Optimization Frictions in the Choice of the UK Flat Rate Scheme of VAT*

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Abstract

UK VAT offers an optional Flat Rate Scheme (FRS) for small businesses to reduce compliance costs. FRS replaces VAT with a turnover tax and creates tax saving opportunities for some traders. Using the universe of VAT returns between 2004-05 and 2010-11 financial years I find 26 percent of eligible VAT traders gain from FRS but only 3 percent join the scheme subsequently. This is despite high persistence and non-negligible size of FRS gains. FRS gainers who remain on VAT in the following year, have 70 percent probability of being an FRS gainer and the median gainer continue to save 10 percent on VAT payment upon joining. I use date of VAT registration and registered outcode of traders to show traders registering later and those registering in high FRS outcodes are more likely to join FRS. These patterns favor broadly defined information frictions over inertia or learning as potential underlying frictions.

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1 Introduction

There is growing evidence in public economics that optimization frictions play an important role in shaping individual behavior. Whether small businesses are subject to similar frictions has not received much attention. An individual owner-manager is often responsible for business decision making but theoretically, one can't generalize the individual-based evidence to small businesses. Business owners have shown particular skills (e.g. started a business) that might reduce the effect of frictions. Understanding role of optimization frictions in the business environment is important from two perspectives. Conceptually, it affects the way economists think about profit maximization. From a policy perspective, it is important to understand frictions in business decision making to design effective support schemes.

In this paper, I study the decision of VAT registered traders with respect to the Flat Rate Scheme of VAT for small businesses (FRS). I use HM Revenue and Customs' (HMRC) newly released VAT returns data to calculate FRS tax gains for eligible traders not on the scheme. This is the first paper that analyzes FRS using tax return data. Flat Rate Scheme of VAT (FRS) is an optional accounting scheme introduced in 2002 to alleviate compliance burden of VAT on small businesses. Normally, VAT liability is the difference between VAT on sales and purchases. HMRC requires record keeping of business transactions showing separation of zero, reduced, and standard-rated sales and purchases. FRS liability[1] is, however, calculated as a percentage of gross sales, relieving traders of the need to account for various rates separately. In order to compensate for the inability of FRS traders to reclaim purchases VAT, HMRC sets sector specific flat rates so that on average FRS and VAT liabilities are equalized.

In the absence of optimization frictions VAT traders should join FRS when expected net benefits are positive. The potential benefits of the scheme are reduced tax payments and lower cost of complying with VAT but anecdotal evidence suggests businesses view the scheme as a tax saving opportunity. An HMRC study of compliance cost of VAT conducted by KPMG reports businesses spend resources to determine whether FRS is suitable for them and "the predominant theme ... is that [traders] enter into the FRS to save them money in terms of the amount of VAT paid to HMRC" (KPMG (2006)).

[1] I refer to VAT liability under FRS as FRS liability, but once traders join FRS this is their VAT liability from HMRC's perspective. Similarly I refer to tax liability under normal VAT accounting as VAT liability.

Therefore, I focus on pure tax gains and define FRS gainers as eligible VAT traders with observed FRS liability less than or equal to the reported VAT liability. I show between 2004-05 and 2010-11, 26 percent of eligible traders are FRS gainers. Following FRS gainers over time, however, reveals little responsiveness. The estimated probability of joining within one year of gaining is 3 percent and within 6 years it only increases to 10 percent. This is despite the fact that gains are persistent and not very small. On average 70 percent of FRS gainers in a given year remain a gainer in the following year. Furthermore, 34 percent either gain during all years or join the scheme eventually. Median FRS gainer would save about 12 percent on VAT payments upon joining the scheme.

Since the decision to join FRS is made ex ante, one could argue that observed FRS gains are not necessarily equivalent to expected gains. Random fluctuations in the business environment could make FRS look optimal ex post while in expectation it is not. Three pieces of evidence, however, go against this explanation. First, a sizable fraction of traders join FRS as soon as they register for VAT. This is in contrast to an uncertainty based explanation of inaction as new inexperienced traders should wait and see whether their business environment is suitable for FRS. Second, for the sub-sample of responsive gainers I show the probability of joining FRS in the following year shoots up as soon as traders get slightly positive gains. In presence of uncertainty one would expect a more gentle increase in probability of joining around zero FRS gains.

Third, FRS gains are highly persistent. Even after controlling for sector and year dummies, last year gainers are on average 62 percentage points more likely to gain in the following year. Furthermore, the probability of gaining in future rises very sharply right at zero past gains and goes beyond 80 percent for traders with gains above £1000 during last year. In fact, the whole distribution of future tax gains shifts to the right for higher levels of past gains. The median tax saving is 10 percent of VAT liability when I restrict to the sample of last year gainers.

Ruling out uncertainty as a potential explanation for inaction of FRS gainers, I move to characterize the frictions that prevent traders from joining. Here, the FRS joining patterns point to broadly defined information frictions. I define information frictions to include both gross ignorance about FRS and lack of knowledge about rules required to calculate FRS liability.

First, it is likely that most of learning about FRS takes place at the time VAT registration as traders spend a disproportionate amount of time making themselves

familiar with general VAT legislation. Therefore, I split the sample into three groups based on the date of VAT registration: a) pre-FRS traders registered before introduction of FRS, b) early-FRS traders registered after introduction of FRS but before major reforms in 2004, and c) late-FRS group registered after FRS reforms in 2004.

In 2004 FRS rates were reduced and a temporary 1 percentage point discount was applied to traders joining the scheme during first year of VAT registration. Late-FRS traders could learn about the favorably reformed FRS and therefore are expected to have highest chances of joining the scheme. On the other hand, pre-FRS traders registered when FRS was not in place and should have least awareness of the scheme. Consistent with this reasoning, non-parametric estimates of joining probability are always significantly higher for late-FRS compared to early-FRS traders. Similarly early-FRS traders show higher joining probabilities relative to pre-FRS traders. Restricting the sample to FRS gainers confirms a similar pattern. I document that gainers among the late-FRS traders are significantly more likely to join FRS subsequently.

The second piece of evidence is based on geographical correlations in the data. Traders registering in areas (and times) with higher FRS population are expected to have higher FRS awareness through peers. To investigate this hypothesis, I look at joining probabilities across areas defined by outcodes (postcode districts). I group traders into deciles of FRS density, defined as the ratio of FRS to eligible traders, distribution across outcodes in 2004-05 and follow their joining pattern from 2005-6 onwards. The non-parametric estimates show, traders registering in higher deciles of FRS density are significantly more likely to join the scheme. Furthermore, FRS gainers registered in outcodes with higher FRS densities are significantly more likely to join the scheme subsequently. A simple Cox proportional hazard model confirms the non-parametric results are robust to controlling for 5-digit sector dummies, size of gains and other observable characteristics.

I argue that inertia, i.e. sluggish responsiveness to potential gains, and learning, i.e. resolving uncertainty about FRS benefits, could not fully explain the observed patterns. I document that most of the current FRS traders have joined the scheme right at the time of VAT registration. With uncertainty, one might expect that traders should wait and learn about suitability of FRS for their circumstances. Inertia is consistent with higher joining probabilities for new traders as they have not established their accounting procedures and can accommodate FRS more easily. But it is harder to explain the joining patterns of FRS gainers using inertia simply because all

gainers have been on VAT at least for one year and therefore have incurred the fixed costs. Furthermore, inertia can't explain the geographical joining patterns unless outcodes with high initial FRS density contain traders with lower inertia.

The conclusion that small traders are susceptible to errors in their business decision making resonates with the results of Devereux et al. (2014) who find small incorporated business are not completely shifting their incomes to the corporate base while in a frictionless world it is optimal to do so. Their preferred explanation for sub-optimal behavior is illiquidity of corporate profits and the need for having a stable flow of income (e.g. in the form of personal income). In this paper, however, I argued for presence of information frictions which implies gainers would join FRS if they get the right information. My results suggest small businesses might be subject to optimization frictions similar to those observed in the context of individual decision making. Accepting this view in the case of FRS calls for a more effective role of the government in publicizing the scheme.

The results are also consistent with the large empirical literature on the importance of frictions in the process of individual decision making. Chetty et al. (2011) find that presence of search costs and hours constraints imply individuals re-optimize only when the tax gains are sufficiently high. This is consistent with an observed positive correlation between estimated labor supply elasticities and size of tax variations in Denmark. Kleven and Waseem (2013) find a significant mass of individual tax filers in Pakistan locate in strictly dominated regions above tax notches. They provide evidence that 90% of wage earners and 50-80% of self-employed in these areas are not responsive to tax incentives potentially due to frictions. Jones (2012) provides evidence that inertia could explain why so many income tax filers receive a tax refund although it might be optimal to adjust tax payments and not pay the money in the first place.

Bhargava and Manoli (2013), Chetty et al. (2013), Liebman and Luttmer (2011), Saez (2009) find direct evidence that provision of information changes individual decisions. Bhargava and Manoli (2013) design a randomized experiment to understand high non take-up of EITC benefits. They find re-sending a reminder letter for potential EITC benefits is most effective in increasing take-up when the information is simplified and the size of potential benefits is displayed. Chetty et al. (2013) show neighborhoods with higher EITC information are more responsive to the incentives created by the program and households moving into high information areas start to optimize their EITC soon after. In the context of social security Liebman and Luttmer (2011)

find an information brochure and an invitation for a web based tutorial increases labor force participation by 4 percentage points one year later. Saez (2009) shows both explaining incentives and presentation details matter for take-up of retirement savings subsidies.

Some other studies however find a minimal role for information indirectly pointing to significance of other frictions. Chetty and Saez (2013) show there is a limited effect of providing information on take-up of EITC in a randomized setting. Jones (2010) finds providing information about advance EITC, an add-on feature paying interim installments, doesn't change take-up of the program significantly. Investigating retirement saving decisions Choi et al. (2011) find providing information to 401(k) participants with strictly dominated contribution rates doesn't change their behavior significantly. They conjecture presence of biased preferences might be responsible for unresponsiveness.

In the next section, I give a detailed account of the rules around FRS. In the third section I describe the data. Section four establishes the fact that a significant number of VAT traders benefit from FRS but fail to join the scheme. In section five I discuss why the evidence is not consistent with uncertainty in business environment. Section six presents joining patterns and discusses why information frictions might matter. The last section concludes.

2 Flat Rate Scheme

HMRC first announced the Flat Rate Scheme of VAT for small businesses (FRS) with a consultation in June 2001. The scheme came to force from 24 April 2002 as part of the Finance Act 2002 with the stated purpose of reducing compliance burden of VAT on small businesses. Businesses in the UK must register for VAT when their annual turnover goes beyond a registration threshold (£67,000 during 2008). VAT features three different rates (standard, reduced, and zero) and a set of exempt activities. Normal VAT liability is the difference between VAT on sales and purchases while VAT liability under FRS is the multiplication of a sector specific tax rate and total turnover. As a result FRS requires businesses to keep track of total turnover rather than separate record of transactions under each of the various VAT rates and therefore it is thought to simplify compliance. Effectively VAT is a tax on

value added while FRS liability is a tax on gross sales as shown below:

$$T_V = \tau_V v S_g \quad (1)$$

$$T_F = \tau_F S_g \quad (2)$$

where T_V and T_F respectively represent VAT and FRS liability, S_g is gross sales, v is share of value added (defined as $\frac{S_g - P_g}{S_g}$, with P_g being gross purchases), τ_V is effective VAT rate (defined as $\frac{T_S - T_P}{vS_g}$, with T_s and T_p respectively showing sales and purchases VAT), and τ_F is the flat rate percentage. Eligible traders chose ex ante to be liable either for T_V or T_F over an accounting period. HMRC sets flat rates by sector so the average traders within sectors are indifferent between FRS and VAT: "We calculate the flat rate percentages from the net tax paid by all the businesses that are currently registered for VAT and eligible for the scheme. The net tax paid varies with different trade sectors and so there are a variety of flat rate percentages"[2]. Nevertheless traders with lower than average purchases VAT would get substantial gains from FRS. For example, a management consultant with no purchases VAT could save 16 percent on VAT payment by joining FRS during 2004-7[3]. There are around 16 distinct flat rates ranging from 2 to 14.5 percent (appendix A). On January 2004, HMRC lowered all but one flat rate, increased eligibility thresholds, and incentivized new VAT registrations to join FRS by offering a 1 percentage point discount on flat rates within the first 12 months of registration. To maintain the attractiveness of FRS when standard VAT rate changed, HMRC revised the flat rates on 1 December 2008, 1 January 2010, and 4 January 2011.

While FRS is advertised as a compliance cost saving scheme[4], anecdotal evidence suggests most businesses view the scheme as a tax saving opportunity. An HMRC study of VAT compliance cost reports that "the predominant theme ... is that [traders] enter into the FRS to save them money in terms of the amount of VAT paid to HMRC" (KPMG (2006)). Same study states that businesses spend resources to determine whether FRS is suitable for them, which suggests information about FRS gains is

[2]HMRC, Notice 733: Flat rate scheme for small businesses, February 2004.

[3]τ_F for management consultants is 12.5 percent. With a standard-rate of VAT equal to 17.5 percent, the VAT rate on gross sales is $\tau_V = \frac{0.175}{1+0.175} = 14.9$ percent. Therefore, when the trader doesn't use any tax-refundable inputs (i.e. $v = 1$) the FRS gain as a percentage of current VAT liability is $1 - {}^{T_F}/_{T_V} = 1 - {}^{12.5}/_{14.9} = 16.1$ percent.

[4]Initially FRS was claimed to save on average about £750 (HM Customs and Excise (2002)) but later an impact assessment puts the average compliance savings at £45 (HMRC (2009)). The first estimate is based on saving 45 minutes of clerical time at an hourly wage of £16 over the course of 52 weeks plus £100 saving on accountants' fees. The second estimate uses a "Standard Cost Model" but details of calculations are not disclosed.

not readily available. In addition, in the initial FRS consultation, accountancy firms argued the scheme wouldn't generate any of the intended savings and opposed the scheme as undermining VAT accounting discipline (HM Customs and Excise (2002)). I ignore compliance cost savings in what follows because I don't have the means to estimate its significance.

Eligible VAT traders could easily and quickly join or leave FRS. Traders wishing to join, fill in a one-page application form declaring main activity from the list in appendix A, the corresponding flat rate, and sign that they are eligible. FRS start date is normally the beginning of next VAT period (a quarter for most of traders) and backdating is not normally allowed. Businesses wishing to leave write to HMRC of their decision and normally stop FRS at the end of current VAT period. Again retrospective departure is usually not allowed. There is no statutory minimum term for being on FRS but once left FRS, the trader can not rejoin within the following 12 months. As a measure of revenue protection HMRC reserves the right to withdraw the scheme (even back date the withdrawal) in fraudulent cases.

FRS eligibility is based on turnover and non-turnover criteria. Table 1 shows turnover eligibility rules. Joining eligibility is based on two tests. Expected taxable turnover should be below a threshold (£150,000 during 2004-10) and expected total turnover should be less than a second threshold (£187,500 until December 2010). Once on the scheme, traders remain eligible until their FRS turnover crosses the continuation threshold (£225,000 during 2004-10). The joining tests are based on forecasts of turnover. Instead, I use actual turnover to determine eligibility. This should do no harm because HMRC suggests traders could use last year turnover as a benchmark for their forecasts and also there is no penalty for falling above the joining threshold once on the scheme. Furthermore, during my sample, a small fraction of eligible traders become ineligible in the following year (8 and 10 percent of FRS gainers and losers respectively).

There are five mostly unobservable non-turnover eligibility criteria that apply at all times. Since the main claim in this paper is that some eligible traders are missing out on tax saving opportunities, it is important to rule out unobserved ineligibility of gainers as a potential explanation. First, traders who were on FRS during the past 12 months can't rejoin the scheme. Second, firms registered or eligible to be registered as a VAT group in the past 24 months are ineligible. While I observe traders registered as groups during the sample, I don't have information on those eligible for group treatment or prior group registrations. It is, however, encouraging

to note that only 0.3 percent of VAT traders below FRS continuation threshold are registered as a group.

Third, FRS can not be combined with certain VAT schemes (capital goods[5], cash accounting, retail, tour operators, margin and auctioneer's schemes). I don't have reliable information on take-up of these schemes but several observations justify ignoring them. FRS provides an alternative to cash accounting and retail schemes. Furthermore, it is unlikely that traders on margin and tour operator schemes benefit from FRS because of the high level of VAT refunds they receive with these schemes. Therefore, remaining on another scheme is unlikely to be an important factor in analysis of FRS gains.

Fourth, any VAT conviction or dishonesty in the past 12 months disqualifies the firm. Data on VAT dis-honesties and convictions is not available. It is, however, unlikely that a big part of FRS gainers fall in this category. National Audit Office reports that out of 196,000 investigations during 2002-03 financial year around 30% of cases had VAT under-declaration but only 4% received a penalty (National Audit Office (2004)). Furthermore, traders with negative VAT liability are under greater scrutiny and a disproportionate number of them are caught in fraudulent activities (National Audit Office (2006)). But traders receiving a net VAT refund would not gain from FRS since my calculated FRS liability is always positive.

Fifth, businesses associated with others[6] are ineligible. This measure was put in place to stop artificial splitting of activities into different entities for tax benefits. For example, a trader with several businesses could concentrate standard rated sales under FRS running entity but report purchases under the one using normal VAT. While HMRC collects data on connections to other businesses from VAT registration form, this data is not available for the current paper. Given the large number of gainers and the small size of traders involved it seems unlikely this criterion creates a major problem.

