Department for Business Innovation & Skills

CabinetOffice
Behavioural Insights Team

GROWTH VOUCHERS PROGRAMME

Trial Protocol (full)

FEBRUARY 2014

Contents

Introduction

Small businesses that seek and obtain strategic business advice are more likely to thrive and grow.[1] Taking business advice can increase productivity, drive sales and improve the chance of survival in tough economic times.

Yet as many as three in every ten small businesses in the UK may have an unmet need for business advice[2]. To date, available evidence is associative, and does not establish a causal link between small businesses taking business advice and their subsequent higher growth. No one definitely knows whether it is the advice conferred that enables businesses to be more likely to prosper, or whether advice and growth are two separate and unrelated consequences of some other unobserved characteristic or behaviour. This is what Growth Vouchers will test.

The Growth Vouchers programme is a pioneering government research project that aims to make it easier for small businesses to access expert advice to help them grow and test which types of business advice are most effective.

The Growth Vouchers programme will run until March 2015 to attract around 20,000 small businesses that do not normally use advice. Vouchers worth up to £2,000 each will be given to a majority of the small businesses who take part to help them pay for advice.

This programme will operate as a Randomised Controlled Trial (RCT), which will enable the government to obtain a robust assessment of the impact of different types of advice on participating businesses to be obtained. RCTs are widely regarded as the 'gold standard' for empirical research and are used extensively in medicine and international development. This is the first time that an RCT has been run on such scale anywhere in the world to explore what business advice works best.

The Growth Vouchers programme will produce real and comprehensive evidence, while providing benefits for the businesses who take part. This evidence will be used to inform future policy.

This document sets out how the Growth Vouchers programme will operate, how its design satisfies the principles of running an RCT and the key questions that we aim to answer. It then explains what data and analysis will be done to arrive at an answer and the technical constraints on how robust our answers may be.

More technical material on key issues may be found in the annexes.

[1] BIS, 2013 'SMEs: The key enablers of business success and the economic rationale for government intervention'.

[2] CEEDR, 2011 'Research to understand the barriers to take up and use of business support', SME employers only.

How the Growth Vouchers programme will work

There are six main stages in the Growth Vouchers programme:

Stage 1 is the initial application stage in which businesses apply to join the programme. The application process must be completed online at GOV.UK.

The Growth Vouchers programme is open to any business based in England that has been running for at least one year, has fewer than 50 employees, and has not paid for external strategic advice in the past three years.

As part of the application process, eligible businesses will complete a brief questionnaire that is designed to help assess what type of business advice might benefit them most.

At **Stage 2**, businesses carry out an assessment of their business advice needs. They can do this by completing an online assessment or meeting with an adviser. Meetings with an adviser may be carried out over the telephone but most businesses will book an appointment and arrange to meet in person.

At **Stage 3**, businesses will receive a recommendation for advice in one of five areas (see below) and then select their preferred area of advice. Businesses will then be told whether they have been allocated a Growth Voucher to help pay for the cost of advice.

A majority of businesses that reach this stage will receive a voucher. This allocation will be random: no assessment about the viability of the business will be made. This is to ensure that a wide range of businesses receive a voucher and that the impact of advice can be measured effectively.

Growth Vouchers may be used to subsidise one of the following five types of advice:

- Raising finance and managing cash flow
- Marketing, attracting and keeping customers
- Making the most of digital technology
- Improving leadership and management skills
- Recruiting and developing staff

At **Stage 4**, businesses select a supplier from the list of registered providers on an online marketplace.

This online portal is managed by Enterprise Nation. It contains hundreds of suppliers of expert advice in each of the five areas above. Suppliers are selected based on their experience, qualifications and membership of organisations recognised for setting the standards for advice on these important topics.

Some of the providers in the marketplace also offer advice on a much wider range of topics that can help businesses grow.

Stage 5 requires businesses to make arrangements to receive their selected advice. It is essential at this stage that the business agrees a price for the advice and checks whether it is suitable to be subsidized using a Growth Voucher. Vouchers will cover up to half of the cost of advice, up to a maximum of £2,000 (non-inclusive of VAT). Businesses may pay more, if they choose, but the maximum they can claim back is £2,000.

At **Stage 6**, businesses can submit a claim for their subsidy. They will have to provide evidence that the invoice has been paid and details of the advice they received. Claims will be processed on receipt and paid within 30 days.

Analytical Aims

Every business that participates in the Growth Vouchers programme will be monitored to examine their progress over the next two to three years. By monitoring their growth over this period, we hope to identify what types of advice really make a difference.

In particular, we aim to answer the following key questions:

- Do businesses that are given a Growth Voucher perform better or worse than those not given one?
- Do businesses assessed online perform better or worse than those assessed face-to-face?
- Which of the five themes of subsidised advice creates the greatest return?

The Growth Vouchers programme is part of a much larger body of research into what helps business grow. Government will use this research to decide how best to help small businesses in the future.

Design of the Programme

The Growth Vouchers programme will operate as an RCT. This section briefly covers the design of this trial, including details on the randomisation procedure, outcome measures and sample size. These details are crucial – getting them right will ensure we can answer robustly the key questions above.

We need to spread participating businesses evenly throughout the programme. In particular, we want to avoid systematic differences between:

- Businesses that do and do not receive an online business advice assessment; and
- Businesses that do and do not receive a Growth Voucher.

To do this, we will randomise two elements of the Growth Vouchers programme:

- The allocation of businesses to either an online or personal business needs assessment; and
- The allocation of Growth Vouchers to businesses.

We will randomise at the individual (business) level rather than in clusters (for example, geographic areas). This is done to make sure that all firms that enter the programme are allocated randomly – that is, without discriminating amongst them in any way.

All participating businesses that select a given advice area will be randomly allocated to receive a Growth Voucher or not, which again avoids discrimination. We intend for many – but not all – businesses that participate in the programme to receive a Growth Voucher.

Further information about how this allocation will work may be found in Annex 1.

Analysis

In this section, we outline what analysis will be done at the end of trial to answer the key questions of the programme. A more detailed description, including regression models, may be found in Annex 2.

We are interested in a number of outcome measures, including business turnover (revenue), employment and exports. Some of these are difficult to measure reliably and so the data we collect might not be indicative of long term success.

