experimental questionnaire, the study team elected to survey a reference group of SMEs that applied for a voucher but were unsuccessful in securing an award. The randomised allocation of vouchers to applicants by lottery created a natural control group of (matched) firms wherein the team believed that any (significant) differences found between the voucher holders and the reference group, on for example their changing levels of interaction with knowledge institutions might be attributed to the voucher. The reference group was profiled using a similar set of criteria to the voucher holders, but principally sector and size (thereby effectively pairing the two samples). Ultimately, 571 businesses completed a questionnaire focusing on their relationships with the knowledge base.

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again are typically invited to provide a critical review by the Director, following an exchange of views with the authors about suitable candidates. In this case, that was two professors from Ecole Polytechnique Fédérale de Lausanne and the Zentrum für Europäische Wirtschaftsforschung (ZEW). Professor Dominique Foray is the one named individual; Professor Foray is a leading economist and director of an institute in Lausanne specialised in analysing the relationship between economics and the management of innovation.

Lastly, the team carried out several dozen telephone and face-to-face interviews among various parties involved in the voucher scheme: policy makers, implementing agencies, research institutions and companies. These semi-structured interviews were used to explore different perspectives on the effects of the voucher on firms and on knowledge institutions in turn and on their interactions. Issues that were explored included: *Do voucher recipients extend their contact with knowledge institutions more generally, and in what ways; are there new orders placed with institutions; how do institutions manage the after sales relationship; do voucher winners manage to innovate as a result of these new collaborations?*

5. Effectiveness and efficiency of evaluation

The use of an experimental design is unusual in evaluations within the innovation policy realm, as it is generally accepted that establishing a matched sample that mirrors the characteristics of the assisted organisations is methodologically challenging and rather costly. Notwithstanding this point, experimental methodologies are considered to be the 'gold standard' in policy evaluation and in this case the client and the contractor both take the view that this particular evaluation was of a very high quality and methodologically robust.

In the real world however there are always methodological issues that arise, which may reduce somewhat the absolute robustness of even an evaluation with the intrinsic qualities reported here, which demand a little more caution in the interpretation of the results and the formulation of conclusions.

- The second-round evaluation was conducted at a point in time where the 2006 vouchers were still valid and recipients may not have redeemed those credits at the point when the interview was carried out. This reduced the total number of cases therefore where interviews were carried out ex-post.
- With only 100 vouchers awarded in the first call (2004), the first round evaluation was confronted by certain structural difficulties, with the absolute number of responses – experimental and reference – being rather small (even with high response rates), when considered against the diversity of the SME population and the varied nature of innovation behaviour across firms and sectors.
- Notwithstanding this limitation of small numbers, the results of the first-round evaluation contributed to the ministry's decision to increase the Innovation Voucher budget and by 2006 the scheme had sufficient funds for all applicants to receive a voucher. So, in 2006 there was no natural reference group of 'unlucky' applicants that one could use as a mirror for the cohort of voucher recipients. CPB attempted to overcome this limitation by creating a reference group of SMEs – matched for size and sector – with the help of the country's chambers of commerce, screening out all of those firms identified that were known to have applied for or received a voucher at some point in time. The study team was very well aware of the limitations to this matching process, where data limitations for both groups meant there was no real possibility to match the two groups on the innovation or R&D profiles.
- 2006 also saw the introduction of several important changes to the innovation voucher: firstly, a fourfold increase in the budget removed the need for allocation by lottery; secondly, the credit had to be matched by a contribution from the recipient; a second type of voucher (a small voucher, up to €2000) was introduced; and lastly, the number of participating institutions increased. These changes make a comparison between 2005 and 2006 difficult, and so in response the analysis focused on the recipients of the larger vouchers.

The report was therefore cautious in its presentation of the results, and placed rather more weight on the comparisons among the 2004 and 2005 cohorts.

- The sample frame was smaller than CPB would have wished, which was partly a result of the resources the ministry allocated to conduct the telephone interviews (a larger budget could have secured a higher response rate) and a more general commitment to protect SMEs from unreasonable administrative costs, wherein the ministry and SenterNovem had an agreement (part of the terms and conditions) with recipients that they would only be asked for feedback on the innovation voucher once. Almost 4,000 firms in the total population were ruled out of bounds due to previous or proposed monitoring surveys.
- Even with a 25% response rate, the number of data points – given the diversity of the population – was felt to be something of a limitation, which may lead to a (small) bias in the results and a reduction in statistical significance.
- There were issues with non-respondents, wherein response rates were substantially better for the more recent calls and substantially worse for the earliest calls.
- The early application forms missed the opportunity to gather basic information on SMEs' innovation activities and pre-existing links with knowledge institutions, which meant the baseline had to be reconstructed after the fact through the questionnaire surveys. Moreover, the study team rightly elected to keep questions to a minimum and sought to establish a baseline relating to the frequency of relationships with the science base and did not establish a similar position vis a vis innovation (the evaluation did not attempt to compare assisted SMEs with all SMEs, in terms of innovation performance).
- CPB did a great deal of statistical work to ensure the representativeness of the sample for the experimental group and the reference group. First, the profile for the population of all voucher holders was compared with the profiles for the experimental responses (checking for both sampling error and response bias). Secondly, the team checked the profiles for the experimental respondents with the reference group and concluded that the groups were comparable and that there was no need to correct for any evident differences through for example weighting the raw results.

While it is possible to make adjustments for these various endogenous factors (e.g. changes over time in scheme design) it is less easy to adjust for certain types of exogenous factors such as changing macro-economic conditions or even the changing government policy in the research and innovation realm (e.g. gradual extension and expansion of the national R&D tax credit).