3 Data

Data used in this paper is the annualized version of all VAT returns submitted to HMRC between 2004-5 and 2010-11 financial years. This data has become available

[5]Capital Goods Scheme includes property or refurbishment valued at greater than £250,000 and computer and related items with values greater than £50,000.

[6]HMRC clarifies that this is based on commercial reality not legal form and applies to cases where a company has the right to give directions to another or complies with directions of another.

recently and this is the first paper analyzing FRS using this data. VAT returns include information on sales, purchases, and corresponding VAT on each but doesn't provide separate account of transactions under each VAT rate. The returns data is merged with part of HMRC's trader characteristics dataset which provides information on date of registration, date of deregistration, date of joining/leaving FRS, sector of activity, frequency of submitting returns, ownership form, and a few other variables. I refer to this dataset as returns-level data as it includes all returns submitted by traders. From this, I also construct a trader-level dataset which has one observation per trader and records the date of certain events of interest (e.g. VAT registration, joining FRS, etc.). The trader-level dataset only contains traders who are observed to be eligible at least once during the sample (includes FRS traders as well).

Table 2 shows the total number of available observations before and after cleaning, and the number of returns submitted by VAT and FRS traders during each financial year. There are around 2 million VAT registered traders in each year (column (1)). Dropping inactive traders, returns reporting zero sales, and other anomalies (see table notes and appendix C for more detail) result in around 1.5 million returns per year (column (2)) . This constitutes the working sample for the analysis in the paper. Based on observable eligibility criteria (see section 2) on average 54 percent of VAT traders are FRS eligible (column (4)). Column (5) reports the number of returns submitted by FRS traders which is a relatively small fraction of total returns (column (6)). The fraction of FRS returns increases from 9 to 21 percent of all eligible traders between 2004 and 2010 (column (6))[7].

Many of the traders joining FRS are doing so right at the time of VAT registration. Figure 1 shows Kaplan-Meier nonparametric estimate of probability of joining FRS over time[8]. The analysis time reflects the months FRS option was available to the trader. 9 percent of traders join FRS as soon as they have the option to do so. While in principle this jump could be a result of existing VAT traders joining when FRS was introduced, evidence shows this is due to a large number of new traders joining FRS at the time of VAT registration (figure 14). After the initial jump, the joining probability continues to rise and by the end of 9 years of exposure to FRS it reaches 18 percent[9].

[7]Eligible traders is used to refer to VAT traders who are eligible for FRS. All eligible traders include eligible VAT traders and FRS traders.

[8]See section 6 for a discussion of Kaplan-Meier method.

[9]The end point estimate of probability of joining FRS is smaller than the fraction of FRS traders as of April 2011 (reported in column (6) of table 2) for two reasons. First, the analysis here is based

Figure 2 shows composition of traders joining and leaving FRS. On average 81 percent of current FRS traders remain on FRS and only 3 percent revert to normal VAT in the next year. 16 percent of current FRS traders also exit data which seems normal given the small size of eligible traders. On the inflow side, new VAT registrations comprise a significant addition to FRS. While 71 percent of current FRS traders were on FRS in the last year, 23 percent are coming from new registrations as opposed to 6 percent from existing VAT traders. In summary, figure 2 shows FRS is close to an absorbing state and most of the additions are from newly registered traders.

Table 3 shows summary statistics for three sub-samples: a) VAT traders below FRS continuation threshold of £225,000, b) FRS traders, and c) eligible VAT traders with gains from FRS (next section). The top panel lists tax variables while the bottom panel shows indicator variables. Average FRS trader has a similar turnover to average eligible gainer but they are smaller than average VAT trader. FRS traders pay higher net VAT compared to VAT traders but slightly less than eligible gainers. Eligible gainers also have much lower average inputs and input VAT compared to VAT traders. This is consistent with the intuition that FRS is beneficial for firms using less inputs. FRS traders report inputs only if they purchase capital goods with a value greater than £2000 or under special circumstances. This pulls down average inputs and input VAT for FRS traders.

Incorporated businesses, with a share of 70%, dominate the population of FRS traders. They have a more balanced share among VAT traders and FRS gainers (43 and 48 percent respectively). Both sole proprietors and partnerships are under-represented in FRS. This suggests that sole proprietors and partnerships are less likely to utilize FRS opportunity. The last two rows show the fraction of group registrations and partially exempt traders are very small among VAT businesses. Group registrations are ineligible for FRS and hence the zeros under panel B and C. It is also less likely that partially exempt traders benefit from FRS justifying smaller numbers under panel B and C.

on once eligible traders which includes traders eligible for FRS in 2011 but also those who were eligible earlier and are not eligible at this time. Therefore the number of FRS traders is divided by a larger denominator. Second, figure 1 is based on trader rather than return level data and uses Kaplan-Meier estimate of survival function which is not necessarily equivalent to cross-sectional estimates of fraction on FRS.

4 FRS gainers

4.1 Calculation of FRS gains

In order to assess whether traders are choosing the minimum tax scheme I need to calculate tax liability under the alternative scenario. VAT traders report VAT liability (T_V in (1)). In order to calculate counterfactual FRS liability (T_F in (2)), I use traders' reported Standard Industry Classification 2007 (SIC2007) codes to determine the appropriate flat rate (τ_F) which is then multiplied by the sum of reported net sales and corresponding VAT. FRS gains are defined to be $T_V - T_F$. Similarly an eligible VAT trader is an FRS gainer if $T_V - T_F \geq 0$.

I give a brief overview of determination of flat rates and leave further discussions to appendix B where I also explain some complications in calculation of FRS gains. HMRC publishes applicable flat rates for 56 "categories of business" together with the list of associated "trade names". I match "trade names" to SIC2007 code descriptions from the Office of National Statistics (ONS) to form a mapping between reported SIC2007 codes and published flat rates. For example, ONS describes SIC2007 code of 70229 as "management consultancy activities (other than financial management)". This description matches with the FRS category for "management consultancy" with $\tau_F = 12.5$ percent during 2004-07. Using this manual matching, I assign flat rates to 78 percent of eligible traders. The largest sectors left out are construction and some retail sectors because reported SIC2007 codes map to several flat rates.

FRS traders make an active decision when joining FRS, therefore it is unlikely that they lose out from the scheme. Comparing FRS and VAT liabilities for FRS traders could shed light on importance of other issues (e.g. compliance cost savings) influencing the joining decision. For example, observing some traders remain on FRS despite having a lower VAT liability suggests that they get compliance cost reductions under FRS. Unfortunately, FRS traders only report gross sales (S_g), and corresponding FRS liability (T_F), making it impossible to *calculate* counterfactual VAT liability (T_V)[10]. I must *estimate* VAT liability for FRS traders which requires estimation of τ_V and v in (1). Absence of enough observable characteristics renders regression based estimation of gains ineffective and therefore, I exclude FRS traders. Table 4 summarizes the focus of this paper. FRS traders are left out but VAT traders

[10]To be more precise FRS traders report FRS turnover which in some cases might differ from gross sales (see appendix B). Also notice that the less demanding reporting requirement is the main source of compliance cost saving under FRS.

are analyzed. The main message of the paper is, however, about the group of VAT traders who are observed to gain from FRS.

4.2 FRS gainers characteristics

Table 5 shows aggregate number of FRS gainers. Column (1) reports the number of eligible VAT traders under investigation (assigned τ_F). On average 26 percent of 573,347 eligible traders are FRS gainers but the percentage of gainers drops from 28 to 23 percent during the sample (column (2)). Columns (4) shows percentage of FRS gainers who join FRS in the following year. On average only 3 percent of FRS gainers join the scheme in the following year and there doesn't seem to be a clear time trend. However, 70 percent of gainers remaining on VAT (don't exit or join FRS) still gain from the scheme in a consecutive year (column (5)). Column (6) checks the robustness of fraction of gainers by setting τ_F to the maximum applicable rate in each financial year. Even using this conservative approach 12 percent of eligible traders are observed to gain from FRS. This, to some extent, alleviates concerns about errors in assignment of flat rates. Therefore, FRS gains seem to be persistent but majority of gainers are not responsive and remain on normal VAT.

To compare size of gainers and current FRS traders figure 3 plots sales distribution (frequency) for the two groups. Both distributions are right-skewed suggesting FRS is suitable for small businesses and is inline with HMRC's design of the scheme as a small business program. The number of FRS gainers is almost similar to FRS traders for low levels of sales, but the ratio of gainers to FRS traders increases after £100,000 annual sales. Around the joining threshold (first vertical line) there are three gainers for each FRS trader. Figure 3 also sheds light on gainers beyond the joining eligibility. As we have seen in section 2 the joining threshold is not binding and traders above this threshold could in effect join the scheme. I ignore this possibility in table 5 but figure 3 shows there is a significant mass of traders who could potentially gain in this region.

In the remaining part of this section I establish four empirical facts about the population of FRS gainers:

Fact 1 Very few FRS gainers join FRS over time. 3 percent join in the following year and the estimated joining probability 72 months after gaining is 10 percent.

Fact 2 Gains are persistent. Gaining in the last period increases the probability of gaining by 62 percentage points after controlling for SIC2007 and year dum-

mies. 34 percent of gainers are observed to gain (or join FRS) during all years they show up in the data.

Fact 3 Size of FRS gains are not small. Median gainer could save 12 percent on VAT liability by joining FRS. 92 percent of gainers have a gain of £100 or more and 46 percent gain £1000 or more.

Fact 4 Gainers are concentrated in a few mostly services sectors (consultancy and personal services).

Fact 1: Few gainers join the scheme

Figure 4 plots Kaplan-Meier non-parametric estimate of (cumulative) probability of joining FRS on or before the indicated number of months since traders are first observed to gain. Similar to table 5, 12 months after gaining, probability of joining is about 3 percent. Interestingly, the likelihood of joining FRS shows a very gentle increase over time. 72 months after first gaining, joining probability reaches 10 percent. Therefore, very few FRS gainers join FRS eventually and it takes quite some time for those who do to join the scheme.

The sluggish response of gainers suggests a potential role for learning, i.e. traders wait to resolve uncertainty over gains from the scheme. Figure 5 looks at the percentage of gainers eventually joining FRS over the number of years they gained. In presence of learning, traders gaining for more years should have higher joining probabilities. In contrast, this figure shows one and two year gainers are more likely to join FRS. Figure 5a groups traders based on the number of years gaining and reports the fraction of each group that is observed on FRS at any time during the sample. 13 percent of one year gainers and 12 percent of two year gainers are ever observed on FRS while only 8 percent of traders gaining for more than two years join the scheme. Interestingly, 4 percent of traders who never gain join the scheme. While this is one third of the fraction of two year gainers who join the scheme, it suggests my calculations are unable to uncover gains for these traders. Splitting the data into traders with different lifespans[11] in figure 5b confirms the same pattern but also shows the percentage of gainers joining FRS is the highest among traders who are present in the full 7 years of my sample: almost 20 percent of one and two year gainers join FRS. In contrast, around 15 percent of one and two year gainers from 5

[11] This is defined as the number of years traders show up in my data.

and 6-year traders join the scheme. This pattern is more consistent with sluggish responsiveness (inertia) but doesn't give much support to learning. Observing one and two year gainers for longer (higher lifespan traders) increases the joining probability but gaining for more years doesn't.

Fact 2: Gains are persistent

Figure 6 looks at the persistence of FRS gains across sales levels. The solid line shows the unconditional probability of being an FRS gainer is first increasing but quickly reaches a plateau after around £30,000 annual sales. The dashed line shows the probability of remaining a gainer conditional on being a gainer in the previous year. While this figure confirms the earlier fact that conditional probability is much higher than the unconditional one (table 5), it reveals less persistence of gains for very small traders and slightly higher than 70 percent conditional probability of gains for larger traders. Interestingly the conditional probability also reaches a plateau after £30,000 annual sales and there is very limited fluctuations in persistence of gains across sales levels after this point.

Figure 7 plots distribution of number of years gaining conditional on gaining once. Figure 7a shows fraction of gainer that gained for less than 50 percent, exactly 50 percent, more than 50 percent and exactly 100 percent of the times they submitted returns. 34 percent of FRS gainers gain for all years (or join FRS) while only 30 percent gain less than 50 percent of the times[12]. Figure 7b shows separate histograms for traders with different lifespans. For almost all lifespans the highest share is for traders gaining during their entire lifespan (far right dots for each curve). In summary these figures show a considerable share of traders gain during all years in the data, while many others have multiple years of gaining.

Fact 3: Gains are not small

Figure 8 plots the distribution of FRS tax gains for eligible VAT traders. The gains distribution has a mode at zero with 4.8 percent of the mass falling between £-100 and £100 FRS gains. This is due to HMRC's targeting of flat rates to make the average traders indifferent between FRS and VAT. A closer look at FRS gainers, i.e.

[12]In this figure, I have assumed traders who join FRS after x-year of gaining continue to gain while on FRS and put them in the 100 percent gains bin. Dropping the traders who join will change the percentages to 33, 14, 25, and 28 percent for less than 50, exactly 50, more than 50, and 100 percent bins respectively.

the positive tail, reveals 92 percent of gainers have a gain of £100 or more and 46 percent gain £1000 or more[13].

In order to get a better sense of size of gains, figure 9 looks at FRS tax gains as a percentage of reported VAT liability across sales levels. The figure plots medians of relative tax gains distribution separately for FRS gainers (above zero) and losers (below zero) within gross sales bins of £1000. The top part shows fairly stable and non-negligible tax gains for FRS gainers. Gainers with annual sales between £9500 and £10500 (first bin) see a median reduction of 17 percent in their tax liability upon joining FRS. The median gain decreases to 12 percent for larger gainers but remains stable at this level. Perhaps not surprisingly, the bottom part confirms FRS losers incur large tax losses if they join the scheme. Median FRS losers with less than £50,000 annual sales would see an increase of 150 percent in their tax liability should they join FRS. This loss reduces to 100 percent for higher annual sales.

Fact 4: Gains are concentrated

To see the type of activities benefiting from FRS, table 6 lists ten sectors with highest number of FRS gainers. These sectors comprise 51% of all FRS traders and 41% of all FRS gainers. This table shows FRS is suitable for a concentrated number of sectors. The list includes management consultancies, computer consultancies, business support activities, and take away food shops. Interestingly, most of these sectors have flat rates close to the high end of the range of applicable rates. Gains seem to be more persistent for these sectors: 77% of gainers who remain on VAT continue to gain in $t+1$ (compared to 70% for all gainers in table 5). Conditional median of gains (columns (6) and (7)) reveals non-negligible potential gains from joining FRS.

Figure 10 generalizes the patterns in table 6 by looking at distribution of FRS traders, gainers, and eligible VAT traders across flat rate categories. Compared to the fraction of eligible traders falling in high flat rate categories, figure shows a larger fraction of FRS traders and FRS gainers fall in these categories. Sectors with higher flat rates contain higher FRS populations and FRS gainers. This counter-intuitive pattern seems to be an artifact of HMRC's conservative approach in setting higher than average flat rates for mostly zero rated activities. Sectors with a low flat rate (e.g. 2

[13]Size of losses for FRS losers could potentially be much larger: the first percentile of gains distribution is -27,800 while the ninety ninth percentile is 4,800 Pounds. This is partly due to inclusion of eligible zero and reduced rated traders who normally receive refunds and therefore incur huge losses under FRS.

percent for retail of food) are involved in zero rated activities (food is generally zero rated). Minor exceptions within broad zero rated sectors would nonetheless make FRS profitable for some traders but this is very limited. On the other hand the high end of the flat rates are for business and personal service activities (some listed in table 6) that are mostly standard rated. This implies sectors with high flat rates have generally higher number of potential FRS beneficiaries.

5 Uncertainty

So far I have shown FRS gainers get persistent non-negligible benefits from joining FRS yet very few of them join the scheme. In order to claim that this is inconsistent with a simple model of expected profit maximization, in this section I present further evidence to rule out uncertainty. Joining FRS is an ex ante decision while the observed gains are ex post. Presence of uncertainty in business environment creates a wedge between realized and expected gains. Therefore, inaction of ex post FRS gainers could be justified due to lack of expected gains.

Fact 2, in the previous section, established that gains are highly persistent. Gaining last year increases the probability of gaining to 70 percent across the sales distribution (table 5 and figure 6). Furthermore, 34 percent of 402,894 traders who are observed to gain at least once and submit at least two VAT returns, gain (or join FRS) in all returns (figure 7). In this section, I first present evidence that the joining patterns of some FRS traders could not easily be reconciled with high levels of uncertainty. Then I reinforce the persistence claim (fact 2) by carefully inspecting various cuts of the conditional distribution of FRS gains.

5.1 Sharp responsiveness of some traders

The uncertainty explanation is not consistent with behavior of responsive traders. Figure 1 and 14a show a sizable fraction of traders join FRS as soon as they have the option of doing so, i.e. the time of VAT registration for most traders. These traders have most likely no experience of VAT but they apparently have no doubt about FRS benefits. Had uncertainty been important, these traders should have waited to learn whether FRS suits their circumstances. Considering the much smaller sub-sample of FRS gainers who join FRS subsequently, figure 11 shows probability of joining FRS rises sharply around zero FRS gains. In other words, slightly positive gains in

the last year sharply increases the probability of moving to FRS in the current year. Therefore, the sub-sample of responsive gainers join the scheme as soon as positive gains are observed as if there is no uncertainty.

