Oxera

Tax-advantaged employee share schemes: analysis of productivity effects

Report 2: Productivity measured using gross value added

Prepared for HM Revenue & Customs

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Executive summary

Many companies reward their employees by granting them shares—or share options—as a complement to their earnings, thereby giving employees a personal stake in the company's future performance. By offering tax advantages to employees involved with such schemes, it is hoped that participation can be increased, leading to growth in productivity and employment. Such employee share schemes are the subject of public policy debate, particularly in terms of whether their cost is warranted in light of the benefits to the economy.

Tax-advantaged share schemes are costly to the government—indeed, this cost has been estimated at just over £800m per annum in tax and National Insurance relief in 2004/05.[1] However, such schemes are currently deemed to be warranted because they are associated with increased productivity and employment in the firms concerned.

In this report, 'tax-advantaged schemes' refers to three specific share schemes, Company/Discretionary Share Option Plan (CSOP/DSOP), Save As You Earn (SAYE) and Approved Profit Sharing (APS) (replaced in July 2000 by SIP), where the government offered tax incentives to encourage employers to offer employees the opportunity to invest in the company. Each scheme is tax-advantaged in different ways, as discussed in the main study (Report 1).[2] The report on the impact of employee share schemes examined their effect on companies' productivity performance measured by an increase in turnover for a given set of factors of production, and identified the following general results.[3]

– The effect of tax-advantaged share schemes on productivity appears significant on average across the whole sample.

– However, when the schemes are analysed on a disaggregated basis, there is a 9% long-run improvement in performance for companies using SAYE schemes, but no significant improvement for those using CSOP or APS schemes.

– There is weak evidence (at the 10% confidence level) of further benefits to be gained from operating a CSOP or APS scheme together with a SAYE scheme.

One of the limitations of the dataset used in Report 1 is that the definition of productivity assumes that any change in turnover of the company, all other things being equal, is seen as an increase in the productivity of the company. This might not necessarily be the case since the company's turnover may fluctuate due to factors other than productivity, such as changing stock levels, the value of insurance claims, acquisitions and purchase costs.

Using gross value added (the part of production that is the actual contribution of an enterprise to the economy) as the measure of productivity rather than an increase in turnover given the inputs of production, aligns the productivity measure used in this study more closely with the aim of measuring the wider benefits to society, since it captures only increases in value added to the economy as a whole rather than all the increases in turnover.

[1] Source: HM Revenue & Customs.

[2] Oxera (2007), 'Tax-advantaged Employee Share Schemes: Analysis of Productivity Effects—Report 1: Productivity Measured using Turnover', January, report prepared for HM Revenue & Customs.

[3] Ibid.

Although gross value added provides a better measure of productivity it is still not possible to assess the impact of wider profit-sharing schemes (such as non-tax-advantaged schemes and other employee participation/workplace relations factors), which may lead to bias in the estimated effect of share schemes.

From ARD an average of three years' data was available for each company. This compares with an average of six years when using FAME data. The change in variable definitions in 1997 restricts the possibility of having a longer time dimension in the ARD dataset until further years' data are added to the ARD. Having a shorter time series available limits the ability of the dataset to infer any dynamic effects that take longer than three years to manifest.

This report extends the empirical research of Report 1 into employee share schemes in the UK, drawing on HM Revenue & Customs' own administrative data on share schemes. In this report HM Revenue & Customs' data has been matched with information from the Office for National Statistics' Annual Respondents Database (ARD), providing a rich dataset of thousands of companies over a number of years, thus facilitating a quantitative assessment of these schemes. The empirical research focuses on the following share schemes:

– Approved Profit Sharing (APS);
– Save As You Earn (SAYE);
– Company/Discretionary Share Option Plan (CSOP/DSOP).

This study examines the impact of share schemes for different types of firm and investigates whether firms operate other financial participation schemes (as far as such additional information is available), with the following results.

– There is no significant effect from having an approved share scheme on gross value added for either listed or non-listed companies.

– Tax-advantaged share schemes implemented on their own do not appear to be sufficient to improve performance—companies with only a tax-advantaged scheme do not appear to have significantly higher productivity. However, if companies implement non-tax-advantaged share schemes (at any point in time) *and* a tax-advantaged share scheme, there is weak evidence (at the 10% confidence level) that productivity increases by around 6.1% in the long run.

– When disaggregated by industry, productivity significantly increases by 7.2% for manufacturing and 28.9% in wholesale and retail when companies have tax-advantaged share schemes. It seems unlikely that a share scheme on its own would generate such a large increase in value added; as such, this result should be treated with caution until verified by other studies on the wholesale and retail industry.

– The effect of a tax-advantaged share scheme increases as company size increases, with firms only in the upper quartile (ie, those with an annual turnover greater than £36.3m) experiencing a statistically significant productivity effect.

The main material differences compared with Report 1 are the change in the dependent variable from logged turnover to logged GVA as a more robust measure of productivity and the improved measure of employment from the ARD. The change in the dependent variable means that the results are not directly comparable; however, in the ARD dataset, it is more difficult to identify a significant effect on productivity from employee share schemes, but when an effect is found for SAYE or in wholesale and retail or manufacturing, the percentage impact on GVA is larger than that on turnover. Alternatively, the shorter time dimension available from the ARD may limit the potential to find a statistically significant relationship.

The results from this report indicate that the use of a tax-advantaged share scheme is not sufficient on its own to increase company productivity. However, there is some evidence that SAYE schemes in large companies may have an effect. For tax-advantaged schemes to be effective in increasing productivity, other factors such as the existence of non-tax-advantaged schemes, company size, and being a listed company increase the probability of a significant productivity effect.

Contents

List of tables

List of figures

1 Introduction

Oxera was commissioned by HM Revenue & Customs (formerly the Inland Revenue) to examine the impact of tax-advantaged share schemes on company performance (whereby companies reward their employees by granting them tax-advantaged shares, or share options, as a complement to their earnings).

This report extends the analysis in Report 1 and is intended to be read in conjunction with those findings.[4]

Summary of main research
Report 1 presented empirical research into employee share schemes in the UK, drawing on HM Revenue & Customs' own administrative data on share schemes. This data was matched with financial information, providing a rich dataset of thousands of companies over a ten-year period; this facilitated a quantitative and methodologically sound assessment of these schemes. The empirical research focused on the following share schemes:

– Approved Profit Sharing (APS);
– Save As You Earn (SAYE);
– Company/Discretionary Share Option Plan (CSOP/DSOP).

In particular, the research addressed the following questions:

– what are the characteristics of companies that operate these employee share schemes in the UK?
– what is the impact of these schemes on companies' productivity performance?

Oxera identified following results.

– On average, across the whole sample, the effect of tax-advantaged share schemes is significant, increasing productivity by 2.5% in the long run. In this study, productivity was defined as an increase in turnover for a given set of factors of production.

– However, when the schemes are analysed on a disaggregated basis, there is a 4.1% long-run improvement in performance for companies using SAYE schemes, but no significant improvement for those using CSOP or APS schemes.

– There are further benefits to be gained from operating several types of scheme—when companies implement both CSOP and SAYE schemes, productivity increases by 4.4% (ie, a greater increase than the effect of operating only either a SAYE or CSOP scheme).

The literature reviewed for Report 1 suggests that the impact of financial participation schemes varies according to employee and firm characteristics. For example, the effect may be linked to other performance management schemes, structures, and incentives within a firm, such that the adoption of tax-advantaged share schemes by themselves may not be sufficient to improve performance. For example, at the same time at which a firm introduces a non-tax-advantaged scheme to incentivise managers to improve performance and

[4] Oxera (2007), 'Tax-advantaged Employee Share Schemes: Analysis of Productivity Effects—Report 1: Productivity Measured using Turnover', January, report prepared for HM Revenue & Customs.

productivity, that firm might also choose to take advantage of the tax incentives of a tax-advantaged scheme. When examining the data, it might appear that the tax-advantaged scheme has increased output but it may not have happened without the existence of the non-tax-advantaged scheme.

Similarly, improvements in productivity are more likely if the nature of the firm's activity implies that, when incentivised, employees can have a significant effect on output. In particular, the findings of this study indicate that larger firms are more likely to see productivity benefits from introducing share schemes. This could be due to the following factors.

– The impact may be greater for larger firms since their human resource managers may be more experienced in employee relations and thus better placed to coordinate profit sharing with other policies.

– Larger workforces may lead to reduced productivity because of the difficulties of managing/motivating them (diseconomies of scale), and hence there is greater potential for share schemes (and other management tools) to produce a greater effect on productivity.

– The cost per worker of implementing a scheme is likely to be lower for larger firms, making the schemes more cost-effective to implement. The result that larger firms find it easier to extract productivity gains following the introduction of share schemes may reflect the fact that management/incentive tools work more effectively as part of a package of measures rather than in isolation.

Thus, Report 1 examined the impact of share schemes for different types of firm, investigating whether firms operate other financial participation schemes (as far as such additional information was available), with the following results.

– Listed companies show a 4.9% long-run improvement in productivity if they have tax-advantaged share schemes; unlisted companies show no significant improvement.

– Tax-advantaged share schemes implemented on their own do not appear to be sufficient to improve performance—companies with only an tax-advantaged scheme do not appear to have significantly higher productivity. However, if companies operate non-tax-advantaged share schemes (at any point in time) *and* a tax-advantaged share scheme, their productivity increases by around 5.2% in the long run.

– When disaggregated by industry, productivity significantly increases by 5% for manufacturing, 24% for electricity, gas and water, and by 11% for financial intermediation when companies implement tax-advantaged share schemes.

– The effect of a tax-advantaged share scheme increases as company size increases, with firms only in the upper quartile (ie, those with an annual turnover greater than £36.3m) experiencing a statistically significant productivity effect.

These results indicated that the tax advantages of tax-advantaged share schemes are not sufficient on their own to increase company productivity. For tax-advantaged schemes to be effective in increasing productivity, other factors such as non-tax-advantaged schemes, company size, and being a listed company are required for a significant productivity effect to be identified.

Table 1.1 summarises these results.

Table 1.1 Results from Report 1

	Productivity effect (%)	Significance at 5%
Any tax-advantaged scheme	2.5	Yes
SAYE	4.1	Yes
APS	0.9	No
CSOP	1.6	No
Combinations of tax-advantaged schemes		
APS and CSOP	–3.3	No
APS and SAYE	–0.3	No
CSOP and SAYE	4.4	Yes
Listed companies with a scheme	4.9	Yes
Unlisted companies with a scheme	1.9	No
Any tax-advantaged scheme by turnover quartile		
Quartile 1 (less than £3.4m)	1.6	No
Quartile 2 (£3.4m to £11.2m)	1.1	No
Quartile 3 (£11.2m to £36.3m)	1.4	No
Quartile 4 (greater than £36.3m)	3.3	Yes
Companies with tax-advantaged schemes only	–1.9	No
Companies with tax-advantaged and non-tax-advantaged schemes	5.2	Yes
Industries where the effect is greatest		
Electricity, gas and water	23.7	Yes
Financial intermediation	11.1	Yes
Manufacturing	4.8	Yes

Source: Oxera (2007), op. cit.

Comparisons with UK studies that provide specific estimates of the effect of schemes give a mixed picture. Conyon and Freeman (2004) found a positive impact for listed companies with APS and CSOP schemes of up to 18.9% and 12.2% respectively.[5] However, they did not identify any evidence of a positive impact for those with SAYE schemes. In contrast, Addison and Belfield (2001) identified some indication that the existence of a SAYE scheme is associated with higher productivity levels (significant only at a 10% significance level).[6]

Limitations of the research for Report 1 and benefits of the ARD

Report 1 employed data supplied by HM Revenue & Customs regarding the use of a tax-advantaged scheme and accounting data from the FAME (Financial Analysis Made Easy) database on turnover, employees and capital. Using accounting data may lead to inconsistencies and bias in the results due to varying interpretations of accounting standards. Report 2 utilises the Annual Respondents Database (ARD), which potentially addresses some of these limitations.

