The

Contents

Executive Summary

Despite the important role school science technicians play in delivering a high-quality science education, there has been relatively little attention paid to the science technician workforce (Gatsby, 2017). This is in contrast to the science teacher workforce, which has been the focus of several policy initiatives, primarily because of under-recruitment to initial teacher training and em

Characteristics of the school science technician workforce

The SWC data confirms findings from other surveys that the science technician workforce is around three-quarters female and three-quarters aged over 40 in 2018/19. Around half of school science technicians work part-time, al.6 (m)9.6 (e)ouheago43 v >>BDC /9 (er)-sc thec sorhoorkt-

1 Introduction

1.1 Overview and motivation for this research

School science technicians play an important role in delivering science education in England. Their support is particularly with assisting science teachers with practical aspects of science learning, such as maintaining the necessary equipment, preparing and setting up experiments and giving technical help to pupils in practical lessons. This support helps to reduce the workload of science teachers that would otherwise be spent on these activities (Gatsby, 2017). However, relatively little attention has been paid to the science technician workforce.

Science teachers have been the focus of several recent policy initiatives, primarily because of under-

2 Provision of school science technician support

Key findings

We estimate the size of the school science technician workforce and the extent of technician support technicians offer to secondary school science departments using a range of metrics. Therent of

Figure 2 Distribution of the number of science technicians per school

Source: NFER analysis of SWC data.

Figure 3 Estimat ed total headcount and FTE science technicians in England

Source: NFER analysis of SWC data and School Census data.

Figure 4 compares this trend in total science technician numbers with a variety of other relevant measures, relative to their level in 2011/12. The number of pupils in secondary schools fell between 2011/12 and 2013/14, but has been rising since then as larger cohorts have come through the education system. Secondary cohort sizes are forecast to continue rising until 2024. The overall number of science teaching hours in secondary schools have followed a similar pattern to pupil numbers, although have not risen quite as fast as pupil numbers since 2013/14. This would suggest that, all else equal, the demand for school science technician support has grown over time.

However, in contrast, the number of FTE school sc.002 Tw [(s)-2 (c)-WFTw 11.7575 0 Td [(s)8.9 (c)-2 (.002

Second, changes to the science curriculum and/ or exam specifications may have affected the amount of practical science in science lessons, and therefore the amount of science technician support required. Ofqual and awarding organisations hoped that new science GCSEs and A levels, which were introduced from September 2016, would increase the amount and variety of practical science occurring in science lessons. However, others had concerns that the removal of controlled

Table 1 Definitions of school science technician support ratios

Metric	Definition	Source/ notes
Science technicians per school	FTE science technicians in the school	Source: SWC.
Science technicians per 100 pupils	FTE science technicians in the school / headcount of pupils age 11-18	Source: SWC, School Census.
Science technicians per science teacher	FTE science technicians in the school / FTE science teachers in the school	Source: SWC. Only includes schools that provided timetable data on teachers' subjects taught
Service factor	Total science technician hours per week in the school / Total science teaching hours per week in the school	Source: SWC. Only includes schools that provided timetable data on teachers' subjects taught See ASE (2019) for details on how the service factor is calculated.
Service factor threshold	Is the service factor (as defined above) at or higher than 0.65?	As above. Thresholds set out in Royal Society and ASE (2002).

Each measure has strengths and limitations for measuring science technician support, which should be considered when interpr.5 (gt) (i)2.6 (85((r)-5(be c)-44 (ac)8.9 (t)-6.a02 T8 160.44 1.4.1 (hni) 0.4

2.5.1 Overall technician support ratios

2.5.1.1 Science technicians per 100 pupils and per science teacher

Figure 5 shows how the first two ratios – number of FTE science technicians per 100 pupils and number of FTE science technicians per science teacher – have changed over time. We present data on the median school, which is the middle school in the distribution, and the 25th and 75th percentiles (quartiles), which are the schools at the top and bottom quarters in the distribution. We present the median and quartiles as they are less sensitive to extreme values, which are likely to be influenced by measurement error.