5.2 Conditional distribution of gains

The evidence on sharp responsiveness of some traders is only suggestive because those who don't join are inherently different from those who join the scheme. It might be that those joining face little uncertainty while others remain unresponsive precisely because of expected losses. In this section, I closely investigate the the persistence of gains for all gainers (not just responsive traders).

Figure 12a plots twenty fifth, fiftieth (median), and seventy fifth percentiles of FRS gains for group of traders within £1000 bins of last year FRS gains. The gains distribution shows high degree of serial correlation. The whole distribution of FRS gains shifts to the right for traders with higher past FRS gains. The comparison of the median line (solid black) with the 45 degree line (one-to-one dependence of gains over time) shows that the median gains and losses are slightly less than the absolute value of last year's tax gain. But size of the gains are quite comparable. For example the median gains for traders with last year tax gains between £5750 and £6250 is equal to £4800 and the 75 percentile is £6,000. The twenty fifth percentile of gains distribution is positive for traders with last year gains falling in $[750, 1250)$ bin or beyond. Figure 12b plots the fraction of traders with a non-negative FRS tax gain within bins of last year gains. While the fraction of gainers is close to zero for last year FRS losers, it increases sharply right after zero last year gains to more than 70 percent. The fraction of gainers increases to 80 percent for traders gaining between £750 and £1250 during last year.

Figure 13 looks at twenty fifth, fiftieth (median), seventy fifth percentiles, and mean of FRS tax gains as a percentage of VAT liability for last year gainers within bins of gross sales. Median gains are fairly stable at around 10 percent of VAT liability[14]. Seventy fifth percentile is also stable and shows 25 percent of traders save more than 20 percent on tax payment upon joining FRS. Twenty fifth percentile of the gains distribution is negative up until £40,000 annual sales but becomes positive for larger

[14]The median gains as a percentage of turnover is also stable at around 1.5% (results not shown).

traders[15]. I have plotted mean[16] of gains distribution to shed light on expected gains for FRS gainers. Assuming that gains distributions for last year gainers in the same gross sales bin are identical, the mean of FRS gains in each sales bin is equal to expected gains for traders in that bin. Therefore, I can use the realized gains for this group to back out expected gains for individual traders[17]. The mean coincides with twenty fifth percentile of FRS gains. For traders with gross sales less than £60,000, mean FRS gain is negative but traders larger than this level have positive mean. This suggests expected FRS gains for these traders.

To see the robustness of the persistence conclusion, table 7 shows the results of regressing an indicator of FRS gains on whether the trader gained last year and other covariates. The coefficient estimate of last year gains is highly significant and shows the probability of gaining from FRS increases by 65 percentage points once a trader is observed to gain during last year. Controlling for sector and year dummies reduces the coefficient to 62 percentage points. While these regressions suffer from all sorts of endogeneity issues, they confirm that being an FRS gainer is an important correlate of current gains even after controlling for sector and year dummies and other observable characteristics.

As the mean is smaller than the median in figure 13 one could argue some past gainers show large losses in future. This could for example be a result of investments in capital goods once in a while. Management consultants might buy new computer systems every 5 years or take-away food shops might invest in new stoves every 10 years. These investments happen with small frequency but involve large losses if traders could not recover input VAT. I argue two features of FRS make this variation of uncertainty-based story an unlikely explanation for inaction.

First, FRS traders *can* reclaim input VAT on capital expenditures exceeding £2000. Items like computers or stoves are likely to have values beyond this level and qualify for input VAT recovery. I don't observe these investments in the data separately. Therefore, in calculation of FRS gains, I assumed input VAT is not recoverable under FRS. Incorporating this possibility might remove the outliers in figure 13 and move the mean closer to the median. Second, FRS traders can leave the scheme at the

[15] 25th percentile fluctuates between a min of 0.2 percent and a maximum of 2.8 percent for traders larger than £40,000 with an average of 1.5 percent. This suggests on average 25 percent of last year FRS gainers have a gain of 1.5 percent or less (maybe negative) in the current year.

[16] I have plotted the mean in figure 12a but this is not released.

[17] Obviously this is a crude way of estimating expected gains as there are very few controls (sales). Table 7 below includes covariates but uses a gainer dummy as the dependent variable rather than a measure of size of tax gains.

end of VAT periods (a quarter for most). Therefore, if traders could predict large upcoming purchases that don't qualify for FRS input recovery, they can simply leave the scheme.

Therefore, inaction of gainers is justified only when traders face large urgent (unpredictable) purchases that happen with small probability and don't qualify for FRS input recovery. For example, traders might need to purchase large stocks of consumable inputs that could not be postponed until they leave FRS. While I can't rule out this possibility based on the current data it doesn't seem plausible enough to explain close to complete inaction of FRS gainers. For example, demand fluctuations wouldn't necessarily generate such shocks. If traders use a fixed proportion of inputs to deliver services, an increase in demand increases input use but doesn't change the share of value added and therefore doesn't change relative merit of FRS and VAT.

6 Evidence on type of frictions

The evidence so far shows a significant number of eligible VAT traders fail to join FRS despite tax benefits. This behavior is not consistent with a frictionless model of expected profit maximization. In this section, I present evidence consistent with presence of broadly defined information frictions. I define *information frictions* to include both gross ignorance about FRS and lack of knowledge about rules required to calculate FRS liability[18]. I argue that *inertia*, i.e. sluggish responsiveness to potential gains, and *learning*, i.e. resolving uncertainty about FRS benefits, could not fully explain the observed patterns. The two competing hypotheses conjecture that traders know about FRS and its rules but either they are slow in responding to gains (e.g. due to adjustment costs) or need time to assess the appropriateness of FRS by inspecting their business circumstances.

The increase in share of FRS traders during the sample period suggests FRS awareness is increasing (table 2) but this pattern could be a result of sluggish responsiveness (inertia) or experimenting with VAT (learning). However, the high likelihood of joining FRS at the time of registration (figure 1) and higher joining probabilities for one and two-year gainers (figure 5) are not supporting learning. Learning suggests traders should wait some time before moving to FRS and predicts higher

[18]The evidence is silent on deeper reasons responsible for lack of knowledge: e.g. high cost of acquiring information, biased beliefs about suitability of VAT, tendency to ignore non-default options, and lack of salience of VAT.

joining probabilities for long time gainers[19]. Same figures, however, are consistent with inertia because new traders might face lower adjustment costs[20].

It is useful to consider the ways traders could possibly learn about FRS in order to better understand implications of information frictions. VAT traders could learn about FRS through a) HMRC, b) tax agents and consultants, and c) business partners and peers. Traders are engaged with HMRC during VAT registration, submission of returns, and audit visits. But chances of learning about FRS is highest at the time of VAT registration because other occasions focus on existing circumstances rather than pointing to new possibilities[21]. Registration is a time of learning about VAT which could raise chances of knowing about FRS[22]. Channels (b) and (c) could be operative at all times but they could be stronger during registration. Channel (b) might be less important because less than half of VAT traders use agents[23] and tax and accountancy associations didn't support the scheme initially[24].

The importance of registration period for acquiring VAT knowledge, suggests traders registering after FRS was introduced, are more likely to know about the scheme (*hypothesis 1*). Additionally, peer effects suggest traders with FRS-aware partners are more likely to know about the scheme (*hypothesis 2*). In the absence of awareness measures, I rely on estimates of probability of joining FRS for various groups to assess the validity of hypotheses 1 and 2.

I take a survival time approach, and look at the probability of joining FRS as a function of analysis time (defined in different ways later). Consider a random variable

[19] One caveat is that I can't distinguish between start-ups and existing firms based on the time of VAT registration. New VAT registrations might be active prior to registration.

[20] Evidence from Cash Accounting Scheme (CAS), another small business VAT scheme introduced in 1987, suggests lack of awareness might be key. Traders on CAS pay VAT when they receive money from customers and reclaim input VAT when they fully pay for the purchase. Based on a telephone survey of around 1500 traders in 2006, HMRC reports 28 percent of eligible traders *haven't heard* of CAS (HMRC (2006)).

[21] Among the numerous VAT guides, HMRC publishes one to help traders filling their returns (Notice 700/12 Filling in your VAT return). Interestingly, there is no mention of FRS here until October 2011 revision.

[22] HMRC's website contains a section on special VAT accounting schemes, where FRS is described. VAT experts indicated from October 2012, traders registering online would face the FRS option on the entry form.

[23] Returns data doesn't show use of agents but National Audit Office (2010) reports around 43 percent of VAT returns were submitted by agents during 2009-10. Furthermore, GfK Business (2008) reports 48 percent of businesses use tax agents for any VAT related issues, while 83 percent of incorporated businesses use agents for corporation tax affairs.

[24] In response to FRS consultation in 2001, many tax and accountancy associations argued FRS diminishes the accounting discipline VAT imposes on traders. 54 responses were received from a total of 225 copies sent out to trade associations, professional bodies, and individual businesses (HM Customs and Excise (2002)).

$T \in [0, \infty)$ representing the time traders join FRS and t_i as realization of this random variable for trader i. Denote the conditional CDF of T by $F(t \mid X)$. The probability of joining FRS up until t is

$$\Pr[T \leq t \mid X] = F(t \mid X) \tag{3}$$

where X is a vector of covariates. In survival terminology this is known as the failure function (failure being the event of joining FRS). I use Kaplan-Meier non-parametric method to estimate (3) for different sub-populations. Starting from a total number of traders, n_1, who have the option of joining FRS at time zero (origin), the probability of joining on or before first month is estimated by $\frac{d_1}{n_1}$ where d_1 is the number who join FRS in first month. Similarly, the probability of joining until the second month is the sum of $\frac{d_1}{n_1}$ and $\frac{d_2}{n_2}(1 - \frac{d_1}{n_1})$, i.e. the probability of joining in the second month conditional on not doing so before. Notice $n_2 = n_1 - d_1 - c_1$ is total number who are still on VAT in the second month and c_1 is the number of traders exiting (censored) the data during the first month. In general, the probability of joining on or before jth period is estimated by 1 minus probability of remaining on VAT until then or $1 - \prod_{i=1}^{j} \frac{n_i - d_i}{n_i - c_{i-1}}$.

I split eligible VAT traders into three groups based on date of registration: a) *Pre-FRS*, registered before April 2002, date of FRS introduction, b) *Early-FRS,* registered on or after April 2002 but before January 2004, and c) *Late-FRS,* registered on or after January 2004, when flat rates and eligibility thresholds were revised favorably. Hypothesis 1 suggests pre-FRS traders should have the lowest chance of joining because during their registration FRS was absent. In contrast, late-FRS traders might learn about the favorably revised FRS during registration, and hence should have highest joining probability. Hypothesis 2 implies traders registering later (e.g. late-FRS) are more likely to have FRS-aware partners as the take-up of the scheme was increasing. Furthermore, the joining probability should increase over time as FRS awareness spreads.

To further support hypothesis 2, I use the registered outcodes of traders and define *FRS density* to be the ratio of FRS traders to all eligible ones in each outcode during 2004-05 financial year[25]. Registering in high FRS density outcodes implies greater chance of having an FRS-aware partner and hence higher joining likelihood if information frictions matter. I use the deciles of FRS density distribution and

[25]Postcodes in the UK consist of two alphanumeric parts. Outcode (postcode district) refers to the first part. For example, WC2A is the outcode associated with WC2A 2AE. The geographical area covered by outcodes varies substantially. I use FRS density to make outcodes comparable.

compare non-parametric estimates of joining probability for traders registering in different deciles. I restrict attention to traders joining FRS after 2004-05 financial year.

To complement the non-parametric evidence, I estimate semi-parametric Cox proportional hazard models (CPH) and verify the non-parametric estimates hold after controlling for observables. The hazard rate is defined as the probability of joining FRS in an infinitesimal interval around t conditional on not having joined before t, divided by the length of the interval as it approaches zero. Equation (4) shows the definition of hazard rate and its relationship to CDF and PDF of T.

$$h(t \mid X) = \lim_{h \to 0} \frac{\Pr\left[T \in [t, t+h) \mid T \geq t,\, X\right]}{h} = \frac{f(t \mid X)}{1 - F(t \mid X)} \tag{4}$$

CPH postulates that the effect of covariates enter as a time separable exponential term as follows

$$h(t \mid X) = h_0(t) \exp\left(\beta' X\right) \tag{5}$$

where $h_0(t)$ is the baseline hazard function and determines the evolution of hazard rate over analysis time when $X = 0$. The model is semi-parametric because the partial likelihood estimation leaves the baseline hazard unrestricted. In the next subsection, I provide non-parametric (Kaplan-Meier) estimates of joining probability and in the second subsection, I show results of CPH estimation.

6.1 Non-parametric estimation

Figure 14 plots non-parametric estimates of the joining probability (equation 3) for pre, early, and late-FRS traders with the shadings around the lines showing 95 percent confidence intervals. Figure 14a estimates joining probability for all eligible traders. The analysis time shows months since traders had the option of joining FRS, with the zero reflecting date of VAT registration for early and late-FRS groups and the date of FRS introduction for pre-FRS traders. Consistent with hypothesis 1, the figure shows a dramatic and sustained difference between the three groups. Probability of joining FRS jumps to 17 percent right at the time of registration for late-FRS traders while it remains close to zero for pre-FRS traders. The subsequent increases in joining probability are small relative to the initial jump for all groups.

The caveat here is that late-FRS traders initially face a more attractive FRS due to 1 percentage point discount on flat rates within 12 months of VAT registration

and more favorable rates and eligibility conditions. The three groups, however, face identical FRS after t =24 months, yet the probabilities don't converge. Furthermore, early-FRS traders face similar incentives as pre-FRS group from the outset, but the former show 2 percentage points increase in joining probability at $t = 1$ while the latter doesn't. Splitting the late-FRS group into yearly registrations reveals traders registering in later years are increasingly more likely to join FRS (results awaiting release, not shown).

Figure 14b focuses on FRS gainers (excludes traders joining right at the time of registration and those with missing gains). The analysis time shows months since traders first gained from FRS, with the zero reflecting the end of the first financial year traders gained[26]. All FRS gainers face a similar FRS structure because they have to be on VAT at least for one year and lose out on 1 percentage point discount. The joining probabilities increase over time but late-FRS gainers have a significantly higher joining probability compared to the other groups. Similarly early-FRS gainers have higher joining probability compared to pre-FRS gainers.

Patterns in figure 14a could be consistent with inertia. New traders have invested less resources in accounting procedures and VAT familiarization, therefore they can invest in FRS accounting procedures. Existing traders are more reluctant to undertake new investments and hence have higher inertia. However, for inertia to justify observed patterns in figure 14b, one would need to assume traders with longer experience of VAT have higher inertia. This is a stronger assumption as all FRS gainers have set up normal VAT accounting procedures but could still prevent drawing firm conclusions.

Figure 15 looks at the sub-samples within outcodes falling in first, fifth, and tenth deciles of initial FRS density. In figure 14a analysis time is months since traders had the option of joining FRS. Consistent with hypothesis 2, traders registering in tenth decile have the highest probability with fifth and first deciles lagging behind. Joining probability jumps to 20 percent as soon as traders in tenth decile get the chance of joining but the jump is smaller for fifth and first decile traders. The joining probabilities increase almost in parallel for tenth and fifth deciles over analysis time but remains fairly stagnant for the first decile. The probability of joining FRS on or before the end of analysis time is 8, 14, and 30 percent for first, fifth, and tenth deciles. Similarly, for FRS gainers, figure 15b shows gainers registered in higher deciles of FRS density are significantly more likely to join FRS in all times after they gain.

[26]Dates for the end of financial year 2004-5 are at 31 January, 28 February, or 31 March depending on the traders' choice.

For inertia to justify patterns in figure 15, one would need the more demanding assumption of less inertia for high FRS density areas. The patterns could, however, be consistent with learning stories where presence of other FRS traders facilitates resolution of uncertainty (although the sharp jump at zero is still against learning).

6.2 Semi-parametric estimation

So far I have looked at joining probabilities for various groups without controlling for potential confounding factors. For example, traders registering later might be registering in high initial FRS density outcodes. Therefore, patterns in figures 14 and 15 might be driven by these traders. To rule out this possibility and other observable confounders, I estimate CPH models (equation (5)). Estimation results are reported as hazard ratios for ease of interpretation. For dichotomous variables hazard ratios are defined as the ratio of the hazard rate when the variable is equal to 1 to when it is 0, fixing other variables:

$$\begin{aligned} HR_i = \frac{h(t \mid x_i = 1,\, X_{-i})}{h(t \mid x_i = 0,\, X_{-i})} &= \frac{h_0(t) \exp\left(\beta_i \times 1 + \beta'_{-i} X_{-i}\right)}{h_0(t) \exp\left(\beta_i \times 0 + \beta'_{-i} X_{-i}\right)} \\ &= \exp(\beta_i) \end{aligned}$$

This suggests the rate of joining FRS is $HR_i = \exp(\beta_i)$ times higher for $x_i = 1$ traders relative to $x_i = 0$ ones. Alternatively the likelihood of joining FRS is HR_i times higher for $x_i = 1$ relative to $x_i = 0$ during the analysis period.