[5] Conyon, M.J. and Freeman, R.B. (2004), 'Shared Modes of Compensation and Firm Performance: UK Evidence', in D. Card, R. Blundell and R. Freeman (eds) (2004), *Seeking a Premier Economy: The Economic Effects of British Economic Reforms, 1980–2000*, National Bureau of Economic Research, University of Chicago Press.

[6] Addison, J.T. and Belfield, C.R. (2001), 'Updating the Determinants of Firm Performance: Estimation Using the 1998 UK Workplace Employee Relations Survey', *British Journal of Industrial Relations*, **39**, 341–66.

Annual Respondents Database (ARD)

Although Datastream and FAME have been used by researchers in previous work on the productivity of UK companies (including that of Oxera), recent studies have opted to use data from the ARD provided by the Office for National Statistics (ONS). A summary of the work using the ARD is provided in Barnes, Haskel and Ross (2001).[7]

The ARD contains business micro data focused on productivity—ie, measures of employment, turnover/output, gross value added (GVA), etc. The database includes data for all businesses that respond to the annual business surveys conducted by the ONS.[8] Although the response rate varies from year to year, with not all businesses responding in every single year, the information provided by the database creates a very large panel of all types of business, whether listed on a stock exchange or not, capturing even very small firms.

The main attraction of using the ARD over an accounting database is that it enables a more direct measure of output to be constructed. The earlier research used a company's turnover as a proxy for the output, but this does not consider how much extra value a company is adding to the raw inputs or the amount of stock produced. Instead, GVA, as made available in the ARD and used here, gives an estimate of the difference between the input and the output values of goods (ie, how much value the company has added). An additional advantage of the ARD is the improved coverage and quality of data on number of employees.

While this is a clear advantage over Datastream and FAME, the ARD presents important drawbacks and cannot be used as the only, or indeed the main, data source to conduct the analysis. In particular, it contains no accounting information and no market data, which limits its ability to address questions relating to financial performance.

Despite the advantages of the ARD, it is unable to address several limitations, as outlined below.

– It is not possible to assess the impact of wider profit-sharing schemes (such as non-tax-advantaged schemes and other employee participation/workplace relations factors), which may lead to bias in the estimated effect of share schemes.

– Again, due to the dataset used, many important firm/employee characteristics are not available for this study (such as scheme design and whether other organisational changes occurred at the same time as the scheme introduction). These characteristics may be related to the use of share schemes in the workplace. Because these cannot be included in the model, the estimated effect of share schemes may be biased since it may also capture the effect of these characteristics.

– One important variable—the extent of employee participation in the tax-advantaged share schemes—could not be included in the analysis as the raw data was a flow. Furthermore, due to some inconsistency in definition, it was not possible to construct a stock measure of employee participation. As such, the analysis focuses on whether a firm operates a particular tax-advantaged share scheme (represented by a simple dummy variable taking the value of 0 or 1), and not on the level of employee

[7] Barnes, M., Haskel, J., and Ross, A., (2001), 'Understanding Productivity: New Insights from the ONS Business Data Bank', paper presented to Office for National Statistics Special Session on Evidence-based Policy, Royal Economic Society Annual Conference, Durham.

[8] The ARD contains information at plant, establishment and enterprise group level. It categorises establishments into seven types: incorporated or company, sole proprietor, partnership, public corporation, central government body, local authority, and other (this includes non-profit-making bodies and others). For this analysis, the sample would be restricted to the first type only.

participation in the schemes, which may represent a more accurate measure of such participation. For example, for one firm, almost all employees may participate in a tax-advantaged share scheme, while another firm may have only a few employees participating. If tax-advantaged share schemes affect firm performance, this impact might be expected to be stronger in the former case; however, this difference is not examined in this study. The examined relationship between share schemes and company performance is therefore somewhat simplified for the current purposes, with the impact of any variation in participation across firms averaged out.

– The sample of firms in this study may be biased since the dataset used in both analyses is almost exclusively based on surviving companies. If the latter differ in their overall characteristics from bankrupt companies, the estimated impact of the scheme may be biased. As a result, it may not be valid to draw conclusions about the effect of share schemes for the population as a whole since results are derived using part of the potentially non-representative population of surviving companies.[9]

As the ARD does not provide data on financial performance, this report focuses on the effect of share schemes on firm-level productivity.

Work under lab conditions: restrictions on reporting

Due to the commercially sensitive nature of the data, access to the ARD is restricted to researchers working on government-sponsored projects under specific conditions, to ensure that the confidentiality requirements of the Statistics of Trade Act (1947) are met.

Oxera staff working on the project have been on the Business Data Linking training course and followed the database users' guide in the course of their research.

To comply with these restrictions, the full range of summary statistics and full data description are not provided in this report, to ensure that no one company's data could be identified through use of this report on its own or in conjunction with other reports.

[9] For example, if, on average, the impact of schemes on productivity were higher for surviving companies, focusing the analysis only on these companies (rather than on a representative sample of the population) would lead to an overestimate of the productivity effect of share schemes.

2 Combining the ARD and HM Revenue & Customs data

The ARD data has successfully been matched with other databases in previous research studies,[10] and similar matching was undertaken with the HM Revenue & Customs datasets. Using the Inter Departmental Business Register (IDBR), it was possible to link company reference numbers to the ARD data. These company reference numbers were then matched to the existing HM Revenue & Customs data relating to share schemes.

Due to problems concerning the availability and consistency of capital stock variables within ARD, the capital variable from FAME (fixed assets) was used.

The control group—those companies without a scheme—was the same as in Report 1 in order to preserve its representative nature with the treatment group (those companies with a share scheme).

As ARD data is recorded at the enterprise level while share scheme data is recorded at the firm level, the former data was aggregated to the firm level using the enterprise reference number.[11] It is possible that not all of the enterprises within certain firms were surveyed and as such the aggregation may introduce a downward bias in any effects, since output would be under-recorded. If present, there is no obvious reason why the bias would be more prevalent in firms with share schemes or those without.

The matching process was performed using Stata[12] and only matched data after 1997 due to a significant change in the variables collected by the ONS. This means a consistent measure of GVA cannot be calculated before and after 1997.

Of the 103,985 observations (an observation is a specific company in a specific year), 25,164 were matched to the correct firm and year, providing a sufficiently large sample to conduct an econometric analysis. As ARD is a sample of companies from across England and Wales, a 25% matching rate with HM Revenue & Customs data is reasonably successful. The data was checked for duplicates in terms of company and enterprise reference number, and the distribution of observations by industry and company size.

Once duplicates were removed, the dataset held a panel of 21,350 observations over seven years, with an average of three years' data for each company. This compares with the average six years available when using FAME data. The change in variable definitions in 1997 restricts the possibility of having a longer time dimension in the dataset until further years' data are added to the ARD. Having a shorter time series available limits the ability of the dataset to infer any dynamic effects that take longer than three years to manifest.

Where an observation existed in both datasets, they were checked for consistency. Theoretically, the ARD has a more robust measure of turnover and employees than FAME, so some differences are expected but the two measures should be positively correlated, as shown in Table 2.1 below.

[10] For example, Griffith and Simpson (2001) match the ARD data with information from the 'Annual Inquiry into Foreign Direct Investment' to assess productivity differences between domestic and foreign-owned firms. See Griffith, R. and Simpson, H. (2001), 'Characteristics of Foreign-owned Firms in British Manufacturing', IFS Working Paper WP01/10, Institute of Fiscal Studies.

[11] Two observations were dropped as they did not have an enterprise reference number.

[12] StataCorp. (2005), '*Stata Statistical Software: Release 9*'. College Station, TX: StataCorp LP.

Table 2.1 Correlation of employees and turnover between ARD and FAME

		ARD	
		Employees	**Turnover**
FAME	**Employees**	0.61	–
	Turnover	–	0.72

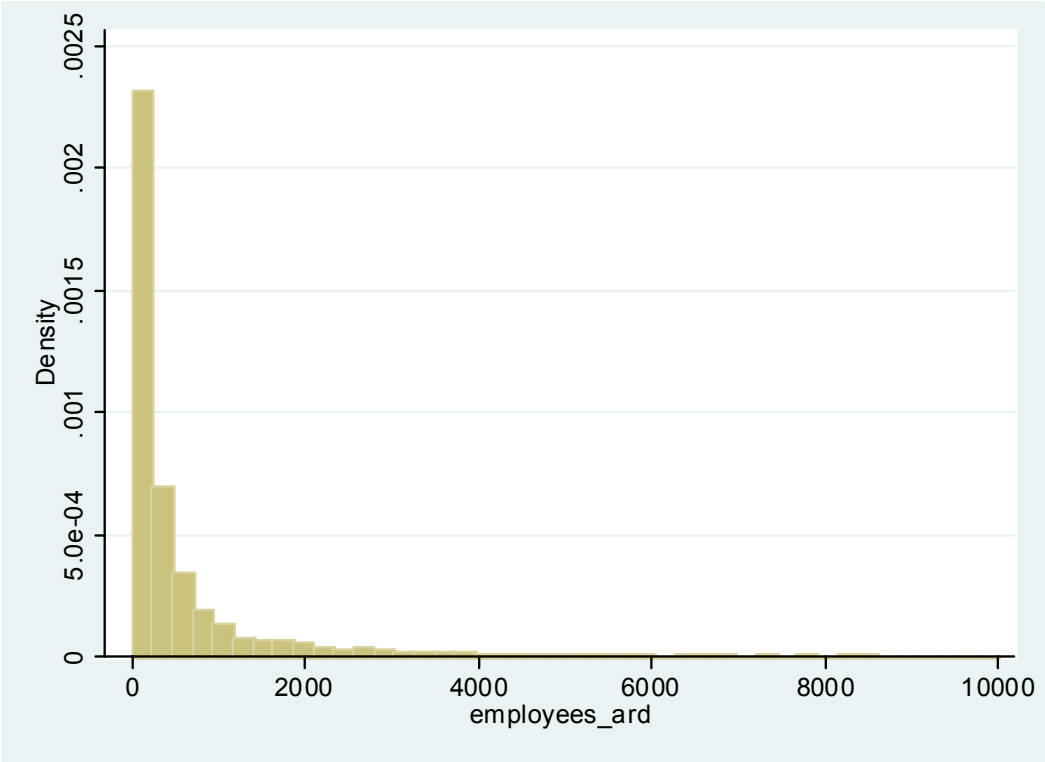
Source: Oxera calculations.

As discussed in section 1, one of the primary aims of the study is to use a measure of value added as opposed to turnover as a measure of output. The measure of value added used here was:

> GVA = turnover – VAT + value of insurance claims – stock at beginning of period + stock at end of period + acquisitions – purchase costs.