To minimise this risk, the primary outcome measure for this trial will be turnover.[3] We are interested in the turnover of businesses that complete a business needs assessment and might then receive a Growth Voucher, relative to the relevant control groups. The programme is successful if we can detect an increase in turnover, as this represents a return on investment for the UK economy.

We will measure the turnover of participating businesses using the Inter-Department Business Register (IDBR), a large and routinely collected dataset. Our analysis will take into account (or 'control') for some characteristic of a business – such as size, age and sector – that may affect turnover. This will help us to isolate any change in turnover that is attributable to participation in the Growth Vouchers programme.

Allocation and power calculations

Our ability to detect a real effect on business turnover (the 'treatment effect') depends on the number of firms in the programme and the size of the effect. Smaller treatment effects are more difficult to detect.

[3] We will use the natural logarithm (ln) of turnover for the analysis, as this makes it easier to detect any real effects of the Growth Vouchers programme.

In order for the programme to be a success, we set the minimum return on investment at 400% (as mentioned above, this return is measured in terms of the increase in business' turnover). We therefore need to be as confident as possible that our analysis will detect an effect of this magnitude. Detecting smaller effects is not crucial.

As is conventional, we aim to have at least an 80% chance of detecting the return set out above (also known as 80% 'power').[4]

We can calculate how many businesses need to participate in the programme (the 'sample size') to deliver this power level. Using the figures above, we have calculated that at least 19,000 businesses need to complete a business needs assessment. Further details on power and sample size calculations may be found in Annex 3.

In the event that fewer or more businesses complete a business needs assessment, contingency plans are in place to maximise how much can be learned and ideally preserve our ability to answer the key questions for the programme.

Finally, a wider evaluation will also be conducted through surveys of a subsample of businesses in the trial. Firms will be surveyed about their performance and management, whether or not they have taken advice and any changes they have made. Their attitudes and confidence will also be measured. Further details may be found in Annex 4.

Oversight of trial protocol

This trial protocol will be registered with the American Economic Association (AEA), the leading trial registry for this kind of research.

The trial team has worked alongside an advisory panel of academics and civil servants. These academics are specialists in trial design and working with small businesses:

- Imran Rasul (University College London)
- Mike Daly (Department for Work and Pensions)
- Stephen Roper (Warwick Business School)
- Michele Belot (University of Edinburgh)

Contingency plans for the trial, which detail how the trial will adapt to adverse circumstances, are not being made public at this time.

However, these plans will be reviewed by leading academics in the field. At the end of the trial, all contingency plans will be published (even those not deployed), as part of the trial research report.

[4] This means that if the entire trial were replicated one hundred times, for example, and in every replication participating businesses who receive a voucher in fact achieved an average return on investment of 400%, then we would successfully detect this effect in eighty of the replications.

Annex 1: Design

In this annex, we explain the key features of the Growth Vouchers programme in terms of its operation as a Randomised Controlled Trial (RCT).

Specifically, we will:

- Outline the eligibility criteria for business to take part in the Growth Vouchers programme;
- Describe all the possible journeys that a business might take through the programme, which are summarised in a flow diagram;
- Identify stages at which randomisation will occur;
- Describe the different treatments; and
- Explain how businesses will be grouped in different ways for the purposes of analysis.

Detailed information on our plans for analysis of the programme may be found in Annex 2.

Eligibility criteria

To be eligible for the Growth Vouchers programme, a business must:

- Be at least one year old.[5]
- Have fewer than 50 employees.[6]
- Be based in England.[7]
- Have a turnover or balance sheet of at most £10 million when it applies.[8]

There are the following supplementary criteria:

- Businesses must confirm that they have not sought strategic advice in the last three years.

[5] This criteria is in place for two reasons: i) to prevent businesses forming in order to apply to the Growth Vouchers programme, and; ii) to reduce the level of noise introduced to the model by a high incidence of firms failing in their first year.

[6] This programme targets small businesses, which are defined by the EU as businesses with fewer than 50 employees.

[7] This criteria is in place due to funding arrangements with the Devolved Administrations.

[8] As per the EU definition of a ‘small firm’.

- No more than 10% of businesses who take part in the programme may be 'unregistered' – that is, not registered either as a limited company or for Value Added Tax (VAT).

- Businesses must not have exceeded the limit for State Aid of €200,000 over the previous three financial years.

Businesses will be recruited into the programme primarily via marketing activities on the part of delivery partners for the Growth Vouchers programme, which will focus on the key geographical regions where the programme runs.

Customer journeys

The key stages of the Growth Vouchers programme are described in the main text. In summary:

- Businesses apply for the scheme (Stage 1) and, if eligible, are randomly allocated to either an online or personal business advice assessment (Stage 2).

- Once this business advice assessment is complete, businesses select one of the five areas of advice available (Stage 3).