Table 8 reports estimation results when the start of analysis time is from the time traders have the option of joining FRS. The variables of interest are "gainer", a dummy variable that is equal to 1 if trader is an FRS gainer, two dummies capturing early and late-FRS traders, and "initial FRS density". In all specifications, I control for average and standard deviation of FRS gains over VAT liability for each trader, average logarithm of gross output, the ratio of number of years trader was eligible for FRS, dummies for sole proprietors and partnerships, and dummies for frequency of submitting returns. Standard errors account for clustering at 5-digit SIC2007 codes.

In column (1) a simple CPH model is estimated. The likelihood of joining FRS is 3.862 times higher for gainers relative to those never gaining. Confirming figure 14a, early and late-FRS traders are respectively 55 and 178 percent more likely to join FRS compared to pre-FRS traders. Columns (2) to (5) estimate stratified CPH models with SIC2007 and deciles of initial FRS density as grouping variables.

Stratification allows baseline hazards to vary flexibly across SIC2007 by FRS density decile groups but restricts to identical effects of covariates across groups (similar to fixed effects in a linear regression)[27]. Coefficient estimates are slightly reduced when I allow for stratification in column (2). Gainers are still 3.025 times more likely to join FRS. Early and late-FRS traders are 51 and 171 percent more likely to join relative to pre-FRS traders. In column (5) I remove traders with less than three years of returns data and the results are still robust.

Column (3) includes interactions of registration period dummies with gainer indicator. The interaction terms capture the change in the hazard rate for gainers registering in different periods. Early-FRS gainers are 45 percent more likely (significant) to join FRS relative to pre-FRS gainers ($1.45 = 1.851 \times 0.782$). Late-FRS gainers are 135 percent more likely to join FRS relative to pre-FRS gainers ($2.36 = 4.313 \times 0.546$).

Column (4) includes the ratio of years traders gain to total years. Learning suggests gaining for more years should increase likelihood of joining. In contrast to patterns presented earlier, here the estimates support learning. Conditional on gaining at least once, traders with one more year of gaining (assuming 7 years of returns) are on average 30 percent more likely to join during the investigation period relative to those gaining one year less[28].

Column (6) includes initial FRS density (continuous) in the regression. Here I restrict to traders registering from 2005-06 financial year onwards (hence remove early and late-FRS dummies). Increasing initial FRS density of the registration outcode of traders by 0.05 increases the likelihood of joining by 15 percent for traders never gaining and 174 percent for FRS gainers. Overall, CPH estimations support the patterns presented in figures 14 and 15.

6.3 Discussion

The highest take-up rate in any of the sub-samples studied in figures 14 and 15 is around 25 percent. Therefore, the presented patterns rely on behavior of responsive traders. In other words, the evidence is silent on the type of frictions responsible for overall low take-up. For example one could argue that small businesses think about VAT as a tax to be passed forward. Therefore, VAT may not be as salient

[27] Stratification allows for more flexibility than including dummies. Dummies shift the hazard rate proportionately across sectors but stratification allows independent time paths for each group.

[28] To calculate this, I used the original coefficient estimate from column (4). Specifically, $\exp(\frac{1}{7} \times \ln(6.245)) = 1.30$.

as corporation or income tax resulting in less effort in optimizing VAT liability. The claim is not information friction is the only friction responsible for inaction. The main argument is there is evidence in support of information frictions and this evidence can not be consistent with inertia or learning.

Throughout the paper, I ignored compliance cost savings and argued, based on the scheme's design, it should strengthen my conclusions. But there is some evidence that compliance costs might actually increase on FRS. First, accounting software usually provide automatic calculation of tax liabilities and tax return information. It seems software developers were rather slow in adding FRS capability. For example SAGE 50 Accounts introduced FRS capability in the 2011 upgrade[29]. For businesses using accounting software without FRS capability a move from VAT to FRS involves an increase in compliance costs. Second, there is anecdotal evidence that FRS traders calculate both VAT and FRS liabilities. Accountancy forums generally advise businesses to be vigilant not to lose money on FRS. The mental cost of worrying about losing money and the time cost of calculating two tax liabilities are likely to increase FRS compliance costs. Findings of KPMG (2006) provides further interview support on this view.

7 Conclusions

Results presented here show a significant number of small businesses with non-negligible tax savings fail to join FRS. Uncertainty in the business environment can not explain inaction because gains are persistent. Once a trader is observed to gain, the likelihood of gaining increases significantly. The joining patterns of traders registering for VAT when FRS was in place suggests they might have higher awareness of the scheme. Furthermore, it seems initial number of FRS traders in a given outcode is an important determinant of joining for future traders.

The conclusion that small traders are susceptible to errors in their business decision making resonates with the results of Devereux et al. (2014) who find small incorporated business are not completely shifting their incomes to the corporate base while in a frictionless world it is optimal to do so. Their explanation for sub-optimal behavior is illiquidity of corporate profits and the need for having a stable flow of

[29] I didn't check other accounting software but SAGE is the most popular. An HMRC report shows from the 58 percent of businesses using accounting software for VAT, 61 percent use SAGE (GfK Business (2008)).

income (e.g. in the form of personal income). In this paper, however, I argued for presence of information frictions. This means in the case of FRS, gainers would join if they get the right information about the scheme. Accepting this view calls for a more effective role for the government to publicize support schemes.

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A Appendix A: Flat rates for FRS categories

Category of Business	24 Apr 02 - 31 Dec 03	1 Jan 04 - 30 Nov 08	1 Dec 08 - 31 Dec 09	1 Jan 10 - 3 Jan 11	4 Jan 11 Onwards
Post offices**	6	2	2	4.5	5
Retailing food, confectionery, tobacco, newspapers or children's clothing	5	2	2	3.5	4
Wholesaling food	7	5.5	5	6.5	7.5
Membership organisation	7	5.5	5.5	7	8
Pubs	6	5.5	5.5	6	6.5
Farming or agriculture that is not listed elsewhere	6.5	6	5.5	6	6.5
Retailing that is not listed elsewhere	7	6	5.5	6.5	7.5
Wholesaling agricultural products	7	6	5.5	7	8
Retailing pharmaceuticals, medical goods, cosmetics or toiletries	8	7	6	7	8
Retailing vehicles or fuel	8	7	5.5	6	6.5
Sport or recreation	8	7	6	7.5	8.5
Wholesaling that is not listed elsewhere	8	7	6	7.5	8.5
Printing	8.5	7.5	6.5	7.5	8.5
Repairing vehicles	8.5	7.5	6.5	7.5	8.5
Agricultural services	9	7.5	7	10	11
Library, archive, museum or other cultural activity	8.5	7.5	7.5	8.5	9.5
Manufacturing food	8.5	7.5	7	8	9
General building or construction services*	9	8.5	7.5	8.5	9.5
Manufacturing yarn, textiles or clothing	9.5	8.5	7.5	8	9
Manufacturing that is not listed elsewhere	10	8.5	7.5	8.5	9.5
Packaging	9	8.5	7.5	8	9
Repairing personal or household goods	10	8.5	7.5	9	10
Hiring or renting goods	9.5	8.5	7.5	8.5	9.5
Social work	9	8.5	8	10	11
Forestry or fishing	10	9	8	9.5	10.5
Mining or quarrying	10	9	8	9	10
Courier Services**	6	9	8	9	10
Transport or storage, including couriers, freight, removals and taxis**	10	9	8	9	10
Travel agency	10	9	8	9.5	10.5
Advertising	11	9.5	8.5	10	11
Hotel or accommodation	10.5	9.5	8.5	9.5	10.5
Photography	10	9.5	8.5	10	11
Publishing	10	9.5	8.5	10	11
Veterinary medicine	11	9.5	8	10	11
Dealing in waste or scrap	11	9.5	8.5	9.5	10.5
Any other activity not listed elsewhere	11	10	9	10.5	12
Investigation or security	11	10	9	10.5	12
Manufacturing fabricated metal products	11	10	8.5	9.5	10.5
Boarding or care of animals	11	10.5	9.5	10.5	12
Film. radio, television or video production	-	10.5	9.5	11.5	13
Business services that are not listed elsewhere	12.5	11	9.5	10.5	12
Entertainment or journalism	12	11	9.5	11	12.5
Estate agency or property management services	11.5	11	9.5	10.5	12
Laundry or dry-cleaning services	12	11	9.5	10.5	12
Secretarial services	11.5	11	9.5	11.5	13
Computer repair services	13.5	11	10	9.5	10.5
Financial services	12	11.5	10.5	12	13.5
Hairdressing or other beauty treatment services	13	12	10.5	11.5	13
Catering services, including restaurants and takeaways	13	12	10.5	11	12.5
Real estate activity not listed elsewhere	13	12	11	12.5	14
Architect, civil and structural engineer or surveyor	13.5	12.5	11	13	14.5
Management consultancy	13.5	12.5	11	12.5	14
Accountancy or book-keeping	13.5	13	11.5	13	14.5
Computer and IT consultancy or data processing	14.5	13	11.5	13	14.5
Lawyer or legal services	13.5	13	12	13	14.5
Labour-only building or construction services*	14.5	13.5	11.5	13.5	14.5
Number of FRS categories	54	56	56	56	56
Number of flat rates	17	16	16	18	17
Range of flat rates	5 - 14.5	2 - 13.5	2 - 12	3.5 - 13.5	4 - 14.5
Standard VAT rate	17.5	17.5	15	17.5	20

B Appendix B: Calculation of FRS gains

To calculate counterfactual FRS liability I need to multiply FRS turnover by the applicable flat rate. FRS turnover is total gross business income which should include exempt, zero rated, reduced rated, and standard rated sales as well as any VAT received on sales. Under normal VAT accounting, VAT liability is VAT received on sales minus VAT paid on purchases (subject to certain qualifying rules). VAT traders report net of tax sales and purchases and corresponding VAT on them in VAT returns. Reported sales includes exempt, zero-rated, reduced-rated, and standard-rated sales but doesn't include VAT itself. Therefore, to arrive at FRS turnover I add up reported sales and the corresponding VAT.

In order to calculate FRS gains for VAT traders, I first assigned a flat rate to each trader (base on reported SIC codes) and then calculated FRS turnover from returns data (as above). FRS gains is then derived as the difference between reported VAT liability and calculated counterfactual FRS liability. Assuming the assigned flat rate is τ_F and FRS turnover is S_g I calculate FRS gains as follows

$$\begin{aligned} \text{FRS gains} &= T_V - T_F \\ T_F &= \tau_F \times S_g \\ T_V &= T_S - T_P \end{aligned}$$

T_F represents FRS liability while T_V shows reported net VAT which itself is the difference between sales VAT (T_S) and purchases VAT (T_P). FRS turnover is basically sum of net of VAT sales and VAT on sales. Both of these values are reported on VAT tax return.

In the next subsection, I explain the details of how I assigned flat rates to VAT traders. Then I present reliability checks I have done to make sure the assigned rates are correct. Finally I discuss several complications in the calculation of gains.

B.1 Assigning flat rates to traders

In principle there are two ways to assign the appropriate flat rate to each firm. In the first method flat rates are set based on observed effective output tax rate for FRS firms within the same SIC2007 code. Two conditions are required for proper functioning of this method: a) non zero mass of FRS traders for most sectors and

b) a tight distribution of effective output tax rates for FRS traders in each sector. Out of 719 SIC2007 codes, 304 sectors have less than 30 FRS traders. Ignoring low FRS sectors however removes only about 2% of FRS eligible traders. The more serious issue with this method is the disperse distribution of flat rates within sectors. The scheme requires traders to account for special transactions outside the scheme but report only the sum of all transactions under outputs and output VAT. For example if a trader purchases services (e.g. consultancy) from another EU member state, these are accounted under the reverse charge scheme at the relevant VAT rate (standard, reduced, or zero) but I don't observe each element separately. Therefore the observed effective output tax rate for FRS traders may not reflect the applicable flat rate. Furthermore, some traders might join FRS in the middle of an accounting period, and therefore have a weighted average of standard rate and flat rates as effective output tax rate. The 1 percentage point discount on new VAT registrations further complicates matters.

Therefore, I use traders' reported SIC2007 codes to assign flat rates. HMRC publishes list of applicable flat rates for around 56 "categories of business" and lists several associated "trade names" under each category (332 trade names). I match these trade names to SIC2007 code descriptions from the Office of National Statistics (ONS) to form a mapping between reported SIC2007 codes and published flat rates. For example, ONS describes SIC2007 code of 70229 as "management consultancy activities (other than financial management)". This description matches with the FRS category for "management consultancy" with $\tau_F = 12.5$ percent during 2004-07. Using this manual matching, 78 percent of FRS eligible traders are assigned a flat rate. The largest sectors left out are construction and part of retail sectors because reported SIC2007 codes map to several flat rates. Table 9 lists the main sectors left out of the analysis and the reason why flat rates could not be assigned.

In the last three years of the sample (2008-9 to 2010-11) there were two flat rates in place during a single financial year (due to changes in the standard VAT rate). I use the variable "stagger" that shows the periods returns correspond to, to assign appropriately weighted flat rates to traders during this period. The full weighting used in the assignments are shown in table 10. For example, during 2008-9 financial year the standard VAT rate was reduced from 17.5 to 15 percent between 1 December 2008 and 31 December 2009. This means there are two sets of flat rates applicable during this time. I denote the pre December 2008 flat rates by $\tau_{F,1}$ and post this time by $\tau_{F,2}$. For a trader submitting annual returns at the end of March 2009 (stagger equal to 0 or 1), I use a weight of $^8/_{12}$ and $^4/_{12}$ on $\tau_{F,1}$ and $\tau_{F,2}$ respectively to arrive

at the year-wide flat rates, i.e. $\tau_{F,2008-9} = {}^{8}/_{12} \times \tau_{F,1} + {}^{4}/_{12} \times \tau_{F,2}$. HMRC advises traders to use the appropriate rates on sales done before and after 1 December 2008, but I don't observe the break down of sales. Therefore, the method explained here is equivalent to assuming a uniform distribution of sales across all months. The degree of measurement error depends on the extent that sales differ across months (e.g. December is a high sales volume period for retailers) and the ability of traders to shift reported sales to favorable tax periods. A look at distribution of effective output and input tax rates for VAT traders confirms there is a significant mass of traders with effective tax rates exactly at the weighted average of standard rates using the weights in table 10.

B.2 Assignment Reliability

To check the reliability of flat rate assignment I use the observed flat rates for existing FRS traders in the same SIC2007 code. I calculate the observed flat rates, τ_F^o, as the ratio of output VAT over reported gross outputs. To get a clean measure of applicable flat rates, I restrict the sample of FRS traders to those satisfying three conditions: a) on FRS for exactly 12 months, b) passed the FRS discount window, and c) with τ_F^o smaller or equal to the maximum applicable flat rate. The three restrictions help to solve for some of the issues mentioned above about using the observed flat rates.

Figure 16 shows the histogram of the difference between assigned flat rates and observed ones, $\tau_{F,s}^a - \tau_{F,si}^o$, for the group of FRS traders satisfying the three conditions (subscripts i and s denote traders and sectors, superscripts a and o denote assigned and observed flat rates). The figure shows two encouraging patterns. First, the distribution of the deviation is almost symmetric around zero. This suggests, the difference between observed flat rates and assigned ones is not systematic and reflects trader specific circumstances and on average the reported number of gainers won't be biased upward or downward. Second, 60 percent of the mass falls in the range of -0.5 to 0.5 percentage points deviation.

To further check whether certain sectors show a high degree of deviation while others don't, I define $\bar{\tau}_{F,s}$ to be average absolute difference between assigned and observed flat rates in sector s:

$$\bar{\tau}_{F,s} = {}^{1}/_{N} \sum_{i} \mid \tau_{F,s}^a - \tau_{F,si}^o \mid \tag{6}$$

where N is the number of included FRS traders in sector s and summation is done over the absolute difference for such traders. A large $\bar{\tau}_{F,s}$ signals potential problems with the assignment process. Table 11 shows the result of this reliability check. 55 percent of eligible VAT traders are in sectors with an average deviation of less than 2 percentage points. These sectors also have higher fraction of FRS traders and gainers.

$\bar{\tau}_{F,s}$ is susceptible to presence of outliers. Therefore, to make sure the assigned flat rates are correct, I investigated the histograms of the observed flat rates for all FRS traders within the sectors with $\bar{\tau}_{F,s} \geq 1$. In all sectors the histograms had a clear mode at the assigned rate. As a final precaution, I re-checked the matching of sectoral descriptions to HMRC trade names for these sectors and found no error or ambiguity.

B.3 Complications in calculation of gains

There are two potential sources of error in calculation of counterfactual FRS liability. First, I use Standard Industry Classification (SIC) codes to assign flat rates but reported SIC codes are usually based on traders declared activities at the time of VAT registration. Some traders might be involved in activities other than those implied by SIC codes leading to measurement error (see appendix C for other errors in SIC codes). While it is not clear whether this causes a systematic over or under estimate of gains, setting the flat rates to the maximum applicable rate in each year shows still 12% of eligible traders benefit from FRS (table 5 column (6)). This is a very conservative estimate of FRS gains and still a significant number of traders benefit. Using this method I can estimate gains for categories that I was unable to assign a flat rate. Results show 9% of all eligible traders benefit from FRS under this scenario. This estimate is encouraging and shows the sample of traders left out of the analysis (unassigned flat rate) are not very different.