Figure 5 Number of science technicians per 100 pupils and science technicians per science teacher

Source: NFER analysis of SWC data and School Census data1.1 ( )-12.1 (N)-20.9 (y)2r6.6 (o)10.5 ((S)2.3tD 6 >>BDC

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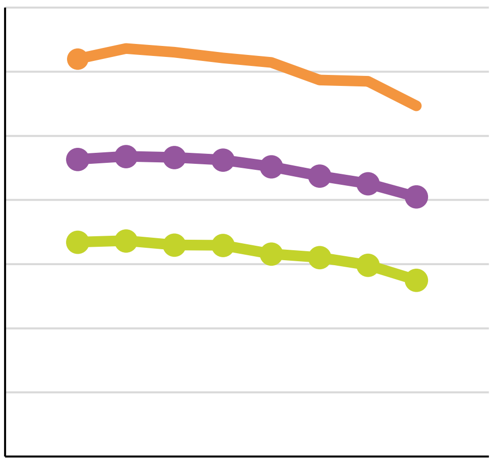
in comprehensive schools in England and Wales. The SWC data implies that the number of pupils per FTE technician in 2011/12 was around 480, which is a similar level to the 2000 survey, rising to 550 pupils per FTE technician in 2018/19. The ten years between 2000 and 2010 were characterised by substantial increases to secondary school budgets, which may have enabled schools to maintain their levels of science technician provision throughout that period.

The SWC data shows that the median number of FTE science technicians per science teacher has fallen by 15 per cent, from 0.26 in 2011/12 to 0.23 in 2018/19.

2.5.1.2 Science technician service factor

Figure 6 shows how the science technician service factor and the proportion of schools with a service factor of 0.65 or above have changed over time. The data shows that the median service factor has also fallen by 13 per cent between 2011/12 and 2018/19, from 0.46 to 0.40.

Figure 6 Science technician service factor and proportion of schools meeting service factor minimum threshold of 0.65



Source: NFER analysis of SWC data.

This fall has translated into fewer schools meeting the ASE's suggested minimum service factor threshold level of 0.65. The SWC data suggests that while 21 per cent of secondary schools were at or above the threshold in 2011/12, the proportion has fallen to 15 per cent in 2018/19.