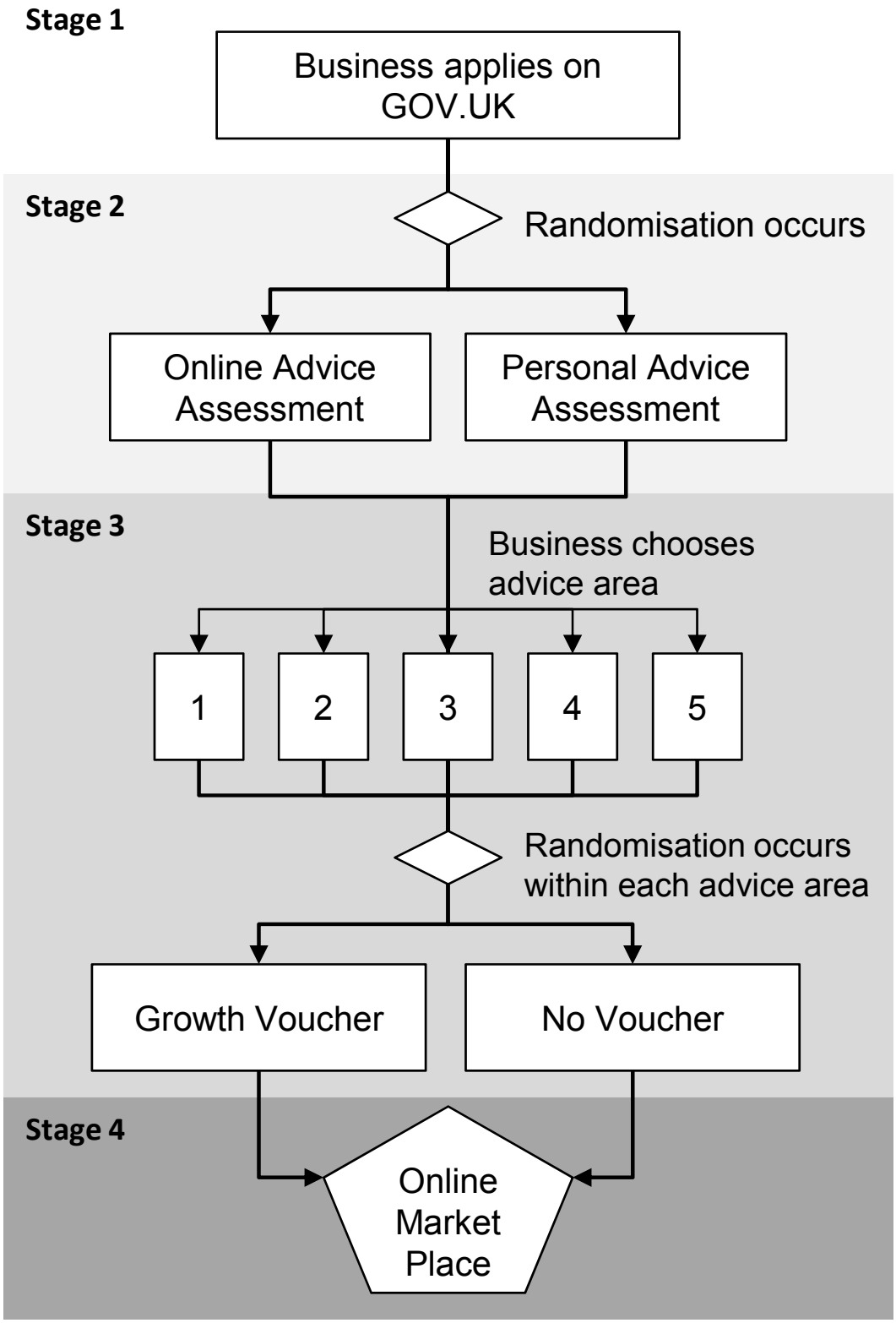
- Businesses will then be randomly allocated a Growth Voucher or not (Stage 3).

- Finally, all businesses will be directed towards the online marketplace hosted by Enterprise Nation to find a suitable supplier of advice (Stages 4, 5 and 6).

In total there are twenty possible journeys that a business might take through the programme, which are illustrated in the flow diagram on the next page.

To note, we will group businesses in different ways, depending on which key question we want to answer. These groups will comprise of business that have taken customer journeys that do not differ in an important way for the purposes of analysis – we explain this further below.

Figure 1: Customer journeys through the Growth Vouchers programme



Randomisation

This RCT is an individually randomised trial. This means that treatments are assigned to each business individually, rather than in clusters (for example, geographic areas). Therefore, the probability of a business being assigned to a given treatment group is independent of the treatments assigned to other businesses.

Randomisation will occur at two points:

- When businesses have verified their eligibility, they will be randomly allocated to either an online or personal business advice assessment.
- After selecting its advice area, a business will be randomly allocated a Growth Voucher or not.

What happens to a given business at these two randomisation points and which advice area it selects will jointly define the journey that it takes through the programme.

Data on randomisation and businesses' characteristics will be held on the Growth Vouchers IT system.

Allocation

Allocation rates at both points of randomisation have been set in order to:

- Maximise the likelihood of being able to answer the three main analytical questions for the trial; and
- Deliver an efficient and effective programme that may benefit as many businesses as possible.

Initial allocation rates for the Growth Vouchers programme are specified in the table below.

Table 1: Initial allocation rates

Randomisation points	Allocation	Initial Allocation Rates
Allocation of business advice assessments	Online business advice assessment	25%
	Personal business advice assessment	75%
Allocation of Growth Vouchers	Growth Voucher	75%
	No Growth Voucher	25%

To note:

- Allocation rates between the online and personal business advice assessments have been set under the assumption that fewer businesses will fail to complete the online assessment, which is simpler and easier to finish than a personal assessment. To account for higher attrition, we allocate more businesses to the personal business advice assessment, so that a roughly equal number will businesses will complete each assessment overall. Allocation rates may be revised, if this assumption proves inaccurate.

- Initial allocation rates for Growth Vouchers do not depend on either i) whether a business completes an online or personal business advice assessment or ii) the advice area that a business chooses. The initial rates are set above the average rates for the programme. This will reward businesses that apply early and, given an uncertain level of participation in the programme overall, distribute as many Growth Vouchers to businesses as possible. As the programme runs, we will increase the allocation rate to control groups in order to ensure they are sufficiently large for the purposes of analysis.

Treatments

There are three main treatments in this RCT:

- Personal business advice assessment

- Online business advice assessment

- Growth Vouchers

As shown above, all businesses will be sent to the online marketplace.

Treatment allocations map onto the journeys that a business might take through the Growth Vouchers programme.

Personal business advice assessment

This is an in-depth assessment conducted with the help of an expert business adviser. Assessments will mostly take place face-to-face but are also available over the telephone and via online voice or video calls.

Businesses will be able to discuss their plans for growth, current concerns about strategy and so on. They then agree which area of advice is most important for them with their adviser. Advisors will write up an action plan that notes which area of advice was agreed and details some specific next steps.

The personal business advice assessment is designed to give real value to small businesses, even if they do not receive a Growth Voucher.

Businesses can choose from one of five geographical regions in England, in order to identify the appropriate regional delivery partner for their assessment. Businesses may

then contact their delivery partner directly or wait to be contacted in order to arrange an appointment.

All businesses will be offered an appointment within two weeks of completing their application for the programme.

Online business advice assessment

This is a simple, online questionnaire that was developed in conjunction with a number of leading national professional bodies. The questions cover all five areas of advice, so that businesses fully consider the options available to them.

On completing the questionnaire, businesses will receive a recommendation on the area of advice best suited to them. This recommendation is not be prescriptive – each business may choose to accept it or select a different area of advice.

Businesses will access the online business advice assessment directly after confirmation that they are eligible to participate in the Growth Vouchers programme. Alternatively, it is accessible via a link that will be emailed to a business should it prefer to complete the assessment later on.