The second source of error is unobservable complications in the calculation of FRS turnover. Normally FRS turnover is gross turnover, i.e. net sales plus VAT received on sales, but certain transactions are treated differently. Reverse charge transactions are accounted for by purchasing partner as if they are self supplied. VAT on these items appears as output VAT and could be reclaimed as input VAT even under FRS. In FRS liability calculations I can't separate reverse charge transactions and hence overestimate FRS liability because I ignore the possibility of reclaiming input VAT. Similarly provisions for bad debt relief under FRS are ignored leading to an

overestimate of FRS liability. Therefore FRS turnover errors are likely to lead to an overestimate of FRS liability and an underestimate of FRS gains.

There are other reasons to believe that the actual number of FRS beneficiaries is higher than what I estimated. First, as mentioned earlier ignoring deductibility of input VAT on certain capital goods results in an underestimation of FRS gains. In my sample 34% of FRS traders claim any input VAT with an average of £1,350. Therefore this could potentially be a large factor working against me. Second, I ignore the 1 percentage point discount on flat rates for new VAT registrations which leads to an underestimate of gains for the population of new entrants. Considering this raises the fraction of gainers by 1 percentage point to 27% of eligible traders. Third, I ignore FRS compliance cost saving which leads to an underestimate of the number of gainers. Finally, I calculate counterfactual liability based on realized sales under VAT accounting. The optimal level of sales however could be different under FRS which leads to higher FRS profits than what I estimate.

C Appendix C: Data cleaning procedures

In this appendix I explain all the cleaning and adjustment procedures I have done on the data.

C.1 SIC2007 corrections

The VAT returns data include a variable that capture the Standard Industry Classification (SIC) code of traders' main activity. HMRC uses descriptions traders declare in question 6 of VAT 1 - Application for Registration form to construct SIC codes but I don't know the exact procedures followed. As SIC codes are used to assign flat rates to traders they hugely influence FRS gains and the analysis in this paper. Therefore it is crucial to make sure this variable is correctly capturing traders' activities.

The main complication in use of SIC codes is the change in the classification system in 2007. Office of National Statistics (ONS), the body responsible for publishing and maintaining of SIC, revised the system in 2007. The SIC codes reported in VAT data should correspond to SIC2003 codes for 2004-5 until 2006-7 financial years and then map to SIC2007 codes for 2007-8 until 2010-11 financial years. To check this, I

match SIC2003 and SIC2007 codes from ONS to those reported in the VAT data in the respective periods.

As table 12 reports, there are very few missing SIC codes in VAT data (column (2)). For firms reporting a correct (in the sense defined below) and constant SIC2007 over the non-missing years, I fill out the missing SIC observations. There is, however, a significant number of mis-matches between ONS and VAT SIC codes in 2007-8 financial year (column (3)). This suggests not all SIC codes reported in 2007 are based on SIC2007 and some of the observations continue to use SIC2003 in this year. Column (4) confirms this idea by showing that in 2007 and 2008 there are significantly more unique codes in the VAT data than the ones exist in ONS classification. Furthermore, when I match the unmatched codes from 2007-8 financial year to SIC2003 codes, 579 unique codes are matched up. This is despite the fact that only two codes remain unchanged moving from 2003 to 2007 classification (ONS tables).

These observations lead me to believe that some traders still report SIC2003 codes in 2007-8 financial year. While the numbers of unmatched observations seem small in table 12, the problem is deeper. There are around 80 codes that are common in the two classifications but map to different codes. For example "01240" in SIC2003 is "farming of poultry" and maps to "01470" in SIC2007. But the same SIC2003 code of "01240" exists in SIC2007 classification and corresponds to "growing of pome fruits and stone fruits". In other words, not all the matched observations in table 12 correspond to correct SIC2007 codes. Fortunately, as I said earlier, there are only two SIC2003 codes that map to an identical code in 2007. Therefore I can safely assume that all traders that don't change their SIC codes when moving from financial year 2006-7 to 2007-8 are mistakenly reporting SIC2003 codes. If these firms keep on reporting the same SIC code in 2008-9 financial year I still assume they are reporting SIC2003 codes and so on.

The flat rate assignments are based on SIC2007 codes (not SIC2003 codes). Therefore, I need to construct a mapping between SIC2007 and SIC2003 for traders reporting SIC2003 codes in VAT data (majority during financial years before 2007). ONS provides the correspondence between the two classification systems. The difficulty is, however, the multiple to multiple mapping of classifications. 418 SIC2003 codes correspond to a unique SIC2007 code but 281 SIC2003 codes could correspond to up to 15 different SIC2007 codes (136 codes correspond to 2). I randomly pick one of the SIC2007 codes that correspond to the given SIC2003. To partly correct

for potential mis-assignments I use the SIC2007 codes reported in VAT data for the same trader from 2007-8 onwards and assign this instead of my random assignment. No corrections are, however, made for traders not observed after 2007-8.

Table 13 shows the number of traders changing SIC2007 codes from one year to the following. In 2007-8 when the classification system changed, I see an unexpected increase in number of switchers. This is due to the two problems mentioned above: mis-reporting of SIC2003 in place of SIC2007 codes after the change and multiplicity of correspondence between SIC2003 and SIC2007. Carrying out the corrections outlined above, however, results in a much more reasonable number of switchers.

C.2 Other corrections

I have replace date of joining FRS with missing if it was prior to 1 April 2002 or after 1 April 2012. Furthermore, a sizable number of traders report FRS date to be missing in 2006-07 financial year. I replace for FRS date using 2005-06 or 2007-08 financial years for these traders. Finally, I use the minimum recorded FRS date for traders that report multiple FRS dates but don't report a change in their FRS condition.

C.3 Observations removed

In order to increase the reliability of the analysis and as reported in table 2 I have dropped several observations. In this section I explain each set of dropped observations and the reason for leaving them out of the analysis.

The first set of observations removed are for traders that are reported to be inactive or deregistered. This is through two variables in the VAT dataset. First, I only keep returns associated with traders reporting as "not deregistered" (dereg_ind equal to 0). I also keep traders reported to be alive (actively trading) at the end of financial year. Deregistration is associated with special treatments and I remove these observations not to confound such special treatments with FRS gains.

The second set of observations removed are based on reported values of sales and purchases. I remove traders that report a zero or missing value for total outputs. These traders either have all tax variables equal to zero (inactive) or have high purchases (e.g. because of start-up costs). I also drop observations that fall above the 99th percentile of the overall distribution of sales or purchases respectively. This

is to make sure that outliers don't influence the results. Notice the percentiles of the distributions are calculated after zero sales observations are dropped.

The third set of observations I remove are for traders that show unusual values for effective input and output tax rates. I define effective output tax rate as the ratio of sales VAT to net sales (both are reported in returns). This could vary from zero to the standard VAT rate. For traders in standard rated activities (e.g. retail of household appliances like TV) the effective output tax rate should be equal to the standard VAT rate (equal to 17.5 percent for 2004-5 to 2007-8). Similarly I define the effective input tax rate as the ratio of purchases VAT to net purchases. Based on the distribution of inputs used by each trader the effective input tax rate could vary from zero to the standard VAT rate. Despite this I observe several traders with effective tax rates higher than standard VAT rate. These might be accounting for errors in previous returns, getting bad debt relief, accounting for penalties, and other special cases. I drop all traders that show an effective input or output tax rate higher than the standard rate plus 0.5 percentage points (e.g. I drop traders with effective input or output tax rate higher than 18 percent when the standard rate is 17.5 percent).

The fourth set of observations dropped are for traders that report to be registered as clubs, associations, charities, and other organizations. In other words I only include VAT registered traders that report to be a sole proprietor, a partnership, or a limited company (incorporation). Table 14 shows the number of observations under each of the four categories above and reports the fraction of FRS traders in each sub-sample.

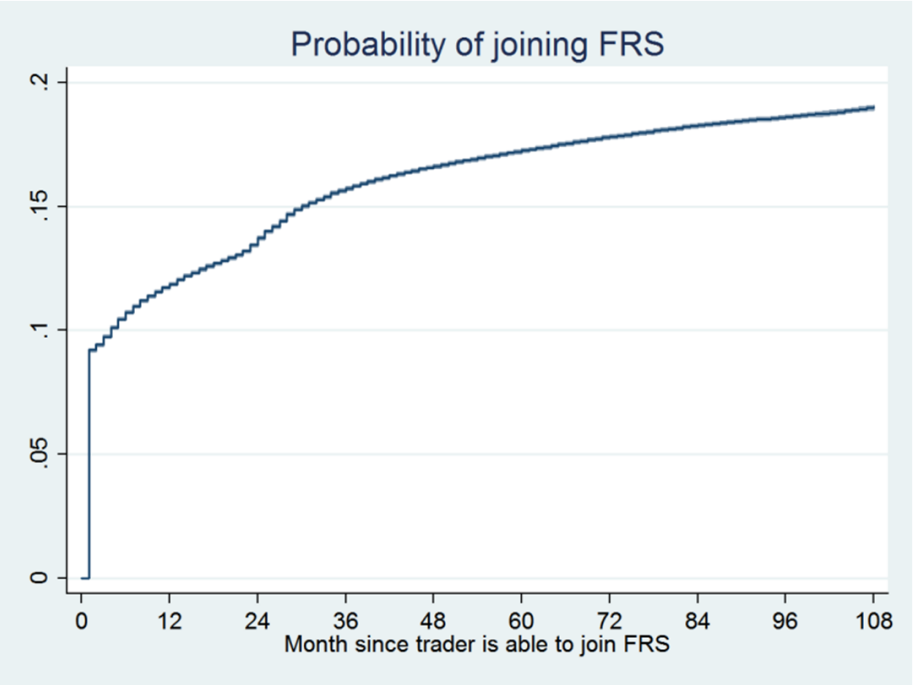


Figure 1: Probability of joining FRS on or before analysis time

Notes: Figure shows Kaplan-Meier nonparametric estimate of probability of joining FRS on or before analysis time. Analysis time measures the time since traders had the option of joining FRS. The zero corresponds to date of VAT registration for traders registering after April 2002, when FRS is available, but is fixed at April 2002 for those already registered when FRS was introduced. Traders who were VAT registered at the time of FRS introduction in April 2002 had the option of joining FRS for 109 months at the end of sample on April 2011. Figure uses trader-level dataset with 1,803,179 traders. 165,967 join FRS as soon as they have the option to do so ($t = 1$) and 129,318 join after this time until the end of analysis time. Data includes all traders who were observed to be eligible for FRS or were on FRS at least once during the sample.

Figure 2: Composition of FRS inflow and outflow

Notes: Figure uses returns-level dataset and follows traders overtime. The inflow figures are based on last year status of traders observed on FRS during 2005-2010 financial years (148,332 average number of traders on FRS in this period). The outflow figures are based on what happens to traders on FRS during 2004-2009 financial years in the next year (130,815 is the average number of FRS traders during this time). New VAT registrations are traders within the first twelve months of VAT registration.

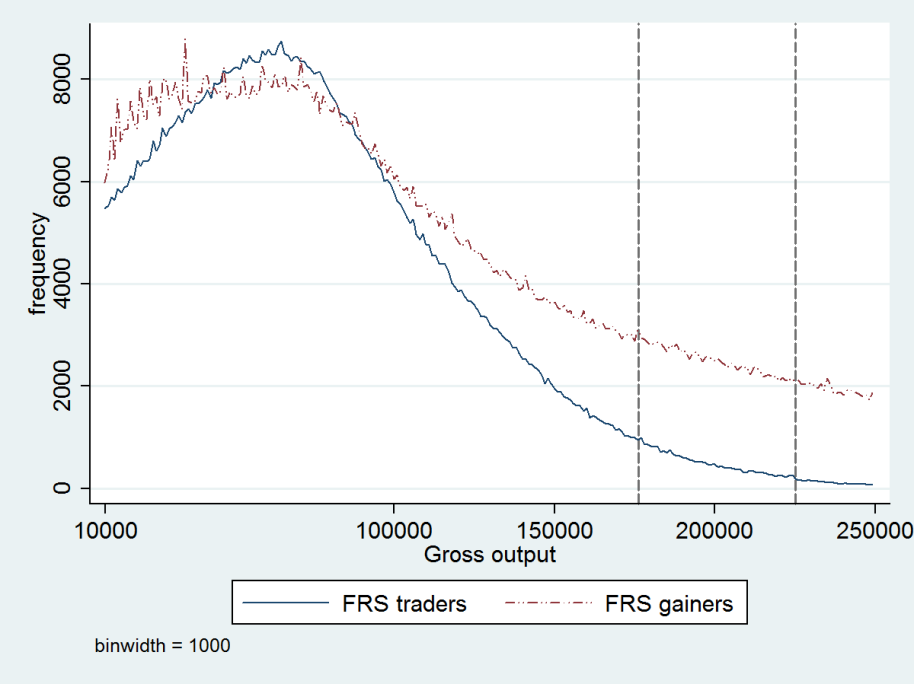


Figure 3: Sales distribution for FRS traders and FRS gainers

Notes: Figure shows number of traders within bins of gross output for FRS gainers and FRS traders. The sample is the returns-level dataset and includes all VAT returns submitted while traders are observed on FRS and all returns for FRS gainers during 2004 - 2010 financial years. The first vertical line shows FRS joining eligibility threshold ($150,000 \times (1+0.175) = £176,250$ during 2004-2010) while the second vertical line shows FRS continuation eligibility threshold ($£225,000$ during January 2004 until January 2011).

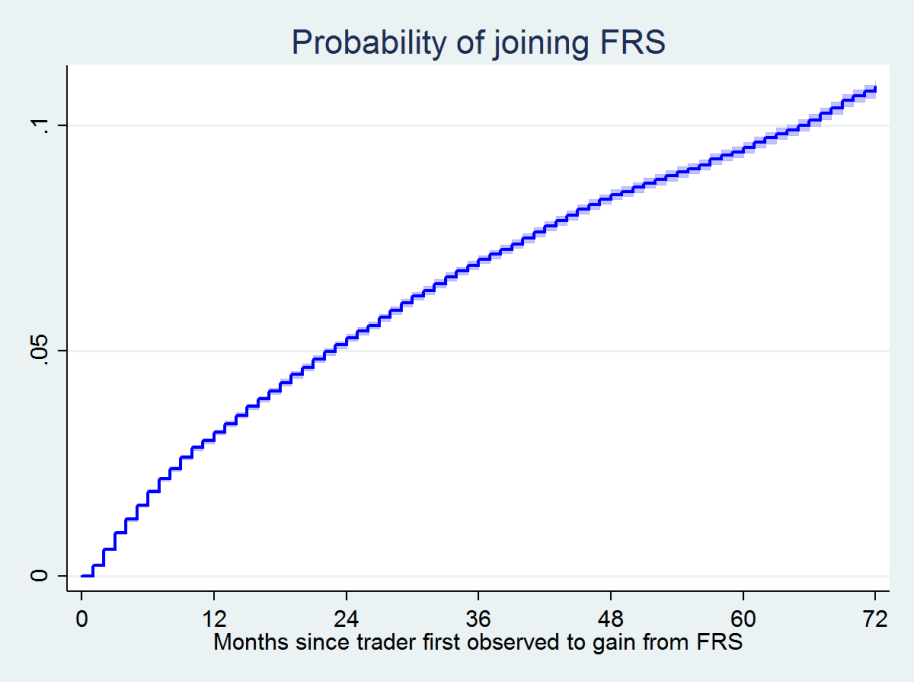
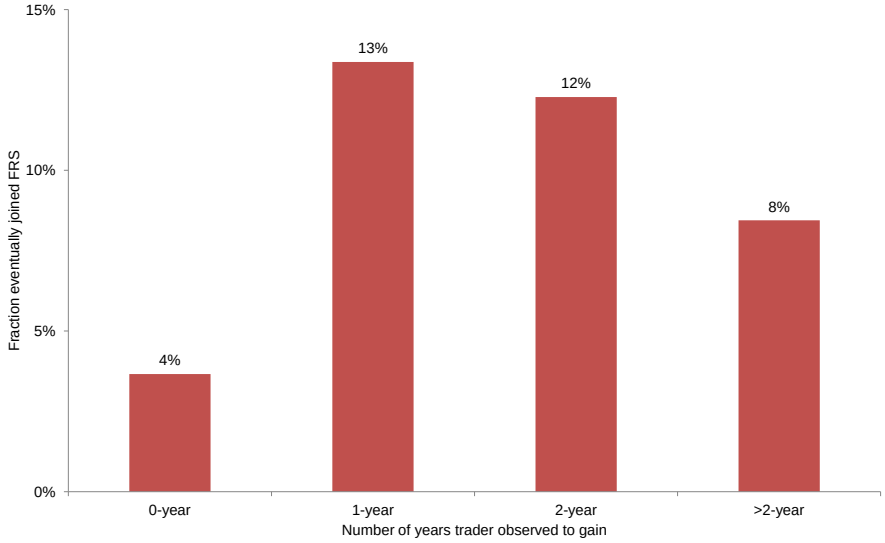
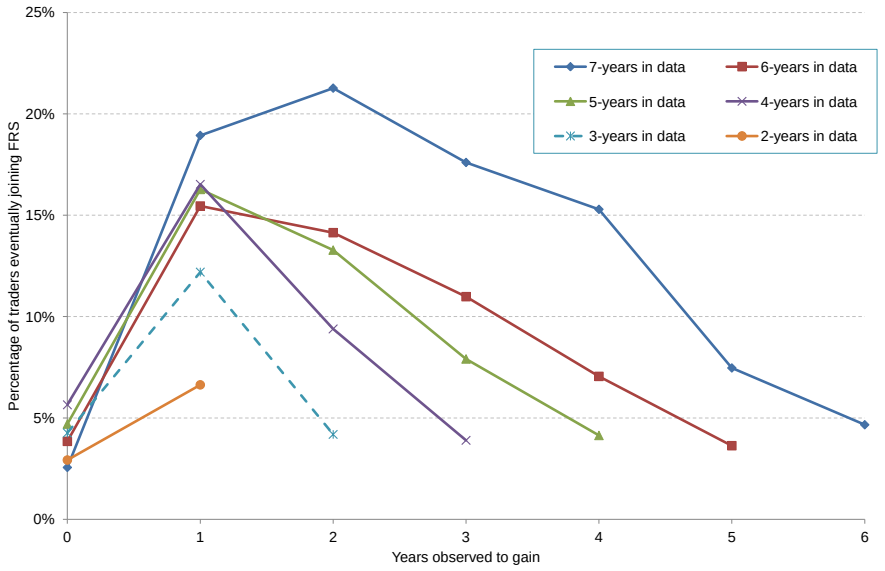


Figure 4: Probability of joining FRS versus months since first gained

Notes: Figure shows Kaplan-Meier non-parametric estimates of the probability of joining FRS on or before analysis time. The zero of analysis time (x-axis) corresponds to end of first financial year traders observed to gain from FRS. Data used here is the trader-level dataset and includes all traders who were observed to be eligible for FRS and gained at least once during the sample period. Traders exiting the data before joining FRS are censored after exit. Figure uses the trader-level dataset and estimates joining probability from the sub-sample of 457,297 traders who gain at least once during their lifetime.