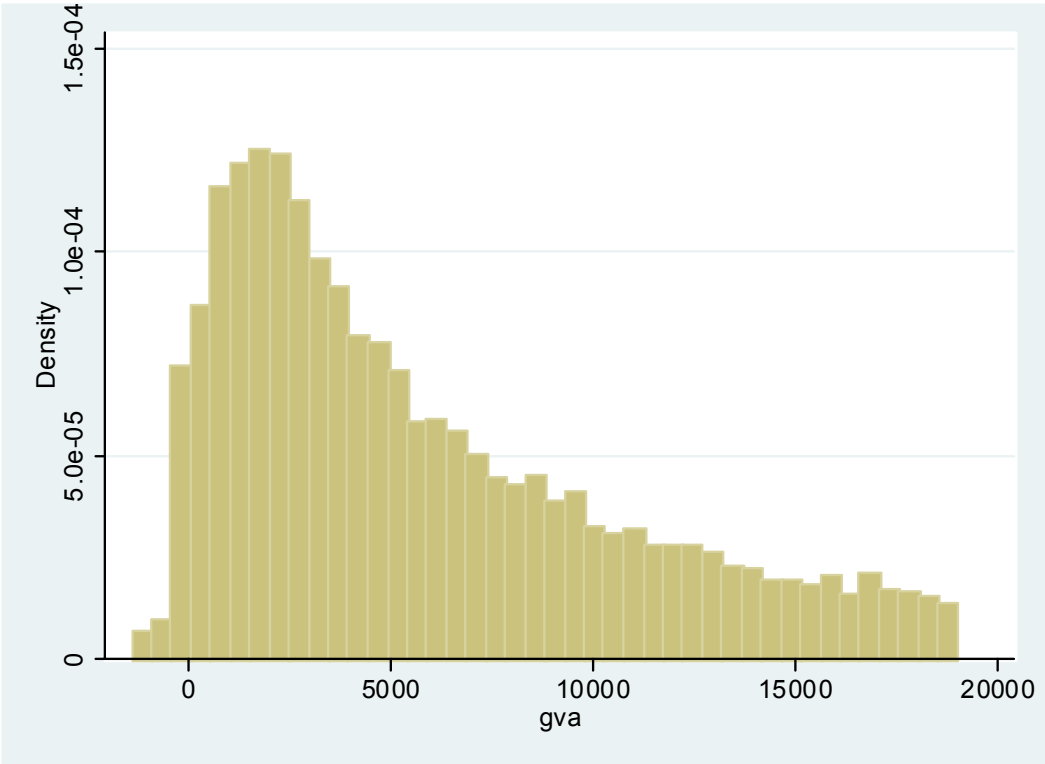
Figures 2.1 and 2.2 show the distribution of employees and GVA from the matched ARD dataset. The distribution of employees shows that the majority of companies have fewer than 1,000 employees, and that, therefore, there are a few very large employers in the sample. The distribution of GVA is less skewed than employees, and shows a smooth, continuous distribution of GVA between zero and 20,000.

Figure 2.1 Number of employees, ARD



Note: Density means the frequency has been scaled such that the sum of the bars equals one.
Source: Oxera calculations.

Figure 2.2 Gross value added, ARD



Note: Density means the frequency has been scaled such that the sum of the bars equals one.
Source: Oxera calculations.

3 Results

To quantify the extent to which each type of share scheme affects company performance, a panel of data was constructed, as explained in section 2. The modelling in this section estimates company performance given company-specific factors and macroeconomic conditions.

3.1 Examining firm productivity performance

Before the econometric analysis was undertaken, a descriptive analysis of the data was performed, including graphs, summary statistics, correlations and statistical tests for differences in labour productivity.

Labour productivity was calculated as the amount of GVA per employee, and the result of a t-test for significant differences in labour productivity between firms with a scheme and those without is shown below:

Table 3.1 Labour productivity

	Number of observations	Mean labour productivity (£ per employee)
No scheme	19,950	90.1
Scheme	3,290	124.8
Combined	23,240	95.0
Difference		–34.7

Source: Oxera calculations.

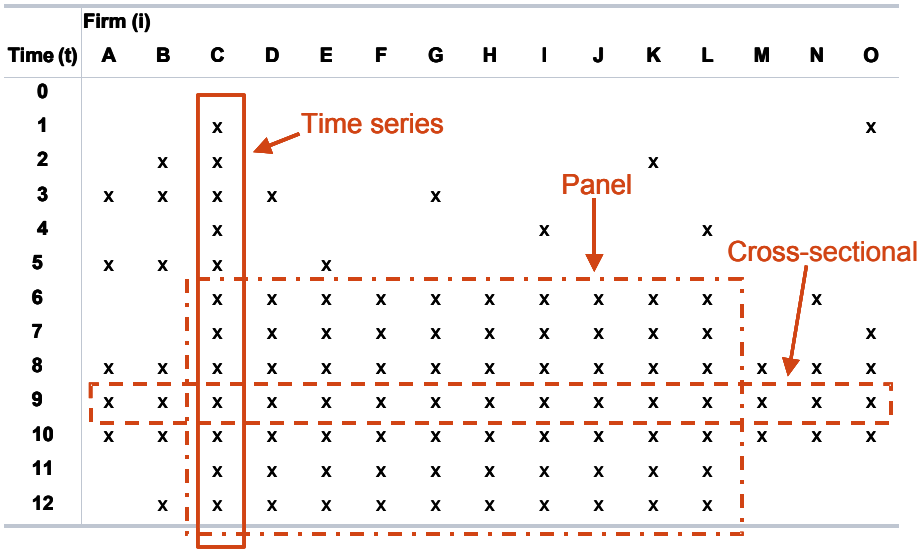
Table 3.1 shows that labour productivity appears to be higher for companies with a share scheme (an increase in GVA of £34.70 per worker); however, this is only significant at the 10% level and therefore constitutes weak evidence that productivity is actually higher in firms operating a share scheme.

This analysis focuses on productivity performance, based on a production approach, using a Cobb–Douglas function, as used in the main report. This is consistent with approaches used in the existing literature: for example, Conyon and Freeman (2004) apply a Cobb–Douglas specification to estimate the impact of HM Revenue & Customs-tax-advantaged compensation systems on productivity performance.[13] However, due to data limitations, the authors' econometric specification was static over time (no lagged variables were included).

This contrasts with the dynamic panel data approach used in both Oxera studies. In addition to cross-section variation across firms, this approach introduces the time dimension and therefore increases the potential explanatory power of the modelling because it can track specific firms operating each type of scheme over time (see Figure 3.1).

[13] Conyon, M.J. and Freeman, R.B. (2004), 'Shared Modes of Compensation and Firm Performance: UK Evidence', in D. Card, R. Blundell and R. Freeman (eds) (2004), *Seeking a Premier Economy: The Economic Effects of British Economic Reforms, 1980–2000*, National Bureau of Economic Research, University of Chicago Press.

Figure 3.1 Types of data



Source: Oxera.

Oxera used the following generic *dynamic* Cobb–Douglas production function as a 'general' model (Equation 3.1), which is refined to a parsimonious 'specific' model.

$$GVA_{it} = \alpha + \sum_{n=1}^{t} \beta_{1,t-1-n} GVA_{i,t-1-n} + \sum_{n=0}^{t} \beta_{2,t-n} L_{i,t-n} + \sum_{n=0}^{t} \beta_{3,t-n} K_{i,t-n} + \sum_{n=0}^{t} \beta_{4,t-n} D_{i,t-n} + \sum_{n=0}^{t} \beta_{5,t-n} Y_{t-n} + \mu_{it}$$

(Equation 3.1)

where:

– GVA is the log of gross value added (as defined in section 2);
– L is a logged measure of labour input into the production process;
– K is a logged measure of capital stock;
– D is a dummy variable for the existence of an employee share scheme;
– Y is a vector of logged macroeconomic variables that vary across time only. Examples of macroeconomic variables that are considered for inclusion in the regression are those referred to above: GDP, stock market performance and interest rates.

Company performance with respect to share schemes is likely to have a dynamic nature (ie, it will take a certain period of time before any effects are felt). Oxera has therefore estimated a dynamic panel that allows for a lag before the effect of introducing a share scheme is observed, although a maximum of a three-year lag is possible due to the change in variables collected by the ONS in 1997. In contrast to static panel data models, dynamic panel data models give rise to additional potential statistical complications of autocorrelation (high correlations between explanatory variables and their lags) or correlation of the lagged endogenous variable and the error term. These statistical problems can potentially bias the estimates if not accounted for.

The dynamic panel data approach described above has been applied in other studies to estimate the productivity performance of UK companies (Nickell, Nicolitsas and

Drydon 1997)[14], and in the USA to assess the effect of employee share schemes (Kruse 1993b).[15]

The monetary measures have been deflated by the RPI to convert them to 2003 prices. The model described in Equation 3.1 is linear in parameters, and is the starting point for estimation.

Hausman test for fixed versus random effects

To determine whether fixed or random effects were appropriate,[16] a Hausman specification test was estimated (Hausman 1978),[17] which clearly indicated that the fixed effects estimator was appropriate (as per Kruse 1993b) and consistent with Report 1. The modelling described below therefore uses the fixed effects estimator. Most of the differences between industries were controlled for by the fixed effect itself, and the effect of schemes can still be estimated by industry since the presence of a scheme varies through time.

3.2 Results from static production functions

The results from the static production functions are summarised in Table 3.2.

[14] Nickell, S., Nicolitsas, D. and Drydon, N. (1997), 'What Makes Firms Perform Well', *European Economic* Review, **41**, 783–96.

[15] Kruse, D.L. (1993b), 'Does Profit Sharing Affect Productivity?', Working Paper no. 4542, *NBER Working Paper Series*, November.

[16] See Oxera (2007), op. cit., for an explanation of fixed versus random effects.

[17] Hausman, J.A. (1978), 'Specification Tests in Econometrics', *Econometrica*, **46**, 1251–71.

Table 3.2 Static fixed effects production functions

	Model				
Dependent variable	Cobb–Douglas Log(GVA)	Including scheme effects Log(GVA)	By industry Log(GVA)	By listing Log(GVA)	By scheme type Log(GVA)
Lemployees	0.644**	0.644**	0.647**	0.644**	0.644**
Lcapital	0.078**	0.077**	0.078**	0.077**	0.077**
Lgdp	0.617**	0.618**	0.61**	0.617**	0.622**
Repo	0.008	0.008	0.008	0.008	0.008
Scheme (any)		0.026			
Scheme listed				0.036	
Scheme non–listed				0.024	
APS scheme					0.027
CSOP scheme					–0.006
SAYE scheme					0.067*
Scheme in agriculture			–0.511		
Scheme in fishing			–		
Scheme in mining and quarrying			0.02		
Scheme in manufacturing			0.032		
Scheme in electricity, gas and water supply			–0.042		
Scheme in construction			–0.047		
Scheme in wholesale and retail trade			0.115*		
Scheme in hotels and restaurants			0.075		
Scheme in transport, storage and communication			0.12		
Scheme in financial intermediation			–0.479		
Scheme in real estate, renting and business activities			–0.052		
Scheme in public administration and defence			–		
Scheme in education			0.744		
Scheme in health and social work			0.415		
Scheme in community, social and personal services			0.041		
Scheme in private households			–		
Scheme in extra–territorial organisations and bodies			–		
Constant	–	–	–	–	–
Number of observations	22,527	22,527	22,389	22,527	22,527
Number of companies	7,633	7,633	7,547	7,633	7,633

Note: Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%. Missing values indicate where a coefficient was unable to be estimated, either due to lack of data points or due to multicollinearity. Constant removed in line with ONS guidelines in reporting ARD results.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

The Cobb–Douglas model in Table 3.2 shows the static, fixed effects production function, where output (the log of GVA) is explained by the log of employees, capital, GDP and the REPO rate. The explanatory variables are significant and have intuitive signs—for example, output is increased by rising GDP and decreased by rising interest rates.

The presence of any tax-advantaged share scheme, as tested by the scheme dummy variable is not significantly different from 0. In addition, there does not appear to be a significant effect when listed and non-listed companies are disaggregated. The research in Report 1, which uses turnover as an output, found a significant effect of 8.3%. When the schemes are broken down by type, there is a significant effect for SAYE schemes of a 6.7% increase in GVA but no effect from CSOP or APS schemes.

If the effect of schemes is broken down by industry, the only industry that responds to employee share schemes is the wholesale and retail trade which exhibits an 11.5% increase in GVA. There was no significant effect for wholesale and retail in Report 1.