Growth Vouchers

Businesses may use a Growth Vouchers to claim up to 50% of the cost of any strategic advice, up to a value of £2,000 (non-inclusive of VAT).

There are effectively five types of Growth Voucher, each valid for only one area of advice:

- Growth Voucher for: raising finance and managing cash flow
- Growth Voucher for: marketing, attracting and keeping customers
- Growth Voucher for: making the most of digital technology
- Growth Voucher for: improving leadership and management skills
- Growth Voucher for: recruiting and developing your staff

That is why Growth Vouchers are only allocated to a business after it selects an area of advice.

This sequencing and the fact that Growth Vouchers are valid for only one area or advice means that we can analyse whether subsiding advice in one area or another results in a greater return on investment. This is in addition to analysing the impact of offering Growth Vouchers overall.

Vouchers may be spent only with accredited suppliers for the Growth Vouchers programme. All such suppliers will be registered on the online marketplace hosted by Enterprise Nation.

To note, businesses that are not given a Growth Voucher will also be directed to the online marketplace but will not receive a subsidy for any advice they purchase.

Online Marketplace

The online marketplace has been developed by the private sector and is hosted by Enterprise Nation. Hundreds of accredited, expert suppliers will be listed and easily identifiable by the Growth Vouchers logo pinned to their profile.

Businesses will use this portal to identify an appropriate supplier of advice in their specific area. The marketplace cannot be used to process any transactions: businesses will need to contact suppliers themselves, agree a level of advice and arrange to receive it, pay the supplier and then claim their subsidy by redeeming their Growth Voucher.

Businesses will be encouraged to leave feedback on their chosen supplier, which should help others judge whether a given supplier is likely to offer a good service and value for money.

Groupings for analysis

To answer our three key questions, we will group businesses in different ways for the purposes of analysis.

Groupings for each question are briefly described here:

- Do businesses that are given a Growth Voucher perform better or worse than those not given one?

  Treatment group: All businesses given a Growth Voucher.

  Control group: All businesses not given a Growth Voucher.

- Do businesses assessed online perform better or worse than those assessed face-to-face?

  Treatment group: All businesses that receive a personal business advice assessment.

  Control group: All businesses who receive an online business advice assessment.

- Which of the five themes of subsidised advice creates the greatest return?

  Treatment groups: All businesses that are given a Growth Voucher for the same area of advice, pooled across both the online and personal business needs assessments. There is one treatment group for each of the five area of advice.

  Control groups: All businesses that are not given a Growth Voucher but selected the same area of advice, pooled across both the online and personal business needs assessments. There is one control group for each of the five area of advice.

Annex 2: Analysis

As stated in the main text, we aim to answer the following key questions:

- Do businesses that are given a Growth Voucher perform better or worse than those not given one?
- Do businesses assessed online perform better or worse than those assessed face-to-face?
- Which of the five themes of subsidised advice creates the greatest return?

This annex explains: what data we will collect about businesses that take part in the Growth Vouchers programme and how we intend to analyse this data to answer the questions above. We also discusses what further analyses may be undertake, provided we can collect sufficient data to do so.

Data

Every business that participates in the Growth Vouchers programme will be monitored to track their progress over the next two to three years.

'Primary data' will be collected in order to answer our key questions. 'Secondary data' will be used in any supplementary analysis, which is described later.

Primary data

Table 1 below specifies the primary variables for this trial – as shown, we will use multiple data sources.

For data on turnover and employment, we will use the Inter-Departmental Business Register (IDBR), which collects information from company tax returns and ONS surveys.[9] For data on exports and business assets, we will survey a randomly drawn sub-sample of participants in the Growth Voucher programme. Finally, the IT system for the programme will allow us to track the assignment of treatments to businesses as well as the number of Growth Vouchers redeemed in each advice area.

To note:

- Data sources, such as the IDBR, may not be updated frequently or may use imputed values. If imputed values for turnover, for example, are calculated based on

[9] The IDBR was introduced in 1994 and provides the main sampling frame for surveys of businesses carried out by the Office of National Statistics and other government departments. It is also a key data source for analyses of business activity. The IDBR covers over 2.1 million businesses in all sectors of the UK economy, other than some very small businesses (without employees and with turnover below the tax threshold) and some non-profit making organisations.

a business' sector or number of employees, then these measures may move together even if only one is being influenced.

- To the extent that this measurement error does not vary on average between our treatment and control groups and is unrelated (or 'orthogonal') to treatment assignments, this will create classical measurement error and therefore bias our estimates of any treatment effects towards zero. So any treatment effects will not be overstated.

- To overcome some of the problems arising from data being infrequently updated, we will survey a sample of businesses for information about their employment and turnover via the wider evaluation – see Annex 4.

Table 1: Primary data variables and sources

Variable	Source
Turnover	IDBR & Wider Evaluation
Number of employees	IDBR & Wider Evaluation
Exporting outside of the UK (binary)	Wider Evaluation Survey
Exporting outside of the EEA (binary)	Wider Evaluation Survey
Treatment assignment	Growth Vouchers IT systems
Voucher redemption	Growth Vouchers IT systems

Secondary Data

Gathering richer data about participating businesses may allow us to learn more from this RCT. To aid our analysis, we will prioritise gathering secondary data on:

- Lagged dependent variables. Many of the variables that interest us are subject to considerable variance, even if we restrict the sample to micro businesses (fewer than 10 employees). However, the variance of this data within-business and between-year is likely to be lower and conform to time trends that are common to both treatment and control groups. This secondary data should be available in the IDBR.

- Business sector. The sector in which a business operates is likely to be relevant, particularly for turnover. Financial services businesses, for example, may employ only a few people but generate very high turnover compared to a small retail business. Therefore, it is inappropriate to compare them. Stratification of our randomisation procedures on the basis of business sector will not be possible, however, because sectoral data will not be available when randomisation takes place.

We will collect survey data on whether a business has pursued any of the actions it was advised to take – writing a business plan or altering branding, for example – and, where possible, profitability.[10] We can also measure labour productivity, using the proxy measure of turnover divided by employment.

Data on other measures, such as business confidence and changes in management practices, will also be gathered through surveys. A brief description of our survey methodology and timings may be found in Annex 4.