(a) Combined all lifespans



(b) Separately for different lifespans

Figure 5: Fraction of traders eventually joining FRS after x years of gaining

Notes: Figure shows the fraction of traders ever observed on FRS among different sub-samples of traders. The figures are based on trader-level dataset where there is one observation for each trader and I record the number of years gaining and the number of years present in the data. This graph uses the pool of unique traders who are present at least for two years in the data. Figure (a) reports percentage of joining traders for traders gaining never, one year, two years, and more than two years during their lifetime. Figure (b) reports percentage joining for traders gaining a given number of years separately for different lifespans. Maximum lifespan is seven years but following trader over time results in at most 6 years of gains (horizontal axis) for those who could join the scheme in the seventh year.

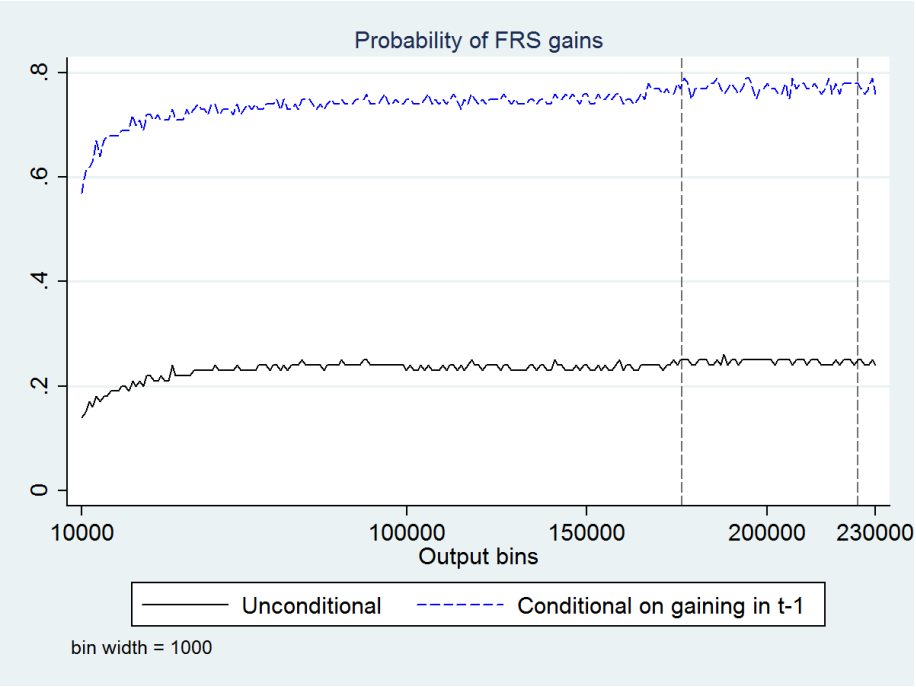
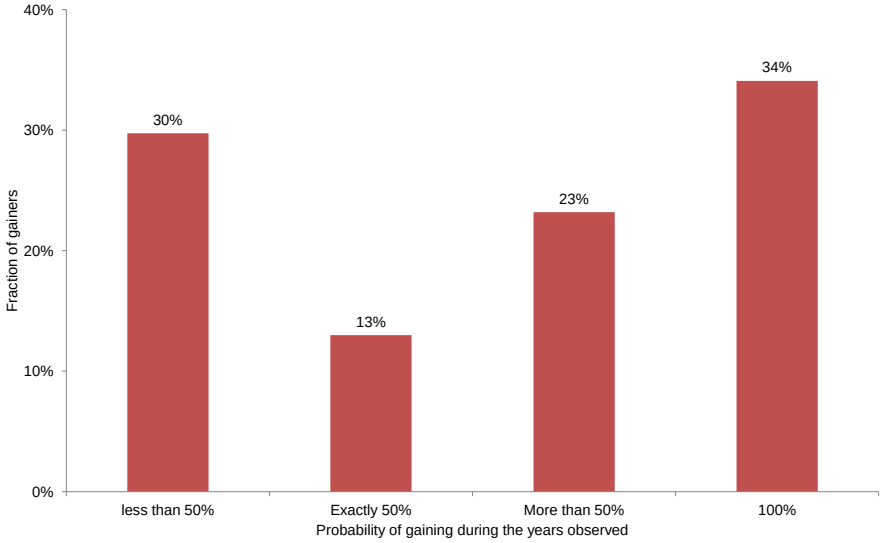
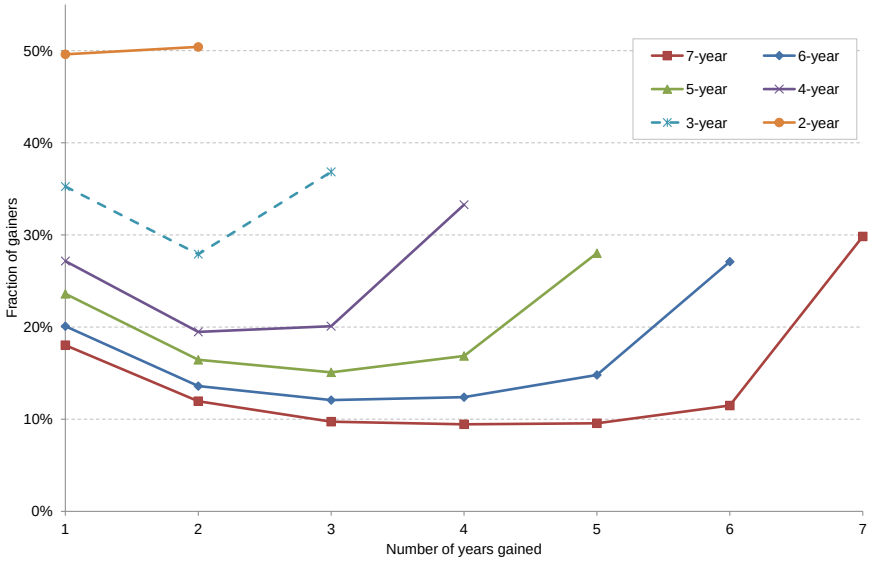


Figure 6: Unconditional and conditional probability of FRS gains

Notes: The solid line shows unconditional probability of being an FRS gainer within bins of gross output, i.e. the ratio of gainers to FRS eligible traders within bins. Dashed line shows the probability of gaining from FRS conditional on being a gainer last year, i.e. the ratio of traders gaining for a second year among last year gainers who remain on VAT (don't join FRS or exit). Graph includes only traders satisfying non-turnover eligibility. Turnover eligibility criteria are reflected in the two vertical lines. The first line shows FRS joining eligibility threshold ($150,000 \times (1 + 0.175) = £176,250$). The second line shows FRS continuation eligibility threshold ($£225,000$). Figure uses returns-level dataset and combines all years.



(a) Combined histogram



(b) Separate histograms for different lifespans

Figure 7: Distribution of number of years gaining conditional on gaining once

Notes: Figure shows distribution of the number of year gaining conditional on gaining once. Traders who joined FRS after gaining over certain years are assumed to continue to gain from FRS and hence are put in all year gaining bin. This graph uses the pool of 402,894 unique traders who are observed to gain at least once and are present at least for two years in the data. Figure (a) plots share of gainers that fall into four categories of gaining less than 50 percent, exactly 50 percent, more than 50 percent, and exactly 100 percent of the times they submit returns. Figure (b) shows separate histograms for traders with different lifespans and instead shows the distribution of number of years (rather than percentages).

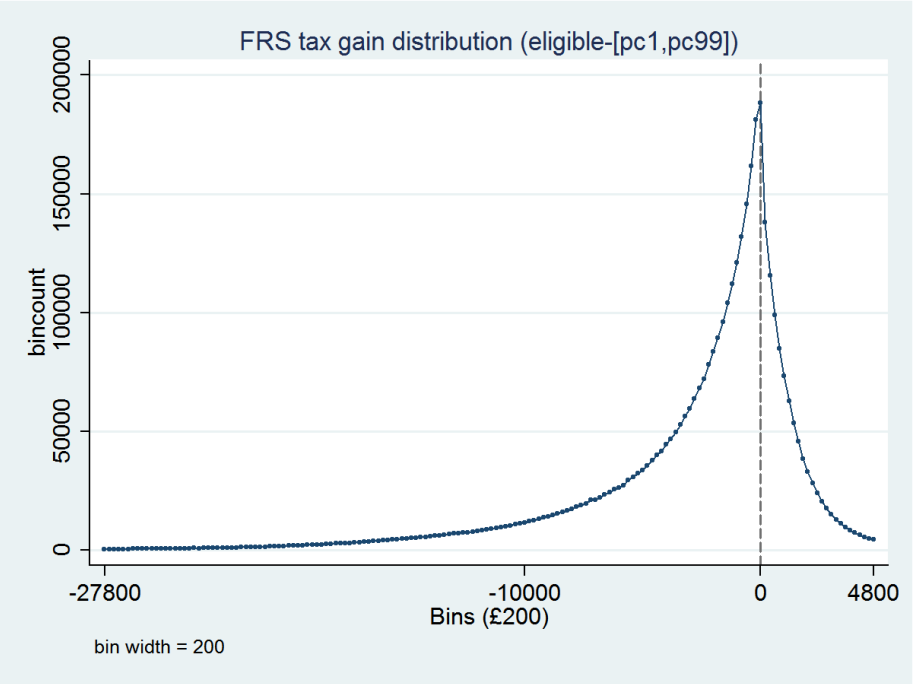


Figure 8: Distribution of FRS tax gains for gainers

Notes: Figure shows distribution of FRS tax gain for current VAT traders, positive numbers show gains from switching to FRS while negative numbers show losses. The figure uses returns-level dataset and combines all available years of data. Sample size is the sum of observations in column (1) of table 5, i.e. eligible VAT traders assigned a flat rate. Figure restricts to the first and ninety ninth percentiles of the gains distribution and removes traders with less than £1000 annual turnover (similar figures obtained without this or with £10,000 threshold.).

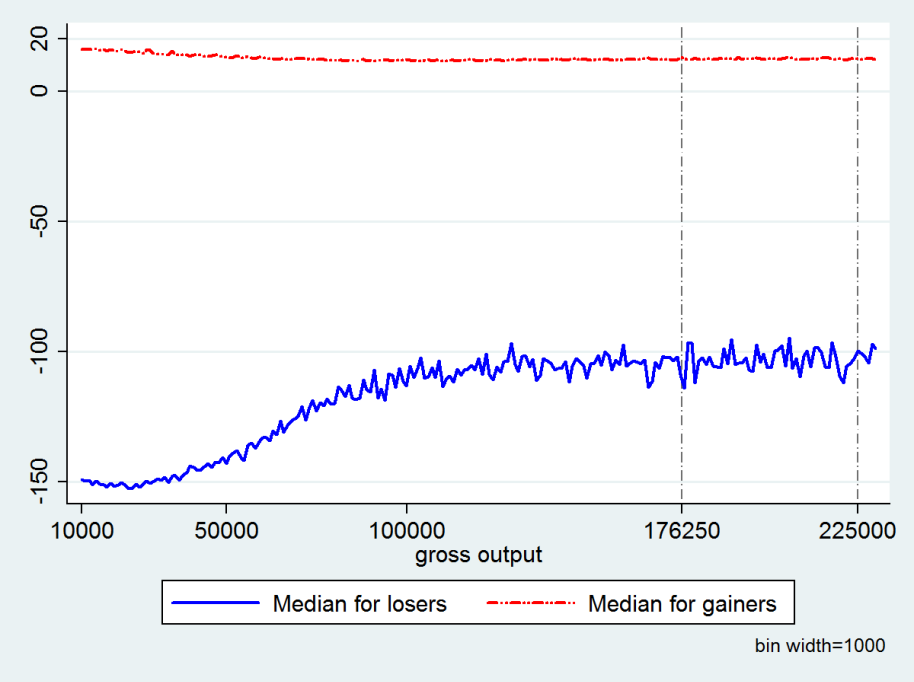


Figure 9: Medians of FRS gains as a percentage of VAT liability

Notes: Figure splits the FRS tax gain distribution at zero and plots medians over gross output bins for FRS gainers and losers separately. Solid line show medians of FRS gains for FRS losers and dashed line represent medians of FRS gains for FRS gainers. Graph includes only traders satisfying non-turnover eligibility. Turnover eligibility criteria are reflected in the two vertical lines. The first line shows FRS joining eligibility threshold ($150,000 \times (1 + 0.175) = £176,250$). The second line shows FRS continuation eligibility threshold ($£225,000$).

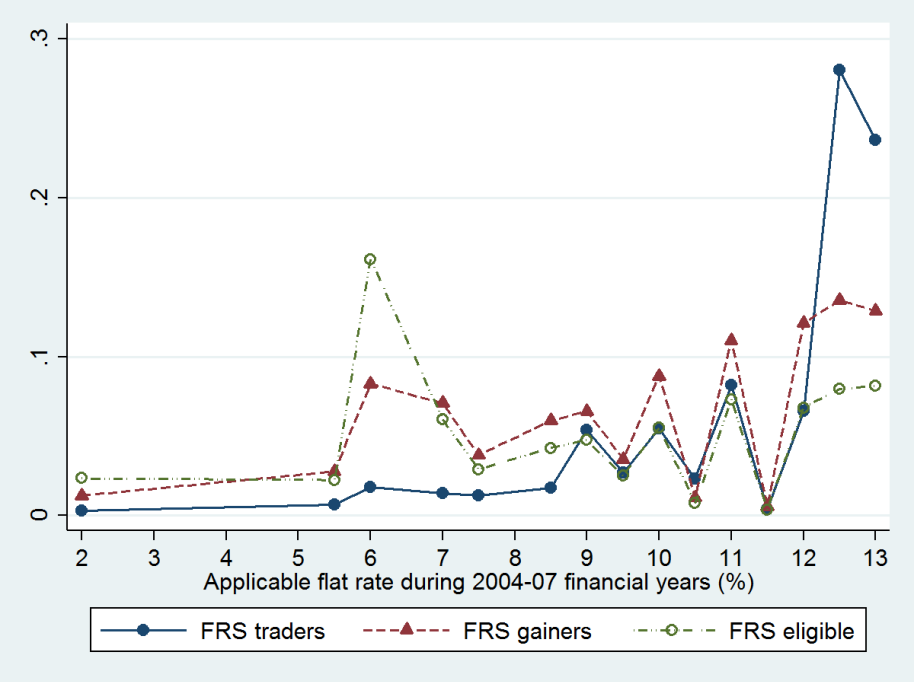


Figure 10: Distribution of FRS traders, FRS gainers, and eligible VAT traders across flat rate categories

Notes: Figure shows distributions across flat rate categories. Solid line shows fraction of FRS traders that fall in each flat rate category, dashed line shows fraction of FRS gainers in each FRS category, and dot-dash line shows the fraction of eligible VAT traders within each flat rate. Flat rate categories are based on the applicable rates during 2004-7 Flat rates range from 2 to 13.5 percent during 2004-2007, but 13.5 percent is excluded as I couldn't assign it. There are, therefore, 15 distinct flat rates. The sample is the returns-level dataset and covers 2004-2010 financial years.