One explanation for the difference between the results of this study and those of Report 1 is that the latter results may have been biased by the use of turnover as a measure of output and the imperfect measure of employees. Alternatively, the shorter time dimension available from the ARD may limit the potential to find a statistically significant relationship. The above models are based on static modelling, assuming that the effect of a share scheme on output is felt instantly. However, there may be a dynamic element to the relationship in that the full effect of a scheme is not felt for several years. It is also possible that the causality between higher output and having a scheme is not clear—for example, as well as tax-advantaged schemes increasing productivity, companies with high levels of productivity may be more likely to have a scheme. As such, these results may not capture the true effects of share schemes on productivity.

3.3 Results from dynamic production functions

To address both these issues, Oxera estimated several dynamic panel data models that include lags of the explanatory variables (which allow for a lagged response to the implementation of a scheme) and lagged dependent variables (which control for the historical performance of an individual company).

Previous studies have argued that the fixed effect (a firm-specific constant that is time-invariant) controls for the potential endogeneity arising from share schemes causing higher levels of productivity and the possibility that higher levels of productivity also result in a higher probability of taking up a share scheme.

However, this is unlikely to be an effective control because it assumes that an average constant level of output is associated with that particular firm, whereas, in reality, the output of the firm's turnover is likely to follow a trend and will vary over time rather than be fixed over time, as the fixed effect suggests. Including the historical values of turnover controls for the most recent observed turnover figures, which are likely to be a better control for the path that the firm's turnover figures are taking. Using this approach, the model predicts the level of output for a company, given its past performance, and mitigates the potential bias from the endogeneity described above.

From the dynamic specification, it is possible to estimate a long-run effect from the presence of a variable by summing the coefficients on the variable of interest and dividing by 1 minus the sum of the lags of the dependent variable. In this case, where there is one lag on the dependent variable:

$$\frac{\sum_{i=1}^{n} \text{coefficient of scheme}_{t-i}}{1-(\text{coefficient of lGVA}_{t-1})} \qquad \text{(Equation 3.2)}$$

3.4 Effects of all tax-advantaged schemes

General dynamic production functions were first estimated as described above with all possible and available variables included. Table 3.3 shows the effect of having any type of tax-advantaged scheme on all companies and by industry.

Table 3.3 Effects of having any scheme (% change in GVA)

	Long-run effect	Significant at 5%?
All industries	1.4	No
Agriculture		No
Fishing		No
Mining and quarrying	4.3	No
Manufacturing	7.2	No
Electricity, gas and water supply	1.8	No
Construction	–4.7	No
Wholesale and retail trade	29.7	Yes
Hotels and restaurants	–12.5	No
Transport, storage and communication	9.0	No
Financial intermediation		No
Real estate, renting and business activities	–8.7	No
Public administration and defence		No
Education		No
Health and social work		No
Other community, social and personal service activities		No
Private households		No
Extra-territorial organisations and bodies		No

Note: Missing values are where the number of companies in an industry was not sufficient to obtain a robust estimate.
Source: Oxera calculations.

The general model indicates that, across all companies and industries, there is no significant effect in increased GVA from operating a tax-advantaged share scheme. When the general model with a dummy variable for the presence of a scheme was subject to a general-to-specific procedure to remove the insignificant variables and find a parsimonious model, the scheme dummy is not significant, as shown in Table 3.4.

Table 3.4 Specific dynamic fixed effects production functions

	General dynamic model	Specific dynamic model
Model	**lGVA**	**lGVA**
lgva_1	0.072**	0.073**
Lemployees	0.52**	0.516**
lemployees_1	0.1**	0.102**
Lcapital	0.068**	0.072**
lcapital_1	0.007	
lgdp	–2.657	
lgdp_1	1.758	
repo	–0.059	–0.018**
repo_1	–0.022	–0.016*
scheme	0.025	
scheme_1	–0.012	
Number of observations	11,976	11,976
Number of companies	4,635	4,635

Note: Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%. Missing values indicate where a coefficient was unable to be estimated, either due to lack of data points or due to multicollinearity. Constant removed in line with ONS guidelines in reporting ARD results.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

When the effect is examined by industry only, wholesale and retail experience a significant effect, which appears to be very large at a nearly 30% increase in GVA. When the insignificant variables were removed (one at a time), the large effect in wholesale and retail was still present. It seems unlikely that a share scheme on its own would generate such a large increase in value added; as such, this result should be treated with caution until verified with other studies.

There was also a weak effect for manufacturing companies of 11.7% at the 10% confidence interval.

Table 3.5 Effects of having any scheme by industry from specific models

	Long-run effect (%)	Significant at 5%?
Manufacturing	11.7	No*
Wholesale and retail trade	28.9	Yes

Note: no* indicates insignificant at 5% but significant at 10%.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

3.5 Effects of each type of tax-advantaged schemes

Although there is little evidence of significant increases in productivity from all schemes, there is some indication that the presence of a SAYE scheme increases productivity

Table 3.6 Effects of having each type of scheme

	Long-run effect (%)	Significant at 5%?
APS	4.4	No
CSOP	2.1	No
SAYE	9.0	Yes
APS and CSOP	6.7	No
APS and SAYE	14.6	No*
CSOP and SAYE	7.0	No*

Note: no* indicates insignificant at 5% but significant at 10%.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

Table 3.6 shows that although there is no effect from APS or CSOP schemes, the presence of a SAYE scheme significantly increases GVA by 9% in the long run. This compares with an effect of 4.1% for SAYE and no effects for APS and CSOP in the main study.

Combinations of SAYE with APS and SAYE with CSOP schemes also show weak signs of increasing productivity being significant at the 10% level. The evidence supports the theory that the SAYE scheme has stronger incentive properties than the other tax-advantaged schemes.[18]

3.6 Effects of schemes by company size

Report 1 found that only companies in the top quartile of the turnover distribution (greater than £36.3m) achieved significant increases in turnover due to the presence of a share scheme. However, using the ARD, no effect was found in any of the turnover quartiles for any scheme, as shown in Table 3.7 below. Nevertheless, the size of the coefficient did increase as turnover increases, despite being insignificant.

Table 3.7 Effects of any scheme by company size

	Long-run effect (%)	Significant at 5%?
Quartile 1 (less than £3.4m)		No
Quartile 2 (£3.4m to £11.2m)	0.9	No
Quartile 3 (£11.2m to £36.3m)	2.7	No
Quartile 4 (greater than £36.3m)	8.6	No

Note: no* indicates insignificant at 5% but significant at 10%.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

When only the SAYE scheme was examined, a significant effect of 10.6% was found for firms in the top turnover quartile (ie, with turnover greater than £36.3m).

[18] See Oxera (2007), op. cit., for differences in incentive properties between the schemes.

Table 3.8 Effects of SAYE by company size

	Long run effect (%)	Significant at 5%?
Quartile 1 (less than £3.4m)		No
Quartile 2 (£3.4m to £11.2m)	–60.7	No
Quartile 3 (£11.2m to £36.3m)	3.5	No
Quartile 4 (greater than £36.3m)	10.6	Yes

Note: no* indicates insignificant at 5% but significant at 10%. Despite the large negative coefficient for quartile 2 it was statistically insignificant from 0.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

3.7 Test for non-tax-advantaged schemes

As with Report 1, it is possible that the results above are not due to the presence of a tax-advantaged scheme; instead, tax-advantaged schemes are often run in conjunction with non-tax-advantaged schemes, and the incentive properties of the latter may be generating the increase in productivity when a tax-advantaged scheme is used.

The data to test this hypothesis is imperfect as there is only information relating to whether a company operated an non-tax-advantaged scheme at any point in time. There is no record of when the scheme was introduced, the incentive properties or the degree of participation.

Table 3.9 below shows the results of interacting the existence of an non-tax-advantaged scheme with the existence of a tax-advantaged scheme.

Table 3.9 Specific dynamic fixed effects production functions with presence of unapproved scheme

	General dynamic model	Specific dynamic model
Model	**LGVA**	**IGVA**
lgva_1	0.071**	0.072**
lemployees	0.521**	0.523**
lemployees_1	0.099**	0.1**
lcapital	0.068**	0.07**
lcapital_1	0.005	
lgdp	0.794	0.541**
lgdp_1	–0.255	
app_scheme only	0.023	
app_scheme only_1	–0.013	
also unapproved_scheme	0.014	0.061
also unapproved_scheme_1	0.07	
Number of observations	11,976	11,976
Number of companies	4,635	4,635

Note: Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%. Missing values indicate where a coefficient was unable to be estimated, either due to lack of data points or due to multicollinearity. Constant removed in line with ONS guidelines in reporting ARD results.
Sources: HM Revenue & Customs; ONS ARD; Office for National Statistics Time Series; and Oxera calculations.

There does not appear to be a significant effect for tax-advantaged schemes on their own, but there was weak evidence (at the 10% confidence level) that when combined with an non-tax-advantaged scheme, GVA was raised by 6.5%. This is consistent with Oxera's finding of

an increase of around 5% in turnover from the presence of a tax-advantaged and non-tax-advantaged scheme in Report 1.[19]

3.8 Test for dependent variable bias

One potential criticism of the dynamic models is that the lagged dependent variable may bias results. This could arise either because it is correlated with the error term, or because the presence of a scheme is often time-invariant and may be correlated with GVA if it is also largely constant over time.

An alternative view is that the lagged dependent variable controls for the past level of GVA and seeks to address the causality issue of whether share schemes help make successful firms or whether successful firms choose to operate share schemes to reward employees.

A sensitivity test was undertaken by removing the lagged dependent variable from the dynamic production function. When testing for the effect of all schemes, the dummy variable was still not significant and when SAYE schemes were examined, it was significant at the 5% level and increased GVA by 10.1% compared with 9.0% when the lagged dependent variable was included.

3.9 Comparisons with Report 1

The main material differences compared with the first report are the change in dependent variable from logged turnover to logged GVA as a more robust measure of productivity and the improved measure of employment from the ARD. The change in the dependent variable makes the results not directly comparable; however, Table 3.10 shows that in the ARD dataset, it is harder to identify a significant effect on productivity from employee share schemes but when an effect is found for SAYE or in wholesale and retail or manufacturing, the percentage impact on GVA is larger than it was on turnover.

This lack of a significant effect from employee share schemes could be a result of the shorter time dimension of the dataset not giving sufficient information on the impact of share schemes. Alternatively, the improved measure of output could be giving a clearer view that, on average, most employee share schemes in most industries have no significant effect on productivity.

[19] Oxera (2007), op. cit.

Table 3.10 Comparison with results from Report 1

	Report 1 (% increase in turnover)	Using ARD (% increase in GVA)
Any tax-advantaged scheme	2.5*	1.4
SAYE	4.1*	9.0*
APS	0.9	4.4
CSOP	1.6	2.1
Combinations of tax-advantaged schemes		
APS and CSOP	–3.3	6.7
APS and SAYE	–0.3	14.6
CSOP and SAYE	4.4*	7.0
Listed companies with a scheme	4.9*	3.6
Unlisted companies with a scheme	1.9	2.4
Any tax-advantaged scheme by turnover quartile		
Quartile 1 (less than £3.4m)	1.6	
Quartile 2 (£3.4m to £11.2m)	1.1	0.9
Quartile 3 (£11.2m to £36.3m)	1.4	2.7
Quartile 4 (greater than £36.3m)	3.3*	8.6
Companies with tax-advantaged schemes only	–1.9	
Companies with tax-advantaged and non-tax-advantaged schemes	5.2*	6.1
Industries where the effect is greatest		
Electricity, gas and water	23.7*	
Financial intermediation	11.1*	
Manufacturing	4.8*	7.2
Wholesale and retail		28.9*

Note: * Significant at the 5% level.
Source: Oxera (2007), op. cit.