Outcome measures

We will make use of data on multiple outcomes of interest to determine the effectiveness of the Growth Vouchers programme. Here we describe these outcomes of interest and select our primary outcome measure: logged (ln) turnover.

Our outcomes of interest are:

1) Logged (ln) turnover

Turnover is defined as the amount of money that a business trades in a particular year. However, turnover has a very high variance, even among the subset of businesses eligible for the Growth Vouchers programme. Taking the natural logarithm (ln) of turnover will aid analysis by reducing the variance of our estimators.

To further reduce any unexplained variance, we may use data on:

- Growth rates in turnover over time (which may be less variable)
- Lagged values of turnover (before a business applied to the Growth Vouchers programme)
- Turnover values by sector or business age.

2) Number of employees (if any)

Again to reduce variance in our estimators, we may use data on:

[10] We do not anticipate being able to measure profitability for the majority of businesses because it is not collected on the IDBR. However, we are not ruling out using it should this data becomes available in future.

- Marginal hiring (growth in number of employees)
- Lagged values of marginal hiring (for businesses with at least one employee before applying to the Growth Vouchers programme).

3) Exports (binary)

This is defined in two ways:

- Does a business sell its products or services outside of the UK?
- Does a business sell its products or services outside of the European Economic Area?

There are advantages and disadvantages to using each of these outcomes of interest.

Whether or not a business exports is difficult to measure, measured with error and may not be an appropriate measure for a large part of our potential sample (hairdressers or gardeners, for example).

Number of employees is more easily and routinely measured and appropriate for all businesses in the programme. However, it is also discontinuous and so a considerable amount of growth in a business' productive potential could occur without any change in to employment. This might especially acute for some areas of advice, such as 'Improving Leadership and Management skills' and 'Making the most of digital technology' – that is, advice in these areas may lead a business to restructure its operations without any change to employment.

For these reasons, logged (ln) turnover is our primary outcome measure: it is likely to be correlated with our other outcomes of interest but presents fewer analytical or interpretative difficulties.

If it can be collected successfully, some secondary data may also provide interesting information about outcomes:

- Firstly, the profitability or productivity of a business in one of the treatment groups might be flat or even fall in the short run. This might happen if the business receives advice that enables or encourages it to expand by taking on new staff that require additional training in the short term or taking on credit, for example. Data on profitability and productivity would allow us to evaluate these effects over time.
- Secondly, it is interesting to establish not only whether businesses that are given a Growth Voucher perform better or worse than those not given one but to understand why (or why not). If Growth Vouchers are not effective, is this because businesses were given the wrong advice (and so taking an advised action is detrimental) or businesses simply failed to follow the advice that they received? Secondary survey data on whether businesses took the actions they were advised to take will allow us

to estimate both an Intention To Treat (ITT)[11] and a Complier Average Causal Effect (CACE)[12].

Model specification

This section describes the primary analysis that we will undertake to capture, as accurately as possible, the effects of the Growth Vouchers programme on businesses' outcomes. Our analysis aims to answer the key questions above.

The primary specification for analysing the programme is:

$$Y_{it} = \alpha + \theta_t + \beta_1 V_i + \beta_2 Y_{i0} + \beta_3 (V_i \cdot \theta_t) + \beta_4 X_i + u_{it}$$

Where:

- Y_{it} is the value of the outcome measure for business i at time t.
- θ_t is a time trend specified to maximise the quality of fit.13
- V_i is a binary variable set to 1 if a business receives a voucher and 0 otherwise.
- Y_{i0} is the baseline observation value for the outcome measure.
- $V_i \cdot \theta_t$ is an interaction variable between treatment assignment (voucher receipt) and the linear time trend.
- X_i is a vector of observable characteristics of the business.
- u_{it} is an individual and time specific error.

Depending on the time elapsed since treatment, we will make use of different outcome measures. Hence, Y may stand for:

---

[11] Intention to Treat analysis will look at the set of all businesses who complete a business advice assessment, regardless of whether or not they used a Growth Voucher. The will allow us to estimate the average effect of a business reaching this point in the programme, which is likely to be lower for those businesses that do not go on to use a Growth Voucher. Ignoring those businesses that fail to use their Growth Voucher may bias (upwards) the estimated returns on the programme. This will be particularly the case if businesses that are, on average, less successful are more likely not to redeem their Growth Voucher because their counterpart businesses in the control group will be overrepresented.

[12] A Complier Average Causal Effect is the effect of the programme on those businesses which do make use of a Growth Voucher (claim any non-zero amount). This form of analysis may suffer from the biasing issues addressed in the footnote above, but may also give a better estimate of the value to businesses of receiving advice, particularly if many businesses that receive Growth Voucher do not make use of it.

[13] We acknowledge that this time trend will capture some element of changes in macroeconomic conditions, combined with differences in selection of eligible businesses into the Growth Vouchers programme over time. These different factors may be of interest but we cannot disentangle them here.

- Turnover (or logged turnover/ change in turnover/logged turnover in the last twelve months)
- Number of employees (or change in employees in last twelve months)
- Exporting outside of the UK (binary)
- Exporting outside of the EEA (binary)

To note, all specifications in this section are invariant to which data is used as the dependent variable from this set of options.

We will measure outcomes at several points during the trial to determine the dynamic pattern of the effect of business advice.[14] We will estimate the effects of these intermediary outcome measures by running the same models at different points in time. Of course, the use of different dependent variables will depend on whether relevant data is available at that time.

We may also be interested in 'dosage effects' – that is, the shape of the relationship between the amount of advice received (value claimed) and the benefit experienced by the business. We will therefore estimate:

$$Y_{it} = \alpha + \theta_t + \beta_1 v_i + \beta_2 Y_{i0+} + \beta_3 (v_i \cdot \theta_t) + \beta_4 X_i + u_{it}$$

Where:

- v_i is a continuous variable taking different values depending on the value of voucher redeemed by business i. All other variables are as before.

All businesses that receive a Growth Voucher will be able to claim up to £2000 but the actual amount claimed will be chosen by the business (or 'endogenous'). By conducting this analysis of dosage effects, we will nevertheless be able to determine whether those businesses that choose to spend a larger or smaller amount of their Growth Voucher are more or less likely to benefit from the advice received. This might inform future decisions about whether to impose a minimum or maximum value on subsidies with a similar purpose. Of course, over interpretation of any finding of this type should be avoided.