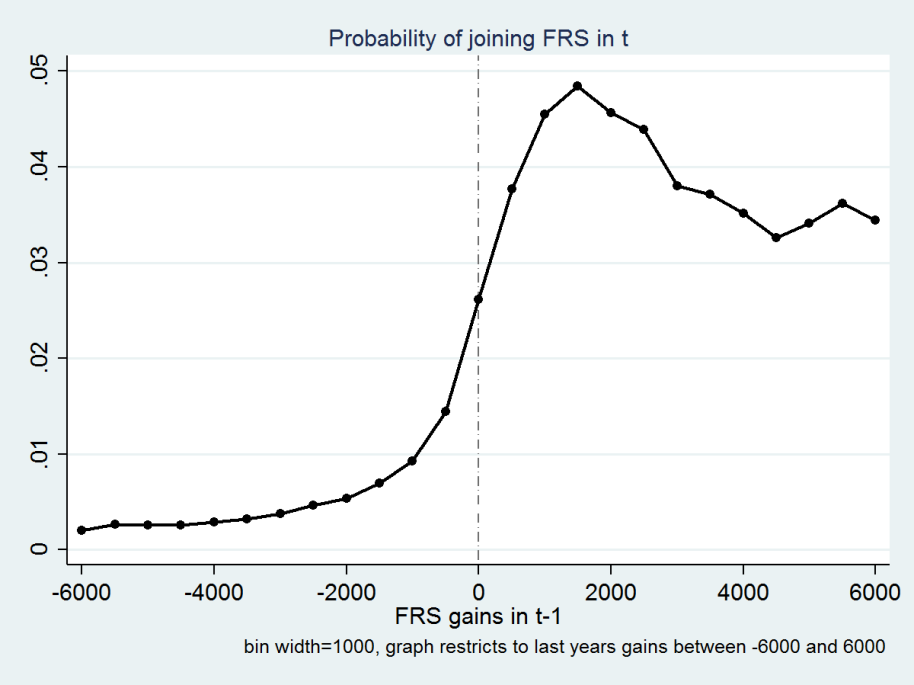
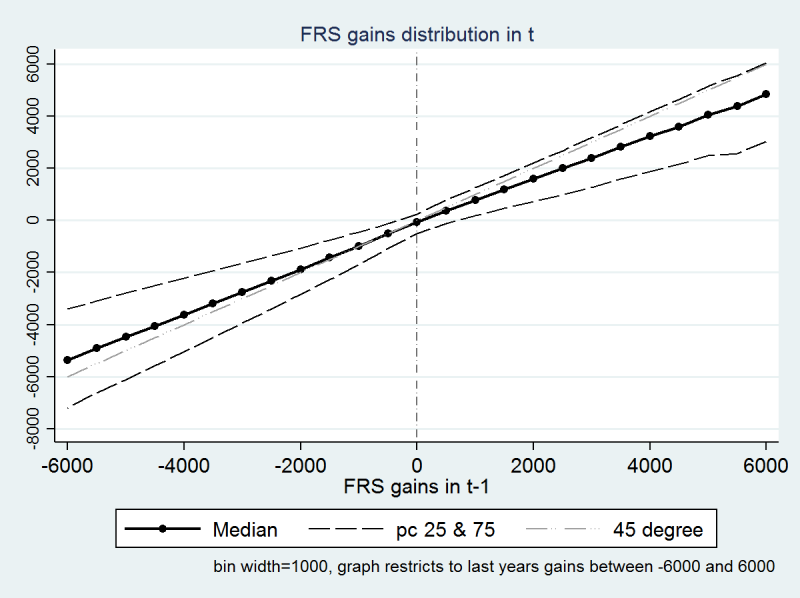
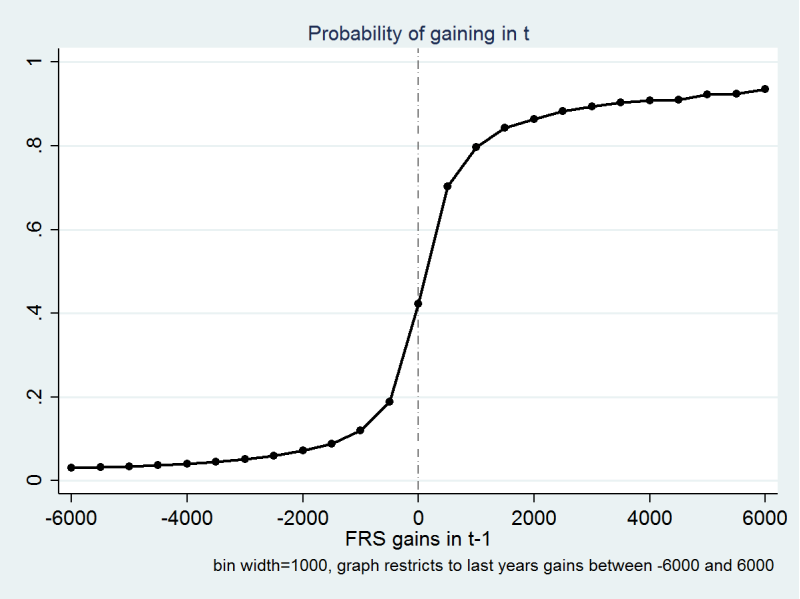


Figure 11: Probability of joining FRS conditional on last year gains

Notes: Figure depicts probability of joining FRS in year t conditional on falling in a given bin of FRS tax gains in year $t-1$. This is the ratio of the number of traders joining FRS to the number of traders remaining on VAT in year t within FRS tax gain bins of year $t-1$. Sample includes all traders who are eligible to join FRS during 2004-2009 financial years and don't exit the data in the following year.



(a) Percentiles of tax gains in year t in bins year $t-1$ gains



(b) Probability of FRS gains in bins of year $t-1$ gains

Figure 12: Impact of last year FRS gains on current gains

Notes: Figure (a) shows twenty fifth, fiftieth (median), and seventy fifth percentiles of FRS tax gain distribution in year t for VAT traders who were eligible for FRS in year $t-1$ within FRS tax gain bins in year $t-1$. Solid black line shows median and dashed gray lines show twenty fifth and seventy fifth percentiles. The solid gray line shows the 45 degree line. Panel (b) shows probability of having non-negative tax gains from FRS in year t conditional on being in a given bin of FRS tax gains in the previous year. This is the ratio of the number of traders gaining from FRS to the number of traders remaining on VAT in year t within FRS tax gain bins of year $t-1$. Sample includes all traders who are eligible to join FRS during 2004-2009 financial years and don't exit the data in the following year. Figures restrict to last years gains being between £-6000 and £6000.

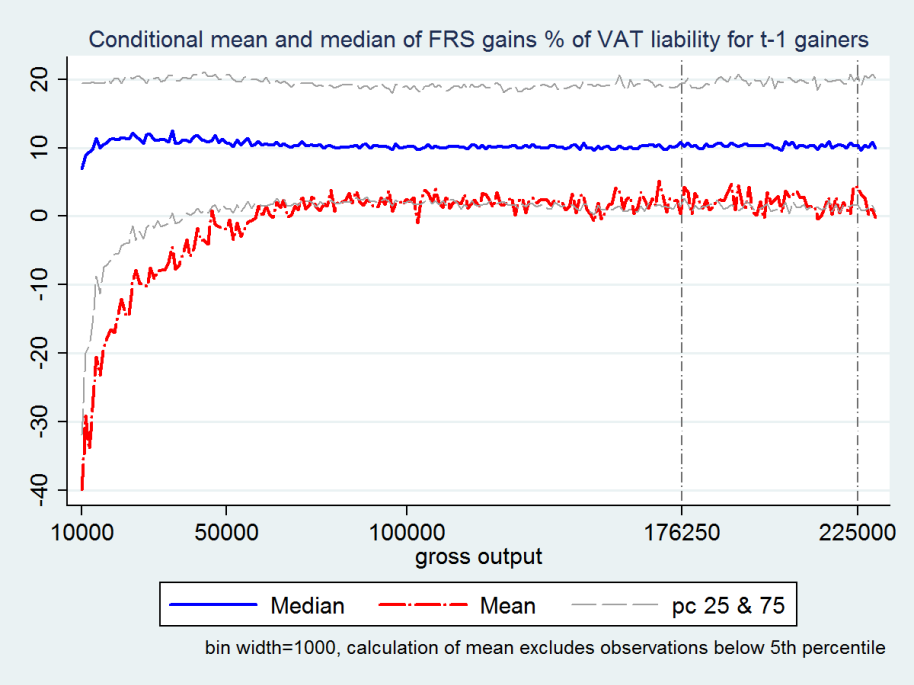
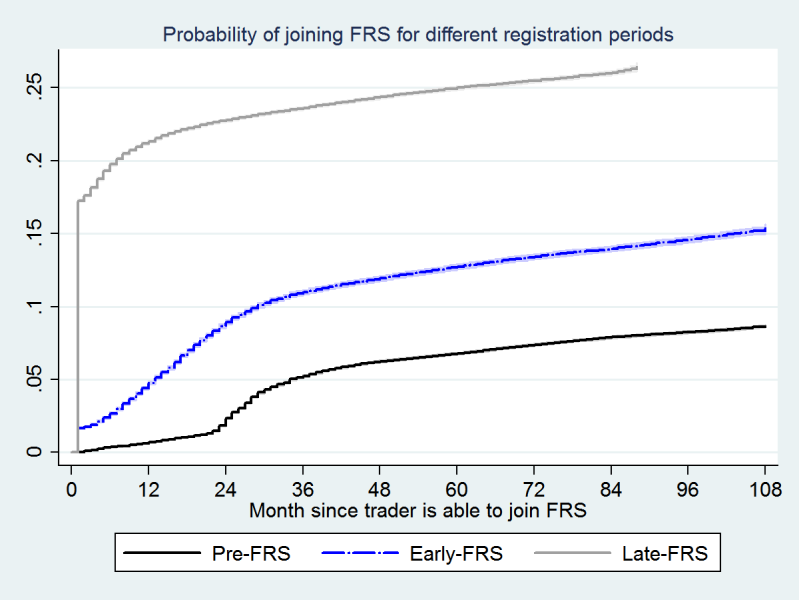
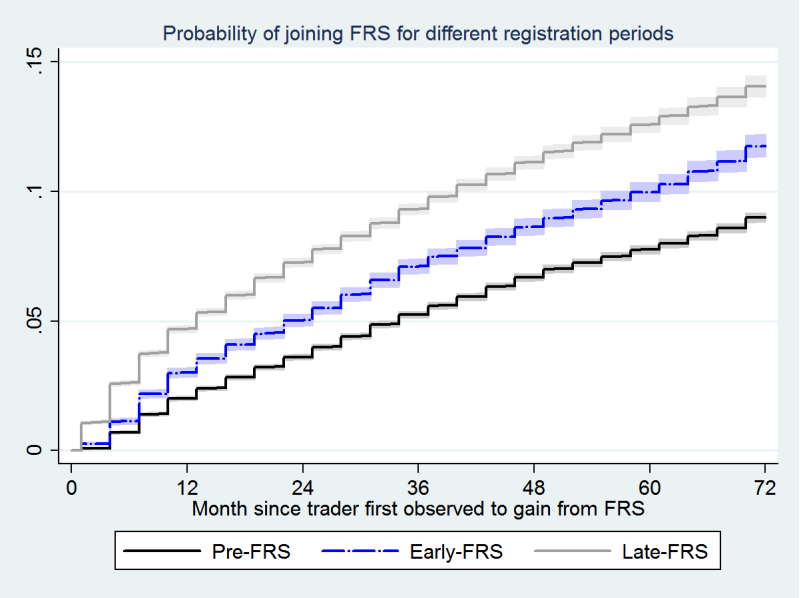


Figure 13: Percentiles of FRS gains as a percentage of VAT liability in t for traders observed to gain in $t-1$

Notes: Figure shows twenty fifth, fiftieth (median), seventy fifth percentiles and mean of FRS tax gain as a percentage of VAT liability distribution in year t for VAT traders who are observed to gain from FRS in year $t-1$. Traders are grouped in to bins of gross output in year t and the statistics of the gains distribution are calculated separately for each bin. The gray dashed lines show 25th and 75th percentiles, while the solid black line is the median. The mean is coinciding with the 25th percentile for most of sales level and is indicated by dashed blue line. The plotted lines ignore turnover eligibility criteria but only include traders satisfying non-turnover eligibility rules. The first vertical line shows FRS joining eligibility threshold while the second vertical line shows FRS continuation eligibility threshold.



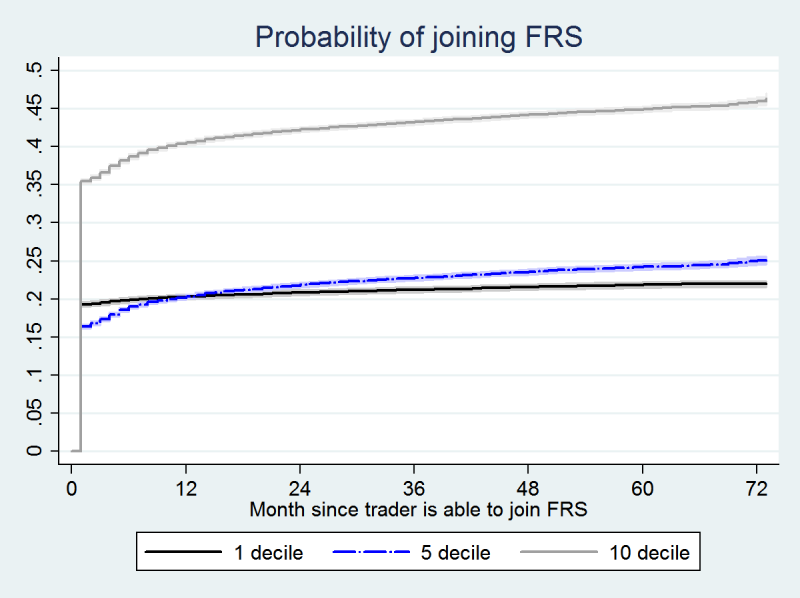
(a) Probability of joining since traders were able to join



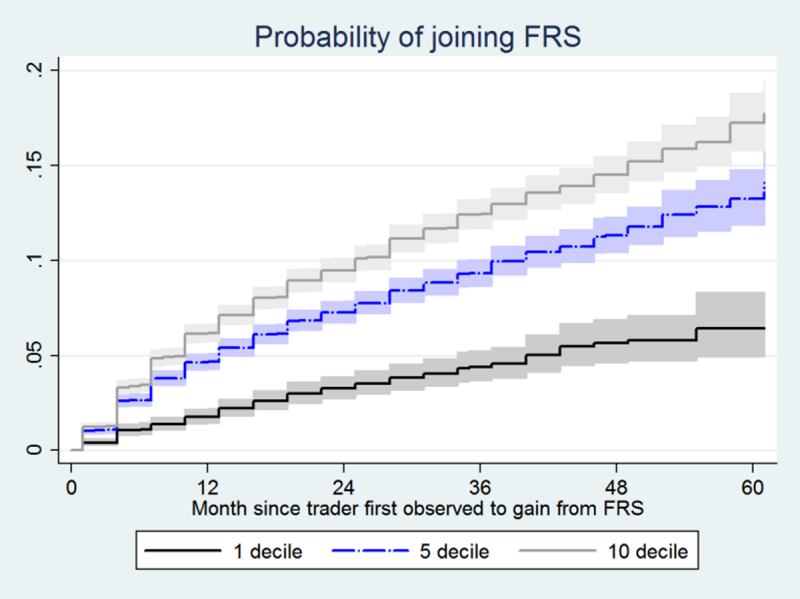
(b) Probability of joining since traders first gained

Figure 14: Probability of joining FRS for different VAT registration periods

Notes: Figures show Kaplan-Meier non-parametric estimates of probability of joining FRS on or before the analysis time for traders registering during different periods. Pre-FRS traders are those registering for VAT before April 2002. Early-FRS are traders registering between April 2002 and before January 2004. Late-FRS are traders registering on or after January 2004. 95 percent confidence intervals are shaded around the lines. Panel (a) shows joining probability since the time traders had the option of joining FRS. The zero of analysis time shows time of VAT registration for early and late-FRS groups but is fixed at April 2002 for pre-FRS traders. The initial ($t = 0$) number of traders that could potentially join FRS is 679,510 Pre-FRS, 180,416 early-FRS, and 943-241 late-FRS. Panel (b) shows joining probability as a function of months since traders first gained. This is the end of financial year where traders are observed to gain for the first time. The initial ($t = 0$) number of gainers that could potentially join FRS is 213,037 Pre-FRS, 52,145 Early-FRS, and 182,310 late-FRS traders.



(a) Joining probability since traders are able to join



(b) Joining probability since traders gained

Figure 15: Probability of joining FRS for deciles of initial FRS density

Notes: Figures show Kaplan-Meier non-parametric estimates of probability of joining FRS on or before the analysis time for traders registering in outcodes featuring 1, 5, and 10 deciles of FRS density distribution in 2004-5 financial year. 95 percent confidence intervals are shaded around the lines. Panel (a) shows joining probability since the time traders had the option of joining FRS. The zero of analysis time shows either time of VAT registration or time of FRS introduction, April 2002, whichever is later. The initial ($t = 0$) number of traders that could join FRS are 59,094 in first, 76,803 in fifth, and 91,146 in tenth decile. Panel (b) shows joining probability as a function of months since traders first gained. This is the end of financial year where traders are observed to gain for the first time. The initial ($t = 0$) number of gainers that could join FRS are 6,484 first, 15,056 Fifth, and 15,856 tenth decile.