4 Conclusions

The first report examined the effect of employee share schemes on companies' productivity performance, measured by an increase in turnover for a given set of factors of production, and identified the following general results.

– On average, across the whole sample, the effect of tax-advantaged share schemes on productivity appears to be significant.

– However, when the schemes are analysed on a disaggregated basis, there is a 9% long-run improvement in performance for companies using SAYE schemes, but no significant improvement for companies using either CSOP or APS schemes.

– There is weak evidence of further benefits to be gained from operating a CSOP or APS scheme together with a SAYE scheme

The literature reviewed in Report 1 suggests that the impact of financial participation schemes varies according to employee and firm characteristics. For example, the impact of tax-advantaged share schemes may be linked to other performance management schemes, structures, and incentives within a firm, such that the adoption of tax-advantaged share schemes only may not be sufficient to improve performance. Similarly, improvements in productivity are more likely if the nature of the firm's activity implies that, when incentivised, employees can have a significant effect on output. The impact may also be greater for larger firms as their human resource managers may be more experienced in employee relations and thus better placed to coordinate profit sharing with other policies; furthermore, the cost per worker of implementing a scheme is likely to be lower for larger firms.

One of the limitations of the dataset used in the first report is that the definition of productivity assumes that any change in turnover of the company, all other things being equal, is seen as an increase in the productivity. This might not necessarily be the case, since the turnover of a firm may fluctuate due to factors other than productivity, such as changing stock levels, the value of insurance claims, acquisitions and purchase costs.

Using gross value added (the part of production that is the actual contribution of an enterprise to the economy) as the measure of productivity, rather than an increase in turnover given the inputs of production, aligns the productivity measure used in this study more closely with the aim of measuring the wider benefits to society, since it captures only increases in value added to the economy as a whole rather than all the increases in turnover.

Thus, this report has examined the impact of share schemes for different types of firm, and whether firms operate other financial participation schemes (to the extent that such additional information was available).

– There was no significant effect from share schemes on productivity in either listed or non-listed companies.

– Tax-advantaged share schemes on their own do not appear to be sufficient to improve performance—companies with only a tax-advantaged scheme do not appear to have significantly higher productivity. However, if companies have non-tax-advantaged share schemes (at any point in time) *and* a tax-advantaged share scheme, there is weak evidence that productivity increases by around 6.1% in the long run.

– When disaggregated by industry, productivity significantly increases by 7.2% for manufacturing and 28.9% in wholesale and retail when companies operate tax-

advantaged share schemes. It seems unlikely that a share scheme on its own would generate such a large increase in value added; as such, this result should be treated with caution until verified by other studies on this issue by industry.

– The effect of a tax-advantaged share scheme increases as company size increases, with firms only in the upper quartile (ie, with turnover greater than £36.3m) experiencing a statistically significant productivity effect.

These results indicate that the tax advantages of tax-advantaged share schemes are not sufficient on their own to increase company productivity. However, there is some evidence of effects from SAYE schemes in large companies. For tax-advantaged schemes to be effective in increasing productivity, other factors such as non-tax-advantaged schemes, and in particular company size are required for a significant productivity effect to be identified.

Appendix 1 Statistical output

A1.1 Static modelling

```
Two-sample t test with equal variances

------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |   19950    90.05907    9.797512    1383.844    70.85514     109.263
       1 |    3290    124.7983    8.166726    468.4313    108.7859    140.8106
---------+--------------------------------------------------------------------
combined |   23240    94.97697    8.489927    1294.261    78.33615    111.6178
---------+--------------------------------------------------------------------
    diff |           -34.73918    24.35348               -82.47361    12.99524
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.4265
Ho: diff = 0                                     degrees of freedom =    23238

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0769         Pr(|T| > |t|) = 0.1537          Pr(T > t) = 0.9231


.
. ****************************************
. *Hausman test: fixed or random effects
. ****************************************
.
. * Null hypothesis that random effects are most appropriate
.

Fixed-effects (within) regression               Number of obs      =     22389
Group variable (i): company                     Number of groups   =      7547

R-sq:  within  = 0.3305                         Obs per group: min =         1
       between = 0.7671                                        avg =       3.0
       overall = 0.7533                                        max =         7

                                                F(17,14825)        =    430.50
```

```
corr(u_i, Xb)  = 0.3751                         Prob > F          =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6465592   .0092246    70.09   0.000     .6284778    .6646406
    lcapital |   .0782627   .0076366    10.25   0.000      .063294    .0932315
        lgdp |   .6104448   .1101794     5.54   0.000     .3944796      .82641
        repo |   .0081626    .006012     1.36   0.175    -.0036218    .0199469
       sind1 |  -.5114104   .4089971    -1.25   0.211    -1.313095    .2902746
       sind2 |  (dropped)
       sind3 |   .0203406   .1756038     0.12   0.908    -.3238646    .3645458
       sind4 |   .0315256   .0333415     0.95   0.344    -.0338278     .096879
       sind5 |  -.0416619   .1559638    -0.27   0.789    -.3473704    .2640465
       sind6 |  -.0468874   .0980876    -0.48   0.633    -.2391513    .1453764
       sind7 |   .1152798   .0514065     2.24   0.025     .0145167    .2160429
       sind8 |   .0745553   .1294144     0.58   0.565    -.1791131    .3282236
       sind9 |   .1196033   .1020928     1.17   0.241    -.0805113     .319718
      sind10 |  -.4794534   .3379697    -1.42   0.156    -1.141916    .1830092
      sind11 |  -.0522022   .0470063    -1.11   0.267    -.1443403    .0399359
      sind12 |  (dropped)
      sind13 |   .7440131   .5600709     1.33   0.184    -.3537953    1.841822
      sind14 |   .4145003   .4234276     0.98   0.328    -.4154703    1.244471
      sind15 |   .0408665   .1031303     0.40   0.692    -.1612817    .2430147
      sind16 |  (dropped)
      sind17 |  (dropped)
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .94666687
     sigma_e |   .4572443
         rho |  .81083714   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7546, 14825) =     8.46         Prob > F = 0.0000


Random-effects GLS regression                   Number of obs      =     22389
Group variable (i): company                     Number of groups   =      7547
```

```
R-sq:  within  = 0.3264                         Obs per group: min =         1
       between = 0.7734                                        avg =       3.0
       overall = 0.7632                                        max =         7

Random effects u_i ~ Gaussian                   Wald chi2(17)      =  32646.21
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .7479164    .005533   135.17   0.000     .7370719    .7587609
    lcapital |   .1311552   .0041922    31.29   0.000     .1229386    .1393717
        lgdp |   .3724962   .1064772     3.50   0.000     .1638048    .5811877
        repo |   .0202954   .0058557     3.47   0.001     .0088185    .0317723
       sind1 |  -.8771642   .3320664    -2.64   0.008    -1.528002    -.226326
       sind3 |   .6491769   .1310512     4.95   0.000     .3923214    .9060325
       sind4 |   .0050758   .0283343     0.18   0.858    -.0504584    .0606101
       sind5 |   .1758884   .1278937     1.38   0.169    -.0747786    .4265555
       sind6 |   .1759188   .0772202     2.28   0.023     .0245699    .3272677
       sind7 |   .0331059   .0437546     0.76   0.449    -.0526514    .1188633
       sind8 |  -.1887071   .1043589    -1.81   0.071    -.3932468    .0158325
       sind9 |   .1461154   .0795121     1.84   0.066    -.0097255    .3019562
      sind10 |   .1493468   .1433305     1.04   0.297    -.1315758    .4302695
      sind11 |   .0938754   .0378559     2.48   0.013     .0196793    .1680715
      sind13 |   .3947674   .4046283     0.98   0.329    -.3982894    1.187824
      sind14 |    .227985   .3363944     0.68   0.498    -.4313359    .8873059
      sind15 |   .0432546   .0918568     0.47   0.638    -.1367814    .2232905
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .80272165
     sigma_e |   .4572443
         rho |  .75502236   (fraction of variance due to u_i)
------------------------------------------------------------------------------


                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
```

```
-------------+----------------------------------------------------------------
lemployees~d |    .6465592     .7479164       -.1013572         .007381
    lcapital |    .0782627     .1311552       -.0528925        .0063831
        lgdp |    .6104448     .3724962        .2379486        .0283213
        repo |    .0081626     .0202954       -.0121328        .0013623
       sind1 |   -.5114104    -.8771642        .3657538        .2387688
       sind3 |    .0203406     .6491769       -.6288364        .1168858
       sind4 |    .0315256     .0050758        .0264498        .0175732
       sind5 |   -.0416619     .1758884       -.2175504        .0892632
       sind6 |   -.0468874     .1759188       -.2228062        .0604832
       sind7 |    .1152798     .0331059        .0821739        .0269845
       sind8 |    .0745553    -.1887071        .2632624        .0765331
       sind9 |    .1196033     .1461154        -.026512        .0640373
      sind10 |   -.4794534     .1493468       -.6288002        .3060717
      sind11 |   -.0522022     .0938754       -.1460775        .0278661
      sind13 |    .7440131     .3947674        .3492457        .3872408
      sind14 |    .4145003      .227985        .1865153        .2571571
      sind15 |    .0408665     .0432546       -.0023881        .0468849
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                         =      404.07
              Prob>chi2 =      0.0000


. 
. * Null hypothesis that random effects is consistent with fixed effect
. *Reject hypothesis that RE is consistent therefore use FE
. 
. ************************
. * General Static model *
. ************************
. 
. /* Basic Static Production Function */
```

```
Fixed-effects (within) regression               Number of obs      =     22527
Group variable (i): company                     Number of groups   =      7633

R-sq:  within  = 0.3283                         Obs per group: min =         1
       between = 0.7702                                        avg =       3.0
       overall = 0.7549                                        max =         7

                                                F(4,14890)         =   1819.18
corr(u_i, Xb)  = 0.3865                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6444719   .0092146    69.94   0.000     .6264101    .6625336
    lcapital |   .0780157   .0076183    10.24   0.000     .0630829    .0929485
        lgdp |   .6165677   .1101353     5.60   0.000     .4006888    .8324465
        repo |   .0077975   .0060087     1.30   0.194    -.0039804    .0195753
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .95191287
     sigma_e |   .4581789
         rho |  .81190369   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7632, 14890) =     8.71         Prob > F = 0.0000

/* Add scheme effect - no impact*/

Fixed-effects (within) regression               Number of obs      =     22527
Group variable (i): company                     Number of groups   =      7633

R-sq:  within  = 0.3283                         Obs per group: min =         1
       between = 0.7704                                        avg =       3.0
       overall = 0.7553                                        max =         7

                                                F(5,14889)         =   1455.70
corr(u_i, Xb)  = 0.3863                         Prob > F           =    0.0000

------------------------------------------------------------------------------
```

```
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |    .644387   .0092147    69.93   0.000     .6263251    .6624489
    lcapital |    .077489   .0076301    10.16   0.000     .0625329     .092445
        lgdp |   .6175902   .1101365     5.61   0.000      .401709    .8334714
        repo |   .0076444   .0060099     1.27   0.203    -.0041357    .0194246
      scheme |   .0264054   .0214182     1.23   0.218    -.0155769    .0683878
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .95135577
     sigma_e |   .4581709
         rho |  .81173016   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7632, 14889) =     8.69         Prob > F = 0.0000


.
. *Effects by Industry

Fixed-effects (within) regression               Number of obs      =     22389
Group variable (i): company                     Number of groups   =      7547

R-sq:  within  = 0.3305                         Obs per group: min =         1
       between = 0.7671                                        avg =       3.0
       overall = 0.7533                                        max =         7

                                                F(17,14825)        =    430.50
corr(u_i, Xb)  = 0.3751                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6465592   .0092246    70.09   0.000     .6284778    .6646406
    lcapital |   .0782627   .0076366    10.25   0.000      .063294    .0932315
        lgdp |   .6104448   .1101794     5.54   0.000     .3944796      .82641
        repo |   .0081626    .006012     1.36   0.175    -.0036218    .0199469
       sind1 |  -.5114104   .4089971    -1.25   0.211    -1.313095    .2902746
       sind2 |  (dropped)
       sind3 |   .0203406   .1756038     0.12   0.908    -.3238646    .3645458
```

```
       sind4 |   .0315256   .0333415     0.95   0.344    -.0338278     .096879
       sind5 |  -.0416619   .1559638    -0.27   0.789    -.3473704    .2640465
       sind6 |  -.0468874   .0980876    -0.48   0.633    -.2391513    .1453764
       sind7 |   .1152798   .0514065     2.24   0.025     .0145167    .2160429
       sind8 |   .0745553   .1294144     0.58   0.565    -.1791131    .3282236
       sind9 |   .1196033   .1020928     1.17   0.241    -.0805113     .319718
      sind10 |  -.4794534   .3379697    -1.42   0.156    -1.141916    .1830092
      sind11 |  -.0522022   .0470063    -1.11   0.267    -.1443403    .0399359
      sind12 |  (dropped)
      sind13 |   .7440131   .5600709     1.33   0.184    -.3537953    1.841822
      sind14 |   .4145003   .4234276     0.98   0.328    -.4154703    1.244471
      sind15 |   .0408665   .1031303     0.40   0.692    -.1612817    .2430147
      sind16 |  (dropped)
      sind17 |  (dropped)
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .94666687
     sigma_e |   .4572443
         rho |  .81083714   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7546, 14825) =     8.46         Prob > F = 0.0000


. 
. *Effects by listing


Fixed-effects (within) regression               Number of obs      =     22527
Group variable (i): company                     Number of groups   =      7633

R-sq:  within  = 0.3283                         Obs per group: min =         1
       between = 0.7704                                        avg =       3.0
       overall = 0.7553                                        max =         7

                                                F(6,14888)         =   1213.02
corr(u_i, Xb)  = 0.3860                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
lemployees~d |   .6443542    .009216    69.92   0.000     .6262896    .6624187
    lcapital |   .0774893   .0076304    10.16   0.000     .0625328    .0924458
        lgdp |   .6167556   .1101968     5.60   0.000     .4007564    .8327548
        repo |   .0076371   .0060102     1.27   0.204    -.0041436    .0194178
     slisted |   .0362111   .0467348     0.77   0.438    -.0553948     .127817
  snonlisted |   .0237985   .0240981     0.99   0.323    -.0234368    .0710338
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .95133693
     sigma_e |  .45818543
         rho |  .81171441   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7632, 14888) =     8.67         Prob > F = 0.0000


.
. *Effects by scheme

Fixed-effects (within) regression               Number of obs      =     22527
Group variable (i): company                     Number of groups   =      7633

R-sq:  within  = 0.3285                         Obs per group: min =         1
       between = 0.7705                                        avg =       3.0
       overall = 0.7556                                        max =         7

                                                F(7,14887)         =   1040.33
corr(u_i, Xb)  = 0.3851                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6443189   .0092145    69.92   0.000     .6262573    .6623805
    lcapital |   .0774059   .0076343    10.14   0.000     .0624417      .09237
        lgdp |   .6216125   .1101863     5.64   0.000     .4056339    .8375912
        repo |   .0079725   .0060102     1.33   0.185    -.0038083    .0197533
aps_indica~r |   .0274715    .042939     0.64   0.522    -.0566942    .1116373
csop_indic~r |  -.0062486   .0220162    -0.28   0.777    -.0494031    .0369059
saye_indic~r |   .0668825    .032452     2.06   0.039     .0032727    .1304924
```

```
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .95086064
     sigma_e |  .45815188
         rho |  .81158368   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(7632, 14887) =     8.63         Prob > F = 0.0000


. 
. *Effect of unapproved scheme Also

Fixed-effects (within) regression               Number of obs      =     21158
Group variable (i): company                     Number of groups   =      7000

R-sq:  within  = 0.3215                         Obs per group: min =         1
       between = 0.7354                                        avg =       3.0
       overall = 0.7304                                        max =         7

                                                F(6,14152)         =   1117.81
corr(u_i, Xb)  = 0.3049                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6338297   .0097733    64.85   0.000     .6146729    .6529866
unapp_scheme |   .0125691   .0286627     0.44   0.661    -.0436136    .0687518
  lemployees |   .0596527   .0114847     5.19   0.000     .0371412    .0821641
    lcapital |   .0635017   .0084703     7.50   0.000     .0468988    .0801046
        lgdp |   .5476402   .1133464     4.83   0.000     .3254663    .7698141
        repo |   .0065855   .0061912     1.06   0.287    -.0055501     .018721
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .91439396
     sigma_e |  .45994639
         rho |   .7980745   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(6999, 14152) =     8.24         Prob > F = 0.0000
```

```
.
      Source |       SS       df       MS              Number of obs =   22389
-------------+------------------------------           F(  4, 22384) = 2755.55
       Model |  1527.51644     4   381.87911           Prob > F      =  0.0000
    Residual |  3102.09216 22384  .138585247           R-squared     =  0.3299
-------------+------------------------------           Adj R-squared =  0.3298
       Total |   4629.6086 22388  .206789736           Root MSE      =  .37227

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .6444277   .0074154    86.90   0.000     .6298931    .6589624
    lcapital |   .0788424   .0061875    12.74   0.000     .0667144    .0909703
        lgdp |   .4980098   .0608194     8.19   0.000     .3787995    .6172201
       sind7 |   .1151664    .041853     2.75   0.006     .0331316    .1972012
       _cons |  /* CUT */
------------------------------------------------------------------------------
```