It is not clear how the evaluation might have been carried out differently, in order to arrive at a set of results that were equally robust. With the benefit of hindsight, it is clear the survey of the 2006 cohort was problematic, with the radical changes in scheme design (disclosed and implemented after the second round evaluation had been agreed and launched) and budget. Budgetary constraints and rules on burdening SMEs limited the team's options for better matching the recipients with a control group, and increasing the numbers of recipients of the larger vouchers.

The experimental design clearly demonstrated its value however. The results of the experimental survey suggested a slightly more positive effect for the innovation voucher as compared with the results of the analysis using the experimental and reference groups, albeit both analyses showed a clear positive effect on industry-science relationships. The experimental survey asked recipients to self-rate the extent to which the voucher had caused their business to increase the frequency or intensity of interactions with knowledge institutions, as well as attempting to establish a pre-assistance baseline. The CPB team believe this difference is an indication of a positive bias among the assisted population.

6. Conclusions and lessons learned

There are many aspects of the evaluation that worked well from a methodological perspective, including the following points:

- The fact that the study design was first proposed by a team of experienced, independent policy analysts with excellent statistical and econometric skills, and well-known to the ministry, clearly gave the ministry the confidence to move forward with a challenging study.
- The experimental design produced robust results, which have attracted the attention of policy makers and practitioners. It also gave the ministry the confidence to move quickly to increase the total annual budget available for Innovation Vouchers.
- The agreement to support a longitudinal study design, with the evaluation run in two rounds proved to be important to the assessment of the longer-term effects of the innovation vouchers.
- The longitudinal design also meant that the overall evaluation was able to pool the data from both evaluation rounds and create a larger sample size, and thereby increase the significance / confidence levels of the subsequent statistical analyses.
- The second round of the evaluation also made full use of the administrative and monitoring data provided to the study team by SenterNovem, which helped with the sampling design and questionnaire refinements.

There were evident successes in terms of the working arrangements too, with the close interaction between the ministry and the study team allowing the research process to be developed naturally in line with interim findings from desk research or interviews.

The degree of trust between the parties also meant that the client was prepared to allow the time (and budget) to very carefully design and test the data collection tools (questionnaires). Innovation is a complex phenomenon, and the time devoted to developing the definitions of key concepts – such as 'an interaction with the science base' – and key metrics (frequency, significance, time-frames, etc) was vital to ensure responses were meaningful. The team also made good use of the definitions and questions used in the Community Innovation Survey, in order to facilitate certain wider comparative analyses.

The interviewers were also trained specifically to carry out the survey and were instructed to check answers back with people where they felt a response was somewhat vague or possibly inconsistent. This level of attention to detail is unusual and would almost certainly have led to higher data collection costs than might be typical with a more conventional commission from a market research company.

From the perspective of the CPB, the main lessons were:

- Knowledge institutions and SMEs interact in many ways and for many reasons, so it is important to be clear about the programme theory and to use this to define good / precise metrics (to guide the primary research and data collection) that capture the intervention logic and so produce a view of effects that is meaningful.
- Innovation behaviour is highly diverse, even with sectors, which in simple terms means analysts should seek to work with larger rather than smaller samples in order to get to any kind of statistical significance.
- The creation and use of a reference (control) group is desirable and a powerful means by which to control for the natural response biases typical of assisted populations (positive and negative) and thereby more robustly determine the net effect of a given innovation-support measure, especially as there is rarely an obvious macro-economic reference or baseline that is suited to the level of aggregation of a typical innovation support measure.

- While the ministry's decision to change the budget, scheme design and funding rules for the innovation voucher – between 2005 and 2006 – had proved challenging for the overall methodology, it also hinted at the potential value of running evaluations of different variants. So, in this case, for example, the qualitative research suggested that the small vouchers had a similar effect to the large vouchers, at a third of the price.

The CPB team also made several suggestions regarding the design and operation of the voucher scheme, going forward. So, for example, there was a suggestion that all applicants and recipients should be obliged to support future evaluations as a condition of making an application, and that applications should as a matter of course collect all of the basic information the evaluation would need in order to characterise the pre-treatment population (a baseline).

The ministry's officials were very pleased with the scientific rigour of the evaluation and its early findings, however it is rare within the innovation policy arena to have access to good control groups, and so this kind of experimental methodology had never been used before and has not been used since. The ministry did derive some insights of course, and in particular they realised just how sensitive the findings can be to the timing of the evaluation – within the lifecycle of a scheme – in the innovation arena; time lags are a real factor.

The principal challenges that must be overcome with an evaluation of an innovation voucher instrument are similar to many other research and innovation measures, and include: the smallness of the awards and resultant effects, the rather intangible nature of the most immediate benefits (not easily captured, counted or monetised), the time lags between awards and the ultimate impact on innovation behaviour and outcomes, and of course the rarity and skewedness of major innovation successes.

Lastly, any evaluation ought to include a question about unexpected results, as the experience of running the innovation voucher revealed a number of issues in terms of the Knowledge Institutes' offer to businesses and the third evaluation confirmed the need for all institutions to have a "SME-friendly entrance". The evaluation also revealed a recurrent problem with businesses' applications, which tended to make a poor job of articulating their research question, at least in terms that made any sense to the research community. For their part, it emerged that SMEs struggled to understand what research fields were relevant to their concerns and which institutions to approach. The solution has been to appoint an independent contractor to help firms to formulate their research questions and to signpost potentially relevant academic work and research groups.

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