As described above, we may decide to look at growth rates in outcomes of interest rather than absolute values in order to reduce the variability in our estimations.[15] To do this, we will also estimate the following specification for both turnover and employment:

[14] Measuring dynamic effects allows us to determine whether the benefits of advice persist over time. There is a trade-off between length of measurement (and hence the most data on the effects and their persistence) and the noise of measurement (which is likely to increase over time).

[15] We may need to segment the population to do this. Growth rates can be difficult when looking at the smallest businesses – at the extreme, going from 0 to 1 employees is a large percentage change.

$$\frac{Y_{it}}{Y_{it-1}} = \alpha + \theta_t + \beta_1 v_i + \beta_2 Y_{it-1} + \beta_3 (v_i \cdot \theta_t) + \beta_4 X_i + u_{it}$$

For turnover, it may also be necessary to estimate:

$$\Delta\left(\frac{Y_{it}}{Y_{it-1}}\right) = \alpha + \theta_t + \beta_1 v_i + \beta_2 Y_{it-1} + \beta_3 (v_i \cdot \theta_t) + \beta_4 X_i + u_{it}$$

We may also look at a proxy for labour productivity, where productivity is defined as employment over turnover, such that the model specified is identical to that above but

$$Y_{it} = \frac{R_{it}}{L_{it}}$$

Where:

- R is turnover and L is the business's employment.[16]

Further analysis

We also intend to conduct supplementary analysis in order to:

a) Check the robustness of our findings to alternative explanations of any effect;

b) Provide a more detailed analysis of data to try to identify distributional properties of any effect;

c) Test for general equilibrium effects[17] of this policy; and

d) Using quasi-experimental analysis, identify the overall effects of participating in the Growth Voucher programme compared to a 'hard control' of receiving no advice.

Achieving (a) will require the use of whichever data are available at the time of analysis. As such, we will treat this analysis as exploratory, at the time of evaluation, rather than confirmatory[18].

Analysis for (b) and (c) will be conducted as confirmatory analysis.

---

[16] This approach may not be possible using the IDBR to the extent that turnover is imputed based on employment and sector, or vice-versa.

[17] General equilibrium effects are impacts of a programme which influence the marketplace beyond those directly affected by it. This could mean, for example, that competition in a region increases because more businesses seek advice, leading to better outcomes for all businesses.

[18] Exploratory analysis makes use of available data to determine relationships between variables. Confirmatory analysis, as is used for our primary analysis of this trial, uses data which has been gathered to test a particular hypothesis. When the hypothesis is a causal one (doing X will cause Y to rise, for example), this will typically involve some exogenous assignment of participants in the trial to X.

Analysis for (b) will use quantile regressions at the 10th and 25th percentiles of the baseline outcome measure, for the same models estimated above, so:

$$Y_{it} = \alpha + \theta_t + \beta_1 V_i + \beta_2 Y_{i0+} + \beta_3 (V_i \cdot \theta_t) + \beta_4 X_i + u_{it}$$

$$where\ p(y_{j,0} < Y_{t,0}) < 0.25\ \forall\ Y_{t,0}$$

Where:

- y_j is the turnover of a hypothetical business randomly drawn from the set of all other businesses in our sample.

This restriction limits our sample to, in this case, the lower quartile of the distribution of our outcome measure.

This analysis will estimate the effect of our intervention at different points in the distribution of businesses. We will focus on those businesses which are doing relatively poorly in the baseline period and may benefit the most in relative terms from the treatment.

To assess (c), we will test characteristics of the market for advice in those areas where relatively more businesses have been issued with (and/or redeemed) Growth Vouchers. We will estimate a model, such that:

$$P_{rt} = \alpha + \beta_1 P_{rt-1} + \beta_2 \frac{(n_{rt}|V = 1)}{(n_{rt})} + u_{rt}$$

Where:

- P_{rt} is the price of advice in region r at time t
- P_{rt-1} is the lagged price of advice in region r at time t.
- $n_{rt}$is the number of businesses eligible for Growth Vouchers in region r at time t.
- $(n_{rt}|V - 1)$ is the number of businesses issued Growth Vouchers in region r at time t.
- $u_{rt}$is a region and time standard error.

It should be stated clearly, however, that we are very unlikely to detect an effect of any magnitude with this analysis. Although our treatment group is quite large, its size relative to the magnitude of the market (approx. 4 million businesses) means that even in regions where relatively many businesses receive a Growth Voucher, these businesses will still account for less than 5% of the market and may in fact be much lower.

Furthermore, it is also possible that owing to the comparatively fluid nature of advice, equilibrium effects are not regional but national and so we would be unable to detect any effect using this method, even if one exists.

Quasi Experimental Methods

There are options for secondary analysis that use the large datasets of business' characteristics for merging and matching and around the cut-offs of eligibility for the Growth Vouchers programme. These methods will continue to be investigated for exploratory analysis during the course of the trial.

The most likely form of quasi-experimental method to be used is propensity score matching. Large numbers of businesses will be eligible for the Growth Vouchers programme but will not fall inside those geographical regions where the programme will be most heavily promoted. This will provide a large control set which can be used to estimate an individual business' propensity to apply to the programme, if they are in an appropriate region.

As random assignment of treatments to businesses should ensure similarity between businesses in different arms of the trial, we can estimate this using a 'with replacement' specification, so that the same out-sample business can be paired with multiple in-sample businesses.

We will then match businesses with one or more of their 'nearest neighbours' in terms of their propensity to apply. Once businesses are matched, the outcomes of these two groups can be compared. This allows us to estimate the effect of aspects of the programme on our outcome measures, compared with a control group that receive no diagnostic and no voucher – a 'hard control'.

Annex 3: Allocation and power calculations

Our ability to detect a real effect on business turnover (the 'treatment effect') depends on the number of businesses that take part in the programme and the size of the effect we aim to detect. Smaller treatment effects are more difficult to detect.

This annex explains our assumptions and calculations used to arrive at a target sample size for the programme.

Here we discuss in detail how many businesses need to take part in the programme – the 'sample size' – in order to be sufficiently confident of detecting a real effect, if one exists. We set out both the size of effect that we aim to detect and with what level of confidence.