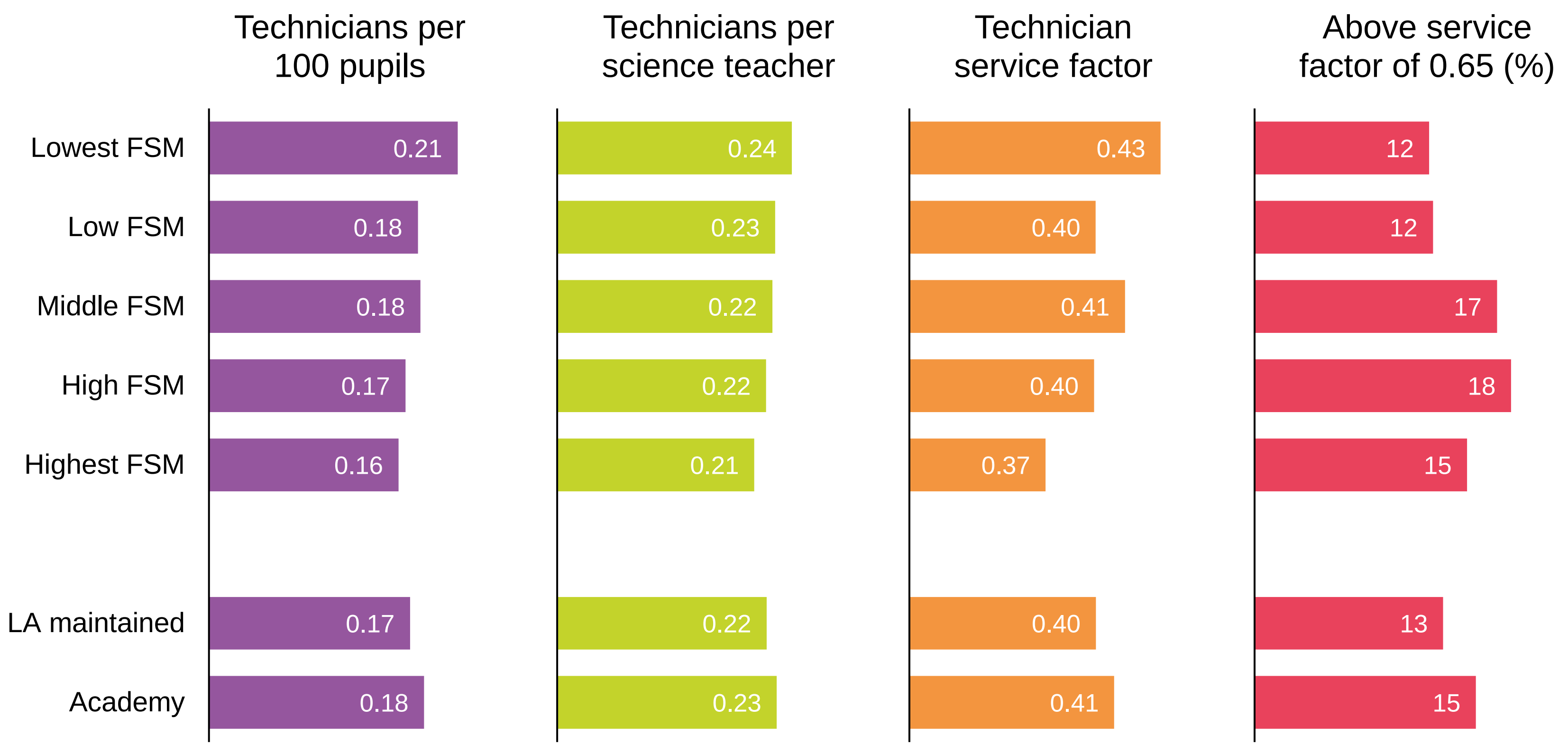
The Royal Society and ASE science technician survey report (2001) estimates that the median service factor in comprehensives schools in England in 2000 was 0.49, with lower and upper quartile values of 0.39 and 0.58 respectively. The SWC data suggests that the service factor has fallen a little since that survey, but not substantially. Again, rising secondary school budgets between 2000 and 2010 may have enabled schools to maintain their science technician service factor throughout that period.

2.5.2 Variation between schools

As suggested by the large gaps between the 25th and 75th percentiles in the ratio figures above, there is considerable variation in support ratios between schools. At least some of this variation is likely to be explained by specific school characteristics. We explore the variation by three key characteristics: region, school deprivation level and school type.

Figure 7 shows the median values of the three technician support ratios, plus the proportion of schools above

Figure 8 Variation in science technician support ratios by level of pupil disadvantage and school type, 2018/19



Source: NFER analysis of SWC data and School Census data.

3 Characteristics of the science technician workforce

Key findings

The SWC data confirms findings from other surveys that the school science technician workforce is around three-quarters female and three-quarters aged over 40 in 2018/19. Around half of school science technicians work part-time, although nearly half of those who work part-time work at least qpart584. 0die tse7who workma 605.57.6 (n)10.(t)-6.6 (h.78ec)8 r-6–(e)1(t543c32.848k)-2 0.5 (w)13.5 (ho w

Figure 14: Science technician salaries vary by experience and geography

Source: NFER analysis of SWC data.

Some of the relationship between technicians’ years of experience and pay

Figure 15: Longer -serving science technicians are more likely to be employed on a full - year contract