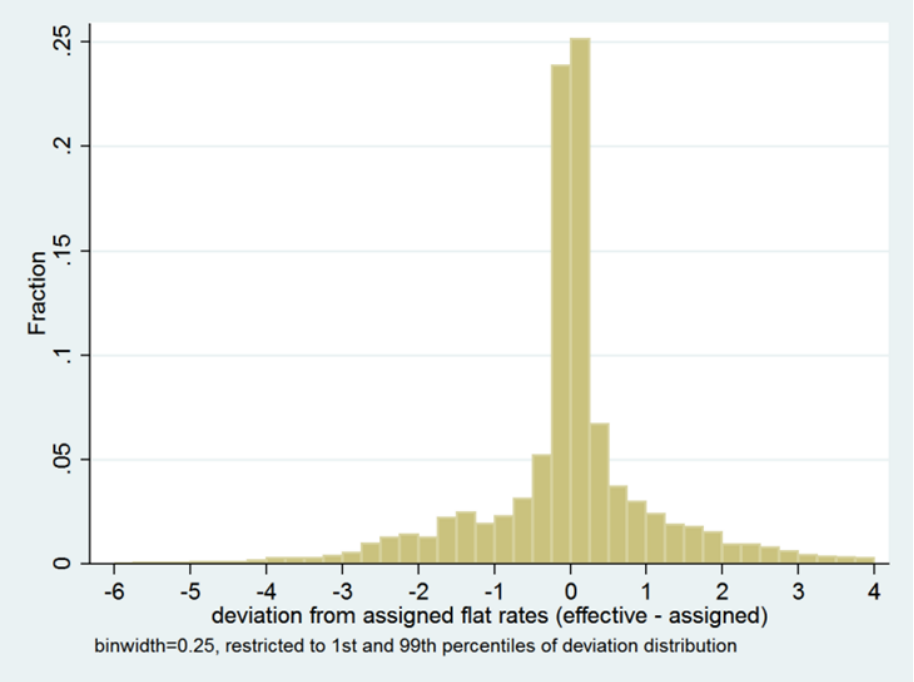


Figure 16: Histogram of the difference between assigned and observed flat rates

Table 1: FRS turnover eligibility criteria

Dates	Joining eligibility		Continuation eligibility
	Test 1 Taxable turnover (excl. VAT)	Test 2 Total turnover (excl. VAT)	FRS turnover (incl. VAT)
April 02 - December 03	<100k	<125k	<150k
January 04 - February 07	<150k	<187.5k	<225k
March 07 - December 10		<187.5k	
January 11 - now		-	<230k

Notes: Taxable turnover (test 1) is the sum of zero, reduced and standard rated supplies excluding any VAT. It excludes exempt supplies and non-business income like charitable or educational activities. Total turnover (test 2) is taxable turnover plus exempt supplies, and non business income such as charitable and educational activities. During March 2007 until December 2010, total turnover for test 2 includes VAT. FRS turnover is VAT inclusive total turnover (e.g. includes exempt, zero, reduced, and standard rated supplies plus any VAT but exclude non business income). Non turnover eligibility criteria are the same across the years. Sources: FRS notices dated February 2004, March 2007, January 2010, April 2011, August 2011, October 2012.

Table 2: Number of VAT and FRS traders

Financial year	All observations (1)	Workable Sample (2)	VAT traders (3)	% FRS eligible (4)	FRS traders (5)	FRS % of eligible (6)
2004-5	1,894,281	1,472,918	1,398,324	56%	74,594	9%
2005-6	2,177,146	1,512,156	1,413,470	57%	98,686	11%
2006-7	2,221,095	1,529,537	1,404,911	54%	124,626	14%
2007-8	2,118,562	1,575,018	1,420,959	54%	154,059	17%
2008-9	2,173,977	1,422,206	1,256,822	51%	165,384	21%
2009-10	2,123,413	1,448,423	1,280,881	52%	167,542	20%
2010-11	2,120,552	1,499,923	1,320,226	52%	179,697	21%
Total	14,829,026	10,460,181	9,495,593	54%	964,588	16%

Notes: Column (1) is number of all available returns. Column (2) shows the cleaned data used for all subsequent analysis and restricts the sample to a) live traders (not reported to be deregistered and identified as live trader at the end of fiscal year by HMRC), b) observations with positive and non missing sales, c) observations with outputs and inputs less than the 99th percentile of the respective distributions, d) observations implying an effective output and input tax rate less than the standard rate plus half a percentage point, e) firms listed as sole proprietors, partnerships, and incorporations, and f) traders with monthly or quarterly VAT returns. Column (3) shows number of VAT returns on normal VAT accounting. Column (4) demonstrates the fraction of VAT traders eligible for FRS based on all observable eligibility criteria (see text for details). Column (5) shows the number of FRS traders and column (6) present FRS traders as a fraction of all eligible traders (actual FRS and FRS eligible traders).

Table 3: Summary statistics

Variables	A. VAT traders (sales≤225k)			B. FRS traders			C. eligible FRS gainers		
	Mean	S. Dev.	Median	Mean	S. Dev.	Median	Mean	S. Dev.	Median
Gross Outputs	82,543	61,268	71,711	76,197	82,671	68,393	75,548	45,913	70,916
Output VAT	9,463	8,715	7,306	8,758	9,592	7,809	10,903	6,679	10,211
Gross inputs	62,746	161,909	37,836	4,805	32,542	0	25,068	46,783	12,967
Input VAT	6,335	18,303	3,464	360	2,559	0	2,161	2,889	1,119
Net VAT	3,190	18,837	2,818	8,407	9,323	7,545	8,821	5,672	8,045
% sole proprietor	37.8			23.8			35.7		
% incorporated	43.4			69.8			48.1		
% partnership	18.9			6.4			16.2		
% EC Trader	21.7			9.6			20.6		
%Group registrations	0.3			0			0		
% Partial Exempt	1.4			0.2			0.91		

Notes: Based on 2004-10 data and the working sample shown in 2. The number of observations are 5,822,956 for VAT traders, 964,588 for FRS traders, and 1,049,218 for eligible gainers. 255,215 of FRS returns show non zero input and input VAT but some of these relate to traders who are submitting a mix of FRS and VAT return. There are 720,856 pure FRS returns (12 months on FRS) and 85,476 of these report a non-zero input VAT (12 percent) with an average input VAT of £2,125. EC Trader counts both former and present traders with EU transactions. Partial exempt counts all traders with some form of partially exempt supplies. Group registration shows fraction of divisional and representative registration.

Table 4: FRS gainers studied

	FRS gainer	FRS loser
FRS traders	$\hat{T}_V - T_F \geq 0$ Left out	$\hat{T}_V - T_F < 0$ Left out
VAT traders	$T_V - T_F \geq 0$ Focus of paper	$T_V - T_F < 0$ Analyzed

Table 5: FRS gainers among eligible VAT traders

year	FRS eligible (assigned τ_F)	% FRS gainer	# FRS gainer	% Joined FRS	% FRS gainer next year	% gainer (max τ_F)
	(1)	(2)	(3)	(4)	(5)	(6)
2004	618,810	28%	172,421	3.5%	72.0%	14%
2005	635,295	27%	174,639	3.9%	69.0%	14%
2006	596,803	27%	161,942	2.8%	71.0%	14%
2007	602,626	27%	165,170	3.6%	69.9%	12%
2008	503,013	25%	125,155	1.9%	68.0%	11%
2009	523,772	24%	124,967	2.8%	68.5%	7%
2010	533,107	23%	124,924	-	-	9%
Average	573,347	26%	149,888	3.1%	69.7%	12%

Notes: Column (1) shows number of VAT registered traders who are eligible for FRS and whom I was able to assign a flat rate to and calculate counterfactual FRS liability. Column (2) shows the percentage of FRS gainers out of column (1) traders, i.e. VAT traders with FRS liability equal or smaller than reported VAT liability. Column (3) is the number of gainers, i.e. column (2) multiplied by column (1). Column (4) follows the population of FRS gainers to the next period and reports the fraction joining FRS. Column (5) reports the fraction of FRS gainers gaining in the following year. This fraction is calculated as the number of second year gainers divided by all first year gainers who remain on normal VAT, i.e. don't exit and don't join FRS. Column (6) uses the maximum applicable flat rate (not the ones I have assigned) and reports the fraction of VAT traders with non-negative tax gains from joining FRS.

Table 6: Ten sectors with highest number of FRS gainers

Sector	τ_F (2004-7)	% FRS	% gainer	% gainers join FRS in $t+1$	% gainers gaining in $t+1$	Conditional Median of gains (£)	Conditional Median of gains % VAT
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Management consultancy	12.5	35	36	5	74	522	7.5
Renting and operating of Housing Association	12	3	52	0	85	642	15
Computer consultancy	13	45	36	7	79	643	7.4
Other personal service activities	10	13	31	2	77	849	15
Other business support service activities	11	17	30	3	79	795	14
Other engineering activities	12.5	48	35	6	76	530	7.3
Take away food shops	12	31	39	5	84	808	7.2
Freight transport by road	9	17	29	1	67	461	8.5
Maintenance and repair of motor vehicles	7.5	10	29	2	76	841	13
Artistic creation	11	20	34	3	73	516	11

Notes: Table uses observations from 2004-2010 financial years. Column (1) reports the assigned flat rate during 2004-2007 financial years. Column (2) shows the percentage of FRS traders out of all eligible traders in each sector. Column (3) is the fraction of eligible VAT traders who gain from FRS in each sector. Column (4) is the fraction of FRS gainers who join FRS in the following period. Column (5) reports two year gainers as a percentage of last year gainers who remain on VAT and are still eligible for the scheme. Column (6) is the median of current FRS tax gains for the population of FRS gainers in the last year who remain on VAT. Column (7) is the same conditional median as in column (6) but for tax gain as a percentage of VAT liability.

Table 7: Linear probability model of FRS gains

Dependent Var: dummy for gainer	(1)	(2)
L.gainer	0.647	0.617
	(.0078)*	(.0068)*
SIC2007 dummies	NO	YES
Year dummies	NO	YES

Notes: Table shows coefficient estimates from an OLS regression of a gainer dummy on covariates. Gainer dummy is equal to one if trader is observed to gain from FRS in a given year and zero otherwise. Columns (1) and (2) control for trader's VAT registration time (two dummies capturing whether VAT registered between 1 April 2002 and 1 January 2004 and after 1 January 2004), ownership status (two dummies capturing incorporations and partnerships), Average log of gross output, average and standard deviation of FRS gains as a percentage of VAT liability, fraction of years trader was eligible for FRS, and a dummy for monthly returns. Column (2) further includes SIC2007 and year dummies and 9 dummies capturing the 2004 FRS density decile for registered outcode of trader. Standard errors are adjusted for SIC2007 clusters and shown in parenthesis. * shows if coefficient is significant at 1 percent level. The sample for both regressions is 3,449,070 returns during 2005-2010. It includes traders that were at least eligible for FRS once during 2004-2010 and drops sectors with less than 1000 observations during the 7 years of the sample. Notice the sample only includes traders NOT on FRS and those I could calculate whether they gain from being on FRS.

Table 8: Estimates of hazard ratios (Cox proportional hazards model)

		Stratified: SIC2007 and deciles of FRS density				Stratified: SIC2007
	Baseline	Baseline	Interactions	% years gained	Traders with at least 3 returns	Include FRS density
	(1)	(2)	(3)	(4)	(5)	(6)
Gainer	3.862	3.025	4.319	0.865	2.924	2.488
	(.405)*	(.227)*	(.385)*	(0.045)*	(.269)*	(0.276)*
Fraction of years gained				6.245		
				(.685)*		
Early-FRS	1.555	1.510	1.851	1.566	1.515	
	(.126)*	(.06)*	(.157)*	(.056)*	(.061)*	
Late-FRS	2.78	2.716	4.313	2.873	2.818	
	(.189)*	(.074)*	(.224)*	(.093)*	(.083)*	
Early-FRS× Gainer			.782			
			(.065)*			
Late-FRS × Gainer			.546			
			(.03)*			
FRS density						16.393
						(0.132)*
FRS density × Gainer						0.407
						(0.132)*
Observations	918,396	915,887	915,887	915,887	731,508	276,287
Number joining FRS	28,206	28,206	28,206	28,206	28,206	7,428

Notes: Table reports hazard ratios from estimation of Cox proportional hazard models. Controls included are average and standard deviation of FRS gains as a fraction of VAT liability for each trader, average of logarithm of gross sales, fraction of years trader was eligible, dummies for sole proprietors and partnerships, and dummies for frequency of submitting returns. Standard errors are adjusted for clusters in SIC2007 and reported in parenthesis. Stars show hazard ratio is significantly different from one at 1 percent level. Reported standard errors are calculated from original standard errors on coefficient estimates using delta method. This amounts to multiplying the original standard errors by $\exp(\beta_i)$. Test of significance, however, relies on the original z-score derived from the ratio of coefficients to the standard errors. Column (2) to (5) estimate stratified Cox models using SIC2007 and deciles of 2004 FRS density as strata. Column (6) only uses SIC2007 as a stratum and restricts the sample to traders registering from 2005-06 onwards.

Table 9: Main sectors that are not assigned a flat rate

SIC2007	ONS description	Why unassigned?
41100 to 41202 (3 codes)	Construction of buildings	Both sectors might include "labor-only" or "general" building or construction services based on the share of labor inputs. The former has a flat rate of 8.5 percent while the latter's 13.5 percent during 2004-2007.
43120 to 43999 (12 codes)	Specialized construction activities	
47190	Other retail sale in non-specialized stores	This includes department stores, general stores (food not predominant), and household stores. Depending on share of sales they could fall in different FRS categories.
47710 47721	Retail sale of clothing in specialised stores Retail sale of footwear and leather goods in specialised stores	Codes combine sale of children and adult clothing but FRS (and VAT) distinguishes between the two.
68100 to 68320 (4 codes)	Real estate activities	Estate agency or property management services

Table 10: Weights used for assignment of flat rates during the change years

Return period for 2008-9	Weights for 2008-9 (change: 1 December 2008)		Weights for 2009-10 (change: 1 January 2010)		Weights for 2010-11 (change: 4 January 2011)	
	$\tau_{F,1}$	$\tau_{F,2}$	$\tau_{F,2}$	$\tau_{F,3}$	$\tau_{F,3}$	$\tau_{F,4}$
1 April 2008 - 31 March 2009	$8/12$	$4/12$	$9/12$	$3/12$	$8/12$	$4/12$
1 February 2008 - 31 January 2009	$10/12$	$2/12$	$11/12$	$1/12$	$10/12$	$2/12$
1 March 2008 - 28 February 2009	$9/12$	$3/12$	$10/12$	$2/12$	$9/12$	$3/12$
not sure (left out)	-	-	-	-	-	-

Notes: $\tau_{F,1}$ shows the flat rate applicable from January 2004 - 30 November 2008, $\tau_{F,2}$ is flat rate during 1 December 2008 - 31 December 2009, $\tau_{F,3}$ is for 1 January 2010 - 3 January 2011, and $\tau_{F,4}$ is for 4 January 2011 - onwards.

Table 11: Sectoral average absolute difference between assigned and observed flat rates

Average absolute difference ($\bar{\tau}_{F,s}$)	Number of Sectors	Number of observations			% FRS	% gainer
		FRS traders	FRS eligible	FRS gainers		
$[0, 0.5]$	121	210,666	1,224,939	300,134	17%	30%
$(0.5, 1]$	84	46,720	596,268	124,237	8%	23%
$(1, 1.5]$	55	20,792	474,182	73,305	4%	16%
$(1.5, 2]$	48	8,167	344,337	43,046	2%	13%
$(2, \infty)$	254	117,122	1,569,015	59,100	7%	4%
Total	562	403,467	4,208,741	599,822	10%	16%

Notes: The difference between numbers here and numbers in the paper is because some sectors with smaller than 30 FRS trader or FRS gainers are removed from this table.

Table 12: Mis-matches in SIC codes

year	Total observations (1)	Missing SIC in VAT data (2)	Unmatched SIC (3)	Unique SIC codes in VAT (4)
2004	1,894,281	<30	2,275	700
2005	2,177,146	8386	13,819	962
2006	2,221,095	<30	2,738	701
2007	2,118,581	<30	114,164	1,365
2008	2,173,988	79	30,684	1,330
2009	2,123,464	<30	15,077	799
2010	2,120,600	<30	16,396	801
Total	14,829,155	8,482	197,144	-

Notes: Column (3) shows the number of observations that had non-missing SIC codes in VAT data but didn't match with SIC codes from ONS. Number of unique SIC codes in ONS data is 699 and 728 respectively in 2003 and 2007 classifications.

Table 13: Change of SIC2007 codes across years

Transition years	Number of SIC2007 code switchers	
	Before correction	After correction
From 2004 to 2005	26,821	26,821
From 2005 to 2006	10,989	15,524
From 2006 to 2007	774,983	19,672
From 2007 to 2008	10,197	8,712
From 2008 to 2009	20,383	5,876
From 2009 to 2010	5,106	4,776

Notes: Table shows the number of traders that change their five digit SIC2007 codes moving from one financial year to the following before and after the corrections mentioned in the text are applied.

Table 14: Number of observations dropped in the cleaning process

Stage	Number of obs	FRS traders
Initial sample	14,829,026	1,084,737
Droppings	1,517,647	2,677
Group 1: Inactive traders	2,873,609	100,926
Group 2: Unusual sales or purchases	837,436	-
Group 3: Unusual effective input/output tax rates	260,078	2,116
Group 4: Other ownership forms	10,460,181	964,356
Cleaned sample	10,460,181	964,356

Notes: Adding individual number of observation for each cleaning step doesn't give total obs dropped because there is overlap between different categories.