A1.2 Dynamic modelling

```
. *General Dynamic model
Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3207                         Obs per group: min =         1
       between = 0.8178                                        avg =       2.6
       overall = 0.7870                                        max =         6

                                                F(11,7330)         =    314.53
corr(u_i, Xb)  = 0.3932                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0718841    .011808     6.09   0.000     .0487371    .0950311
      scheme |   .0249934    .042714     0.59   0.558    -.0587382     .108725
    scheme_1 |  -.0122096   .0407927    -0.30   0.765    -.0921751    .0677559
lemployees~d |   .5197559   .0141121    36.83   0.000     .4920922    .5474196
lemployees~1 |   .0995904   .0163897     6.08   0.000      .067462    .1317189
```

```
    lcapital |   .0684046   .0131399     5.21   0.000     .0426465    .0941627
  lcapital_1 |   .0068208   .0132318     0.52   0.606    -.0191174     .032759
        lgdp |  -2.656937   3.981929    -0.67   0.505    -10.46266     5.14879
      lgdp_1 |   1.757507   2.492863     0.71   0.481    -3.129222    6.644236
        repo |  -.0593031   .0676456    -0.88   0.381     -.191908    .0733018
      repo_1 |  -.0220197   .0136361    -1.61   0.106    -.0487504     .004711
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .79201128
     sigma_e |  .39417626
         rho |  .80147757   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7330) =     2.56          Prob > F = 0.0000

. *and by industry

Fixed-effects (within) regression               Number of obs      =     11938
Group variable (i): company                     Number of groups   =      4611

R-sq:  within  = 0.3226                         Obs per group: min =         1
       between = 0.8152                                        avg =       2.6
       overall = 0.7845                                        max =         6

                                                F(28,7299)         =    124.13
corr(u_i, Xb)  = 0.3738                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0715814   .0118592     6.04   0.000     .0483339    .0948288
lemployees~d |   .5232944    .014178    36.91   0.000     .4955013    .5510874
lemployees~1 |   .0994204   .0164773     6.03   0.000     .0671201    .1317207
    lcapital |    .067522   .0131589     5.13   0.000     .0417268    .0933173
  lcapital_1 |   .0074717   .0132637     0.56   0.573     -.018529    .0334725
        lgdp |  -3.079019   3.988455    -0.77   0.440    -10.89754    4.739506
      lgdp_1 |   2.031578   2.496984     0.81   0.416    -2.863234    6.926389
        repo |  -.0663407   .0677604    -0.98   0.328    -.1991706    .0664893
      repo_1 |   -.022153   .0136629    -1.62   0.105    -.0489362    .0046302
```

```
       sind1 |  (dropped)
       sind2 |  (dropped)
       sind3 |  -.0631038   .2519382    -0.25   0.802    -.5569755    .4307678
       sind4 |   .0563808   .0402967     1.40   0.162    -.0226125     .135374
       sind5 |  -.0659196   .2021692    -0.33   0.744    -.4622297    .3303906
       sind6 |   .0918076   .1236621     0.74   0.458    -.1506059    .3342211
       sind7 |   .1537861    .069418     2.22   0.027     .0177068    .2898654
       sind8 |   .0222896    .213744     0.10   0.917    -.3967104    .4412896
       sind9 |  -.0303785   .1350197    -0.22   0.822    -.2950561    .2342991
      sind10 |  (dropped)
      sind11 |  -.1099884   .0612306    -1.80   0.072    -.2300181    .0100412
      sind12 |  (dropped)
      sind13 |  (dropped)
      sind14 |  (dropped)
      sind15 |   .1417909   .1413422     1.00   0.316    -.1352807    .4188625
      sind16 |  (dropped)
      sind17 |  (dropped)
     sind1_1 |  -.3040035   .4828857    -0.63   0.529    -1.250599    .6425922
     sind2_1 |  (dropped)
     sind3_1 |   .1028087    .226936     0.45   0.651    -.3420514    .5476688
     sind4_1 |   .0101653   .0401056     0.25   0.800    -.0684533    .0887839
     sind5_1 |   .0827474   .1605827     0.52   0.606    -.2320412    .3975359
     sind6_1 |  -.1353968   .1152418    -1.17   0.240    -.3613041    .0905105
     sind7_1 |   .1222392   .0645127     1.89   0.058    -.0042243    .2487027
     sind8_1 |  -.1380104   .2219847    -0.62   0.534    -.5731645    .2971437
     sind9_1 |   .1141038    .126172     0.90   0.366    -.1332298    .3614375
    sind10_1 |  (dropped)
    sind11_1 |     .02941   .0585407     0.50   0.615    -.0853466    .1441666
    sind12_1 |  (dropped)
    sind13_1 |  (dropped)
    sind14_1 |  (dropped)
    sind15_1 |    -.0114   .1365313    -0.08   0.933    -.2790409    .2562409
    sind16_1 |  (dropped)
    sind17_1 |  (dropped)
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78830441
     sigma_e |  .39416638
```

```
         rho |   .79998849   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4610, 7299) =     2.51          Prob > F = 0.0000


.
Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3205                         Obs per group: min =         1
       between = 0.8178                                        avg =       2.6
       overall = 0.7870                                        max =         6

                                                F(6,7335)          =    576.70
corr(u_i, Xb)  = 0.3989                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0730818   .0117493     6.22   0.000     .0500499    .0961137
lemployees~d |   .5157412   .0129541    39.81   0.000     .4903475    .5411349
lemployees~1 |   .1018259   .0162013     6.29   0.000     .0700667    .1335852
    lcapital |   .0722475   .0113748     6.35   0.000     .0499496    .0945453
        repo |  -.0177528   .0050295    -3.53   0.000    -.0276121   -.0078934
      repo_1 |  -.0160393    .006711    -2.39   0.017    -.0291948   -.0028839
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .79422915
     sigma_e |  .39407875
         rho |   .8024444   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7335) =     2.56          Prob > F = 0.0000


.
. *Specific Dynamic model by scheme type

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635
```

```
R-sq:  within  = 0.3212                         Obs per group: min =         1
       between = 0.8187                                        avg =       2.6
       overall = 0.7879                                        max =         6

                                                F(9,7332)          =    385.42
corr(u_i, Xb)  = 0.3953                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0723439   .0117498     6.16   0.000     .0493109    .0953769
lemployees~d |   .5152803   .0129524    39.78   0.000     .4898898    .5406709
lemployees~1 |   .1018135   .0161993     6.29   0.000     .0700581    .1335688
    lcapital |   .0716237   .0113767     6.30   0.000     .0493221    .0939254
        repo |  -.0179465   .0050345    -3.56   0.000    -.0278157   -.0080774
      repo_1 |  -.0165803   .0067126    -2.47   0.014    -.0297389   -.0034216
aps_indica~r |   .0409168   .0514969     0.79   0.427     -.060032    .1418655
csop_indic~r |   .0193805   .0272956     0.71   0.478    -.0341267    .0728876
saye_indic~r |   .0837393   .0374461     2.24   0.025     .0103343    .1571444
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .79138691
     sigma_e |  .39397672
         rho |  .80138773   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7332) =     2.56          Prob > F = 0.0000

. *Test for unapproved schemes

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3207                         Obs per group: min =         1
       between = 0.8187                                        avg =       2.6
       overall = 0.7879                                        max =         6

                                                F(11,7330)         =    314.64
corr(u_i, Xb)  = 0.3892                         Prob > F           =    0.0000
```

```
------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0714109   .0117869     6.06   0.000     .0483051    .0945166
  app_scheme |   .0233878   .0426959     0.55   0.584    -.0603085     .107084
app_scheme_1 |  -.0129985   .0407814    -0.32   0.750    -.0929418    .0669449
unapp_scheme |   .0136651   .0555735     0.25   0.806    -.0952749    .1226051
unapp_sche~1 |   .0696692   .0535119     1.30   0.193    -.0352295    .1745679
lemployees~d |   .5214624   .0126849    41.11   0.000     .4965964    .5463284
lemployees~1 |   .0990487   .0162964     6.08   0.000      .067103    .1309944
    lcapital |   .0675813   .0131321     5.15   0.000     .0418386     .093324
  lcapital_1 |   .0052002   .0132396     0.39   0.694    -.0207532    .0311537
        lgdp |   .7943349   .4997043     1.59   0.112    -.1852292    1.773899
      lgdp_1 |  -.2554956   .4997673    -0.51   0.609    -1.235183    .7241921
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78900668
     sigma_e |  .39415575
         rho |  .80028192   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7330) =     2.56          Prob > F = 0.0000


. 
. *Specific model controlling for unapproved schemes

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3206                         Obs per group: min =         1
       between = 0.8178                                        avg =       2.6
       overall = 0.7869                                        max =         6

                                                F(6,7335)          =    576.76
corr(u_i, Xb)  = 0.3904                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
      lgva_1 |   .0715571   .0117547     6.09   0.000     .0485145    .0945996
unapp_sche~1 |   .0608272   .0344552     1.77   0.078    -.0067149    .1283694
lemployees~d |   .5231431   .0124226    42.11   0.000     .4987913    .5474949
lemployees~1 |   .0997601   .0162084     6.15   0.000     .0679869    .1315332
    lcapital |   .0700497   .0113655     6.16   0.000     .0477701    .0923293
        lgdp |   .5411118   .1132804     4.78   0.000     .3190496     .763174
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .79137018
     sigma_e |  .39407207
         rho |  .80130395   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7335) =     2.56          Prob > F = 0.0000


.
. ****************************************
. * Specific Dynamic model by turnover band *
. ****************************************

Fixed-effects (within) regression               Number of obs      =       323
Group variable (i): company                     Number of groups   =       219

R-sq:  within  = 0.3529                         Obs per group: min =         1
       between = 0.7524                                        avg =       1.5
       overall = 0.7660                                        max =         5

                                                F(6,98)            =      8.91
corr(u_i, Xb)  = 0.6329                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |  -.1188057   .1165088    -1.02   0.310    -.3500136    .1124023
      scheme |  (dropped)
lemployees~d |   .4750207   .1065025     4.46   0.000       .26367    .6863714