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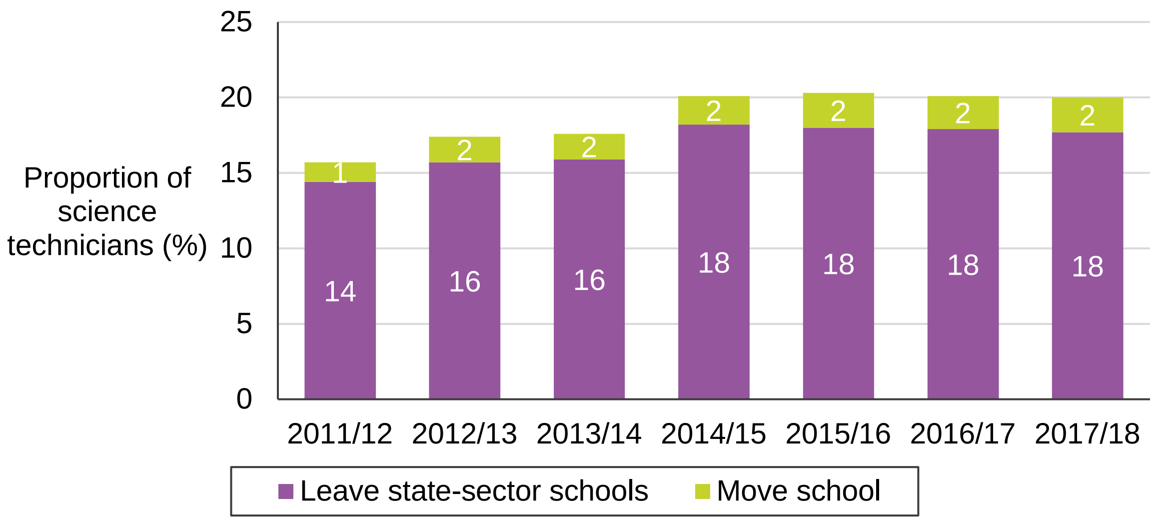
(including Wales or Scotland) or as a technician in an independent school, or in a college, higher education or in industry.

The low rate of school science technicians moving school may be due to the quality of the longitudinal linking within the SWC data: a technician could move school but their records be treated as if they are two separate individuals within the data. However, as the longitudinal data linking uses name, date of birth and national insurance number it should pick up most genuine cases of school-to-school moves.

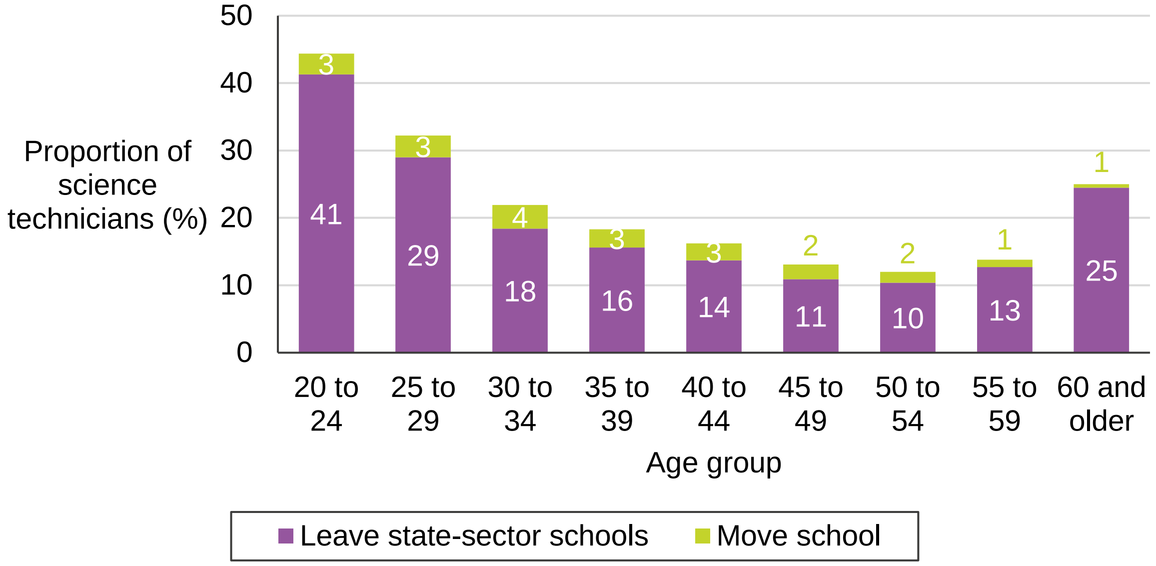
Figure 17: S chool science technician turnover has risen between 2011/12 and 2018/19



Source: NFER analysis of SWC data.