Our power calculations aim to determine the minimum sample size required to i) answer the three key questions for the trail and ii) offer the greatest chance of determining whether there are interactions between businesses needs assessments and Growth Vouchers.

Key assumptions

Following standard practice, our key assumptions are:

- Significance Level: 0.05
- Power: 0.80 (80% probability of detecting an effect)
- Intra-cluster correlation: 0.05, with businesses clustered by parliamentary constituency (650 clusters).
- Design effect: Varies with number of businesses recruited, according to a fixed number of clusters.

Missing data

Due to the data sources we intend to use (see Annex 2), some businesses that take part in the programme will not be unobservable. In particular, we cannot capture data on businesses that employ nobody and are not registered for VAT. To increase the number of businesses about which we can collect data, the share of unobservable businesses that may be recruited into the programme is limited to 10%. Hence, we account for a 10% failure to observe rate.

In addition to unobservable businesses, we also need to account for failure to capture data for some businesses at any point during our monitoring process.

- For outcome data from administrative sources, such as the IDBR, we expect attrition rates to be a reasonable proxy for business failure rates. Hence, null-values

are applied for all businesses that drop out from the data. We will also consider the set of businesses that do not fail over the course of the trial and investigate whether the Growth Vouchers programme has any effect on the incidence of business failures – see Annex 2 for further details.

- For outcome data not gathered through administrative sources, such as IDBR, we will use the last observation carried forward, which amounts to assuming that businesses achieve no further benefit after they disappear from our data. We use this method – as opposed to a null-value method, or first observation carried forward – because we expect the attrition rates for survey-based data to be high and this kind of attrition is likely to be broadly unrelated (or 'orthogonal') to treatment assignment. This also removes the need to explicitly resolve issues of attrition in our sample size calculations that follow.

Baseline

To gain information on the baseline characteristics of businesses eligible for Growth Vouchers, we made use of a dataset containing data on more than two million businesses with information on businesses age, sector of operation, their SIC 2010 code, their turnover and their number of employees, among other things.

Of these, 80% were eligible for the Growth Vouchers programme – see Annex 1 for eligibility criteria. We then excluded those businesses which are reported as having zero turnover, as they are inactive or failed or subject to measurement error. Around 1.4 million businesses were left in the dataset.

Turnover is our primary outcome measure. As discussed in Annex 2, the variance of turnover is very high (Mean = £1.8 million, Standard Deviation = $1.7*10^8$), which makes detecting any effect at all very unlikely. Its distribution is also highly skewed by a small number of businesses with very high turnover as shown in Figure 1 below.

To tackle this problem, we generate a new variable by taking the natural logarithm of turnover, which has a much smaller mean and variance (Mean = 11.58, Standard Deviation = 1.72 or crudely translated into £s, Mean = £106,937, Standard Deviation = £490,000). The distribution of this variable is considerably closer to normality, as shown in Figure 2 below.

To further increase the potential power of our test, we consider businesses within SIC code, thereby comparing those businesses which conduct similar types of business. Eligible businesses come under 558 different SIC codes.

We calculate the within-SIC mean, and within SIC variance for each SIC, and then calculate a sample average within SIC variance (weighted by number of businesses in that SIC). As a result, the sample mean remains unchanged but the standard deviation is reduce to 1.51, equivalent to roughly £377,000. This is used as the baseline level of variance for our power calculations.

Figure 1: Turnover of Businesses, distribution

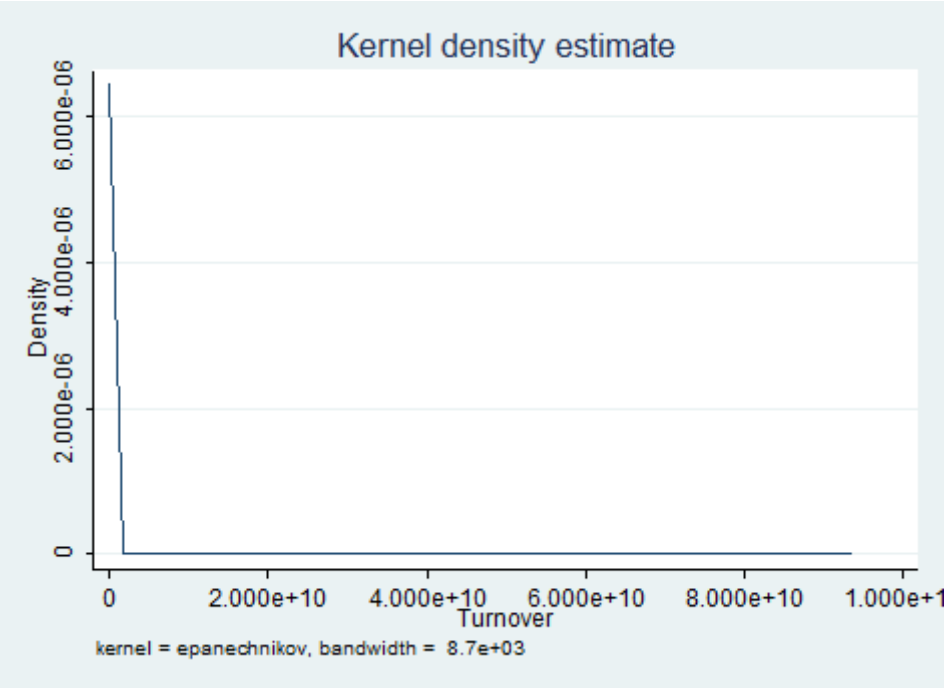
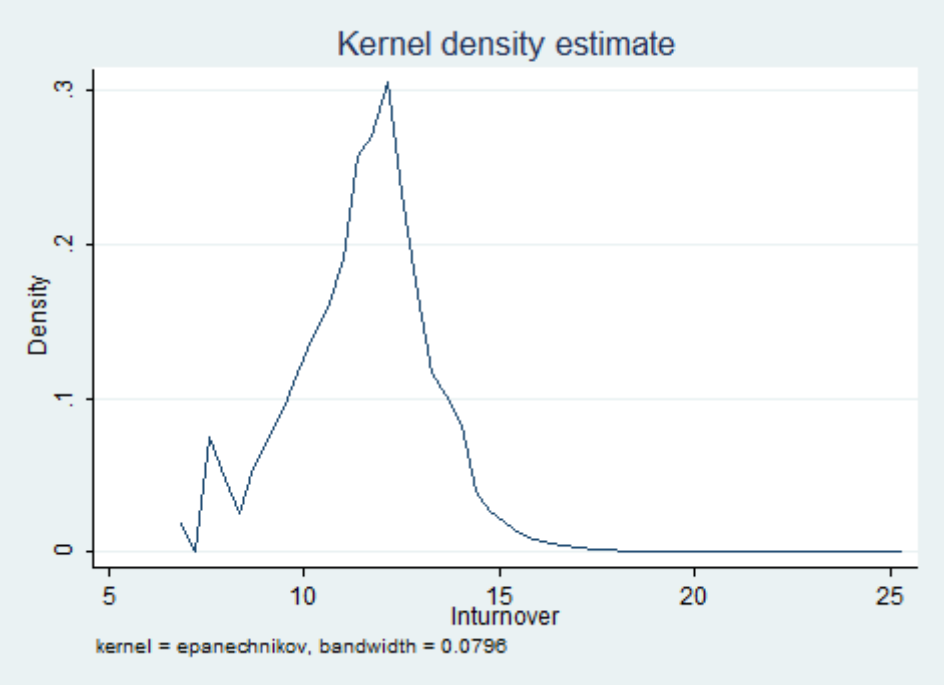