lemployees~1 |   .1000034   .1447142     0.69   0.491    -.1871773     .387184
    lcapital |   .0951347   .0845347     1.13   0.263    -.0726216     .262891
```

```
        repo |  -.0221152   .0358182    -0.62   0.538    -.0931952    .0489649
       repo_1 |  -.0535158   .0485863    -1.10   0.273    -.1499337    .0429021
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  1.3748385
     sigma_e |  .29721485
         rho |  .95535209   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(218, 98) =     4.05             Prob > F = 0.0000

Fixed-effects (within) regression               Number of obs      =      1883
Group variable (i): company                     Number of groups   =      1108

R-sq:  within  = 0.2860                         Obs per group: min =         1
       between = 0.6696                                        avg =       1.7
       overall = 0.6845                                        max =         6

                                                F(7,768)           =     43.95
corr(u_i, Xb)  = 0.2186                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |  -.0603467   .0375352    -1.61   0.108    -.1340305    .0133372
      scheme |   -.051769   .1204243    -0.43   0.667    -.2881687    .1846308
lemployees~d |   .5941682   .0458445    12.96   0.000     .5041727    .6841636
lemployees~1 |   .1551698   .0613568     2.53   0.012      .034723    .2756167
    lcapital |   .0387584   .0391264     0.99   0.322    -.0380489    .1155658
        repo |  -.0251844   .0148638    -1.69   0.091    -.0543629    .0039941
      repo_1 |   .0010866   .0185393     0.06   0.953    -.0353072    .0374804
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .70316375
     sigma_e |  .35881467
         rho |  .79340403   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1107, 768) =     2.21           Prob > F = 0.0000
```

```
Fixed-effects (within) regression               Number of obs      =      3716
Group variable (i): company                     Number of groups   =      1689

R-sq:  within  = 0.3173                         Obs per group: min =         1
       between = 0.6734                                        avg =       2.2
       overall = 0.6555                                        max =         6

                                                F(7,2020)          =    134.09
corr(u_i, Xb)  = 0.0580                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0124485   .0217781     0.57   0.568    -.0302614    .0551584
      scheme |   .0270027   .0627857     0.43   0.667    -.0961287    .1501342
lemployees~d |    .479212   .0230838    20.76   0.000     .4339415    .5244824
lemployees~1 |    .220496   .0346147     6.37   0.000     .1526117    .2883803
    lcapital |   .0938197   .0194461     4.82   0.000     .0556832    .1319562
        repo |  -.0149821   .0077271    -1.94   0.053    -.0301361    .0001719
      repo_1 |  -.0074143   .0102947    -0.72   0.471    -.0276037     .012775
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .65994215
     sigma_e |  .31074076
         rho |  .81852505   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1688, 2020) =     3.03          Prob > F = 0.0000


Fixed-effects (within) regression               Number of obs      =      5557
Group variable (i): company                     Number of groups   =      1900

R-sq:  within  = 0.2867                         Obs per group: min =         1
       between = 0.7118                                        avg =       2.9
       overall = 0.6718                                        max =         6

                                                F(7,3650)          =    209.55
```

```
corr(u_i, Xb)  = 0.2950                         Prob > F          =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0901467   .0168032     5.36   0.000     .0572021    .1230914
      scheme |   .0780537   .0736456     1.06   0.289    -.0663369    .2224442
lemployees~d |   .5018634   .0185501    27.05   0.000     .4654938    .5382329
lemployees~1 |   .0265423   .0216832     1.22   0.221      -.01597    .0690547
    lcapital |   .0774685   .0182239     4.25   0.000     .0417385    .1131985
        repo |  -.0212988   .0079396    -2.68   0.007    -.0368652   -.0057323
      repo_1 |  -.0189223    .010458    -1.81   0.070    -.0394264    .0015818
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .81228049
     sigma_e |  .43592825
         rho |  .77638733   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1899, 3650) =     2.65          Prob > F = 0.0000


.
. *Examine SAYE by turnover bands
. *Specific Dynamic model by scheme type and sizeband

if turnover_1==1, fe  /* n very small and saye dropped */

Fixed-effects (within) regression               Number of obs      =       323
Group variable (i): company                     Number of groups   =       219

R-sq:  within  = 0.3572                         Obs per group: min =         1
       between = 0.7445                                        avg =       1.5
       overall = 0.7576                                        max =         5

                                                F(8,96)            =      6.67
corr(u_i, Xb)  = 0.6365                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
      lgva_1 |  -.1334585   .1230754    -1.08   0.281    -.3777612    .1108443
lemployees~d |   .4663132   .1083256     4.30   0.000     .2512886    .6813377
lemployees~1 |   .1080252   .1469292     0.74   0.464     -.183627    .3996775
    lcapital |   .0915632   .0852554     1.07   0.286    -.0776675     .260794
        repo |  -.0243224   .0363202    -0.67   0.505    -.0964175    .0477726
      repo_1 |  -.0555265   .0491793    -1.13   0.262    -.1531466    .0420936
aps_indica~r |   .0328424   .3639886     0.09   0.928    -.6896692     .755354
csop_indic~r |   .1880784   .2370815     0.79   0.430    -.2825247    .6586814
saye_indic~r |  (dropped)
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  1.4023423
     sigma_e |  .29930783
         rho |   .9564306   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(218, 96) =     3.97             Prob > F = 0.0000

Fixed-effects (within) regression               Number of obs      =      1883
Group variable (i): company                     Number of groups   =      1108

R-sq:  within  = 0.2885                         Obs per group: min =         1
       between = 0.6659                                        avg =       1.7
       overall = 0.6821                                        max =         6

                                                F(9,766)           =     34.51
corr(u_i, Xb)  = 0.2099                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |  -.0620134   .0375386    -1.65   0.099    -.1357041    .0116774
lemployees~d |   .6021636   .0461105    13.06   0.000     .5116456    .6926816
lemployees~1 |   .1511466    .061378     2.46   0.014     .0306574    .2716357
    lcapital |   .0369991   .0391478     0.95   0.345    -.0398506    .1138487
        repo |  -.0246212   .0148183    -1.66   0.097    -.0537104     .004468
      repo_1 |   .0021892   .0185581     0.12   0.906    -.0342415      .03862
aps_indica~r |  -.0646686   .1638483    -0.39   0.693    -.3863136    .2569764
```

```
csop_indic~r |  -.0977731   .0986866    -0.99   0.322    -.2915014    .0959551
saye_indic~r |  -.6443959   .5111765    -1.26   0.208    -1.647869    .3590772
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |   .7060812
     sigma_e |  .35865178
         rho |  .79490618   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1107, 766) =     2.22           Prob > F = 0.0000


Fixed-effects (within) regression               Number of obs      =      3716
Group variable (i): company                     Number of groups   =      1689

R-sq:  within  = 0.3181                         Obs per group: min =         1
       between = 0.6742                                        avg =       2.2
       overall = 0.6558                                        max =         6

                                                F(9,2018)          =    104.58
corr(u_i, Xb)  = 0.0598                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0123128   .0218112     0.56   0.572    -.0304621    .0550876
lemployees~d |   .4788608   .0230857    20.74   0.000     .4335864    .5241352
lemployees~1 |   .2196736   .0346424     6.34   0.000      .151735    .2876122
    lcapital |   .0940539   .0194642     4.83   0.000      .055882    .1322258
        repo |  -.0150667   .0077439    -1.95   0.052    -.0302537    .0001202
      repo_1 |  -.0078423   .0102952    -0.76   0.446    -.0280327    .0123481
aps_indica~r |   .1465343   .1223213     1.20   0.231     -.093355    .3864235
csop_indic~r |   .0484664   .0503036     0.96   0.335     -.050186    .1471187
saye_indic~r |   .0347245   .1229656     0.28   0.778    -.2064283    .2758772
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .65924166
     sigma_e |  .31071278
         rho |  .81823611   (fraction of variance due to u_i)
```

```
------------------------------------------------------------------------------
F test that all u_i=0:     F(1688, 2018) =     3.03          Prob > F = 0.0000

Fixed-effects (within) regression               Number of obs      =      5557
Group variable (i): company                     Number of groups   =      1900

R-sq:  within  = 0.2877                         Obs per group: min =         1
       between = 0.7131                                        avg =       2.9
       overall = 0.6731                                        max =         6

                                                F(9,3648)          =    163.69
corr(u_i, Xb)  = 0.2887                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0891583   .0168021     5.31   0.000     .0562158    .1221008
lemployees~d |   .5013292   .0185447    27.03   0.000     .4649702    .5376883
lemployees~1 |   .0262034   .0216848     1.21   0.227     -.016312    .0687188
    lcapital |   .0759319   .0182328     4.16   0.000     .0401844    .1116794
        repo |  -.0214001   .0079423    -2.69   0.007    -.0369719   -.0058282
      repo_1 |  -.0195592    .010457    -1.87   0.062    -.0400614     .000943
aps_indica~r |   .0458039   .0690634     0.66   0.507    -.0896028    .1812107
csop_indic~r |   .0276923   .0386454     0.72   0.474    -.0480765     .103461
saye_indic~r |   .0963956   .0449499     2.14   0.032     .0082661     .184525
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |   .8095744
     sigma_e |  .43574462
         rho |   .7753733   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(1899, 3648) =     2.65          Prob > F = 0.0000

.
. ************************************************************
. * Specific Dynamic Model by all combinations of scheme type *
. ************************************************************
```

```
.
. *aps & csop

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3209                         Obs per group: min =         1
       between = 0.8181                                        avg =       2.6