Figure 2: Logged Turnover of Businesses, Distribution



Minimum Effect Size of Interest (MESI)

We assume that actual effect sizes (as a % of business turnover) do not depend on the turnover of a business when it first enters the programme. We also assume that selection into the programme from the population of eligible businesses is random and therefore the

distribution of businesses that take part in the programme reflects the population distribution.

The likelihood that smaller, younger businesses will be more eager to use a Growth Voucher, if they receive one, increases the conservatism of our analysis below because the variance in turnover is greater for older, larger businesses.

We now consider what effect size we seek to detect. We start from the assumption that a return of investment of 4:1 is an acceptable minimum, as is standard for similar government programmes.

Working on the basis of a cost of delivery per business of £1,154 and an average claim of £1,000 per voucher, the economic cost of issuing a Growth Voucher is £2,154.

To take account of displacements in both factor and product markets, we require a gross value-added (GVA) of £6,615 per business to achieve a net economic impact equal to the costs of the programme.

Table 1 sets out the required GVAs for different net economic impacts:

Table 1: Required gross value add (GVA)

Net economic impact per £ of investment	£1	£2	£3	£4	£5	£6
Required avg. gross GVA per business	£6,615	£8,923	£11,231	£13,538	£15,846	£18,154

For example, a 2:1 return on investment requires a GVA of £8,923 per business, which is equivalent to employing an extra 0.22 of a person or increasing turnover by £27,000 (assuming one third of turnover constitutes value added, which is based on internal figures).

Table 2 below gives the turnover and employment impacts implied by different rates of return (in terms of GVA) on investment:

Table 2: Required turnover and employment

Net economic impact per £ of investment	£2	£3	£4	£5	£6
Required avg. turnover per business	£27,121.81	£34,136.08	£41,150.34	£48,164.60	£55,178.86
Required avg. change in employees	0.22	0.28	0.34	0.40	0.45

So in order to detect a 4:1 return on investment, we need to observe an increase in turnover of £41,150 per business on average. Expressed in terms of our standard deviation, this is an effect size of d=0.108, where d is Cohen's d, a standard effect size scale for continuous variables. An effect of this size would be considered small by the standards of randomised trials of this type[19].

Sample Size Calculations

We proceed to run sample size calculations. Under the assumptions above, the sample size required is a minimum of 1,450 per arm for analysis or a total of 17,400 businesses across the programme, as shown in Table 3.

Table 3 also reports the changes in employment for businesses implied by the corresponding return on investment. However, changes in employment should be detectable with smaller sample sizes because this outcome measure has a lower variance than turnover.

Table 3: Required Sample Sizes to detect MESI – Observable Businesses

Net economic impact per £ of investment	£2	£3	£4
Required turnover per business	£27,121.81	£34,136.08	£41,150.34
Required avg. change in employees	0.22	0.28	0.34
Number of businesses per arm	4,000	2,033	1,450
Number of arms	12	12	12
Total number of businesses needed for the trial (small and micro)	**48,000**	**24,396**	**17,400**

As explained above, our sample will include up to 10% of businesses that are not observable in our dataset. However, the figures reported are only for observable businesses. Table 4 produces new minimum sample sizes for all businesses to account for this.

To summarise, we need 19,333 businesses to participate in the programme (up to completion of a business advice assessment) in order to observe a 4:1 return on investment, allowing for 10% of unobservable businesses.

[19] Cohen, Jack. *Statistical power analysis for the behavioral sciencies*. Routledge, 1988.

Table 4: Required Sample Sizes to detect MESI – All Businesses

Net economic impact per £ of investment	£2	£3	£4
Required turnover per business	£27,121.81	£34,136.08	£41,150.34
Required avg. change in employees	0.22	0.28	0.34
Number of businesses per arm	4,444	2,259	1,611
Number of arms	12	12	12
Total number of businesses needed for the trial (small and micro)	**53,333**	**27,107**	**19,333**

Annex 4: Wider Evaluation

The Wider Evaluation project will provide evidence to inform the evaluation of the for Growth Vouchers programme. This project has our interlinked work-streams and will be delivered by an external contractor.

- Early work will start three months after the programme launches and will seek evidence on whether the programme is being delivered effectively from the point of view of both participating businesses and delivery partners.

- We will assess qualitative impacts of the programme. Three qualitative studies will collectively try to answer how business advice might help small businesses to grow.

- We will then focus on collecting quantitative data. These surveys will provide data that may be compared with baseline data collected at the Growth Vouchers application stage. They will also seek data on attitudes towards using business advice, any market failures that businesses face in the market for business advice and other similar issues.

- Lastly, we will focus only on gathering the primary data for the programme, using the IDBR, which will help us to measure the long-term impacts of using business advice.

This publication available from www.gov.uk/bis

Any enquiries regarding this publication should be sent to:

Department for Business, Innovation and Skills
1 Victoria Street
London SW1H 0ET
Tel: 020 7215 5000

If you require this publication in an alternative format, email enquiries@bis.gsi.gov.uk, or call 020 7215 5000.

BIS/14/599