       overall = 0.7874                                        max =         6

                                                F(9,7332)          =    385.04
corr(u_i, Xb)  = 0.3867                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0711472    .011785     6.04   0.000     .0480451    .0942492
aps_csop_i~r |   .0626073   .0594383     1.05   0.292    -.0539088    .1791234
saye_indic~r |   .0862117   .0372135     2.32   0.021     .0132625    .1591609
lemployees~d |   .5213746   .0126725    41.14   0.000     .4965329    .5462164
lemployees~1 |   .1003727   .0162779     6.17   0.000     .0684634    .1322821
    lcapital |   .0671963   .0131292     5.12   0.000     .0414593    .0929333
  lcapital_1 |   .0064746   .0132213     0.49   0.624    -.0194428    .0323921
        lgdp |   .7311724    .499876     1.46   0.144    -.2487283    1.711073
      lgdp_1 |  -.1917748    .500168    -0.38   0.701    -1.172248    .7886983
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78934086
     sigma_e |  .39404029
         rho |  .80051084   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7332) =     2.56          Prob > F = 0.0000

.
. *aps & saye

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635
```

```
R-sq:  within  = 0.3207                         Obs per group: min =         1
       between = 0.8180                                        avg =       2.6
       overall = 0.7872                                        max =         6

                                                F(9,7332)          =    384.66
corr(u_i, Xb)  = 0.3875                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0717292    .011783     6.09   0.000     .0486311    .0948272
aps_saye_i~r |   .1351907   .0722789     1.87   0.061    -.0064967     .276878
csop_indic~r |   .0265596   .0270619     0.98   0.326    -.0264894    .0796087
lemployees~d |   .5214585   .0126748    41.14   0.000     .4966122    .5463048
lemployees~1 |   .1004999   .0162831     6.17   0.000     .0685802    .1324195
    lcapital |   .0675615   .0131296     5.15   0.000     .0418237    .0932993
  lcapital_1 |   .0061693   .0132286     0.47   0.641    -.0197626    .0321012
        lgdp |   .7790621   .4995675     1.56   0.119    -.2002338    1.758358
      lgdp_1 |  -.2382653   .4996931    -0.48   0.634    -1.217807    .7412768
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78997445
     sigma_e |  .39410141
         rho |  .80071749   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7332) =     2.56          Prob > F = 0.0000


.
. *csop & saye

Fixed-effects (within) regression               Number of obs      =     11976
Group variable (i): company                     Number of groups   =      4635

R-sq:  within  = 0.3207                         Obs per group: min =         1
       between = 0.8181                                        avg =       2.6
       overall = 0.7873                                        max =         6
```

```
                                                F(9,7332)         =     384.53
corr(u_i, Xb)  = 0.3894                         Prob > F          =     0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0711761   .0117874     6.04   0.000     .0480695    .0942827
aps_indica~r |   .0413812   .0514957     0.80   0.422    -.0595651    .1423276
csop_saye_~r |   .0645997   .0368494     1.75   0.080    -.0076358    .1368351
lemployees~d |   .5213402   .0126743    41.13   0.000     .4964949    .5461854
lemployees~1 |    .100094   .0162814     6.15   0.000     .0681777    .1320103
    lcapital |   .0674505    .013132     5.14   0.000     .0417079     .093193
  lcapital_1 |     .00619   .0132237     0.47   0.640    -.0197322    .0321123
        lgdp |   .7485832   .5000247     1.50   0.134    -.2316091    1.728775
      lgdp_1 |  -.2129002   .5002744    -0.43   0.670    -1.193582    .7677816
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |   .7903474
     sigma_e |  .39412284
         rho |  .80085072   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4634, 7332) =     2.55          Prob > F = 0.0000


.
. ************************************
. * Removing lagged dependent variable *
. ************************************
. *Specific Dynamic model

Fixed-effects (within) regression               Number of obs      =     12127
Group variable (i): company                     Number of groups   =      4703

R-sq:  within  = 0.3176                         Obs per group: min =         1
       between = 0.7774                                        avg =       2.6
       overall = 0.7465                                        max =         6

                                                F(5,7419)         =     690.68
corr(u_i, Xb)  = 0.3351                         Prob > F          =     0.0000
```

```
------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .5419833   .0129306    41.91   0.000     .5166356     .567331
lemployees~1 |   .1399931   .0148828     9.41   0.000     .1108186    .1691676
    lcapital |    .071558   .0111769     6.40   0.000      .049648    .0934679
        repo |  -.0160032    .005098    -3.14   0.002    -.0259968   -.0060095
      repo_1 |  -.0154997   .0067994    -2.28   0.023    -.0288286   -.0021709
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .86426123
     sigma_e |   .4021186
         rho |  .82204377   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4702, 7419) =     9.35          Prob > F = 0.0000


.
. *Specific Dynamic model by scheme type

Fixed-effects (within) regression               Number of obs      =     12127
Group variable (i): company                     Number of groups   =      4703

R-sq:  within  = 0.3181                         Obs per group: min =         1
       between = 0.7776                                        avg =       2.6
       overall = 0.7469                                        max =         6

                                                F(5,7419)          =    692.23
corr(u_i, Xb)  = 0.3239                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lemployees~d |   .5503997   .0121227    45.40   0.000     .5266357    .5741636
lemployees~1 |   .1371393   .0148839     9.21   0.000     .1079627    .1663159
    lcapital |   .0691829   .0111476     6.21   0.000     .0473305    .0910354
      lgdp_1 |   .5169756   .1145302     4.51   0.000     .2924639    .7414873
saye_indic~r |   .1007834   .0376965     2.67   0.008     .0268875    .1746793
```

```
       _cons |  /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |    .860559
     sigma_e |  .40197563
         rho |  .82088889   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4702, 7419) =     9.36          Prob > F = 0.0000

. *SAYE has 2.6-17% effect
.
. *Specific model controlling for unapproved schemes
.
. ************************************************
. * In which industries does SAYE have an effect *
. ************************************************
.

. *General Dynamic model
.
Fixed-effects (within) regression               Number of obs      =     11938
Group variable (i): company                     Number of groups   =      4611

R-sq:  within  = 0.3223                         Obs per group: min =         1
       between = 0.8164                                        avg =       2.6
       overall = 0.7860                                        max =         6

                                                F(18,7309)         =    193.07
corr(u_i, Xb)  = 0.3817                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0707834   .0118518     5.97   0.000     .0475504    .0940163
lemployees~d |   .5215597   .0141484    36.86   0.000     .4938248    .5492946
lemployees~1 |    .100243   .0164402     6.10   0.000     .0680155    .1324705
    lcapital |   .0685262   .0131513     5.21   0.000     .0427459    .0943065
  lcapital_1 |    .006871   .0132435     0.52   0.604    -.0190901    .0328322
        lgdp |  -2.925928   3.984123    -0.73   0.463    -10.73596    4.884103
```

```
      lgdp_1 |   1.956981   2.494534     0.78   0.433    -2.933026    6.846988
        repo |  -.0626267    .067671    -0.93   0.355    -.1952814     .070028
      repo_1 |  -.0215886   .0136426    -1.58   0.114    -.0483321    .0051549
    sayeind1 |  (dropped)
    sayeind2 |  (dropped)
    sayeind3 |   .1656372   .1798967     0.92   0.357    -.1870122    .5182866
    sayeind4 |    .110654   .0569024     1.94   0.052    -.0008911    .2221991
    sayeind5 |  -.1724919   .2912665    -0.59   0.554    -.7434582    .3984745
    sayeind6 |   .2205474   .1832126     1.20   0.229    -.1386022    .5796971
    sayeind7 |   .2684438   .0959293     2.80   0.005     .0803947    .4564928
    sayeind8 |  -.0776396   .1971263    -0.39   0.694    -.4640641     .308785
    sayeind9 |  -.1249242   .1359037    -0.92   0.358    -.3913347    .1414862
   sayeind10 |  (dropped)
   sayeind11 |  -.0123217   .0938831    -0.13   0.896    -.1963597    .1717162
   sayeind12 |  (dropped)
   sayeind13 |  (dropped)
   sayeind14 |  (dropped)
   sayeind15 |   .1108085   .1675957     0.66   0.509    -.2177274    .4393444
   sayeind16 |  (dropped)
   sayeind17 |  (dropped)
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78787524
     sigma_e |  .39399187
         rho |  .79995593   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4610, 7309) =     2.54          Prob > F = 0.0000


*Specific Dynamic Model

Fixed-effects (within) regression               Number of obs      =     11938
Group variable (i): company                     Number of groups   =      4611

R-sq:  within  = 0.3218                         Obs per group: min =         1
       between = 0.8164                                        avg =       2.6
       overall = 0.7857                                        max =         6

                                                F(8,7319)          =    434.02
```

```
corr(u_i, Xb)  = 0.3864                         Prob > F          =    0.0000

------------------------------------------------------------------------------
        lgva |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lgva_1 |   .0724278   .0117869     6.14   0.000      .049322    .0955336
lemployees~d |   .5169282   .0129878    39.80   0.000     .4914683     .542388
lemployees~1 |   .1027812    .016251     6.32   0.000     .0709247    .1346378
    lcapital |   .0722358   .0113879     6.34   0.000     .0499122    .0945594
        repo |  -.0176951   .0050348    -3.51   0.000    -.0275648   -.0078254
      repo_1 |     -.0154   .0067154    -2.29   0.022    -.0285641   -.0022359
    sayeind4 |   .1087247   .0568247     1.91   0.056     -.002668    .2201175
    sayeind7 |   .2678966   .0958922     2.79   0.005     .0799202     .455873
       _cons |   /* CUT */
-------------+----------------------------------------------------------------
     sigma_u |  .78992601
     sigma_e |  .39386723
         rho |  .80088755   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(4610, 7319) =     2.55          Prob > F = 0.0000

------------------------------------------------------------------------------
```

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