Figure 18 shows the retention and turnover of school science technicians by age group. The data shows that younger science technicians and those approaching, or at, retirement age are more likely to leave the state-funded school sector than those in their 40s and 50s. It also shows that younger science technicians are more likely to move school and older technicians less likely to move school. This is likely to be due to older technicians being more settled and less footloose. A very similar pattern is seen for teachers (Worth *et al*., 2018).

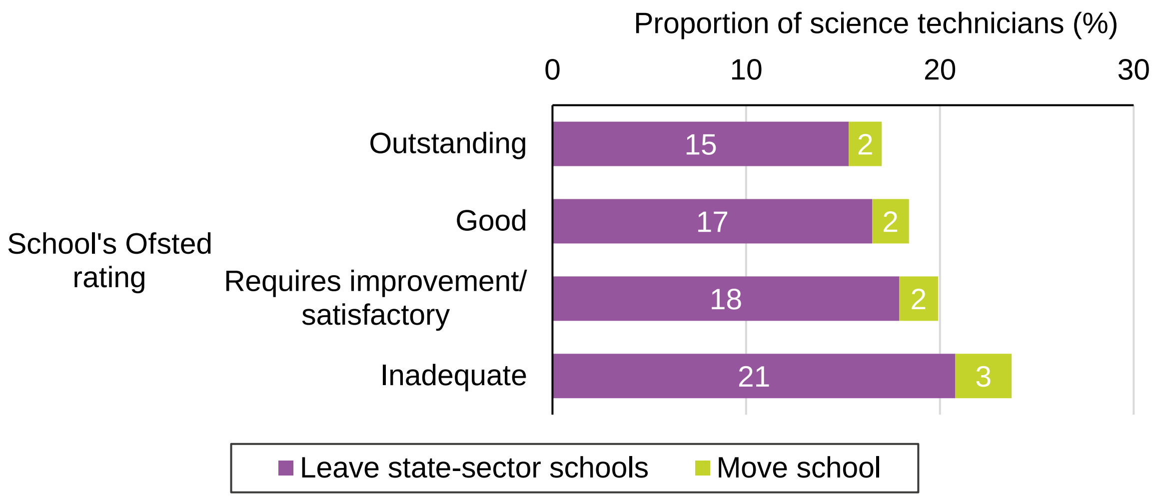
Figure 18: Younger and older school science technicians are more likely to leave



Source: NFER analysis of SWC data.

Figure 19 shows that, as for teachers, there is higher turnover among school science technicians in schools with lower Ofsted ratings (Worth *et al*., 2018). This may relate to the lower quality of working environment in those schools. For example, teachers in schools rated as inadequate or requires improvement are more likely than teachers in schools rated as good or outstanding to report that their workload is unmanageable (Walker *et al*., 2019; Jerrim and Sims, 2019).

Figure 19: Science technicians in schools with a low Ofsted rating are more likely to leave



Source: NFER analysis of SWC data.

5 Conclusions and recommendations

The findings from this new research lead to a number of key overall conclusions about the current state of the school science technician workforce in England. In this section we draw these together and make a number of recommendations for policy, practice and further research.

The level of school science technician support in England's secondary schools has fallen between 2011/12 and 2018/19

All the measures that we have explored of the extent of science technician support available within school science departments, many of which are based on long-established metrics, show that science technician support has fallen between 2011/12 and 2018/19. Given the reduction in real-terms per pupil school funding over this period, the most likely explanation is that the fall is due to schools reducing their expenditure on science technicians as their budgets have been squeezed (Cramman *et al.*, 2019; Britton *et al.*, 2019). However, we cannot definitively rule out other explanations, such as increasing science technician shortages, also playing a part.

Schools in the North of England have the lowest level of technician support, while schools in London and the South of England have the highest levels. Schools with more deprived pupil intakes and local authority maintained schools also have slightly lower levels of science technician support.

Most schools are, as a result, operating with a science technician workforce that is smaller than the minimum support threshold recommended by the ASE. This could be having a detrimental impact on the workload of science teachers. However, relatively little robust quantitative research has been conducted to demonstrate the relationship between science technician support and science teacher workload.

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likely to genuinely have no science technicians where there are fewer than five science teachers, but they have been incorrectly omitted where the school has more than five science teachers. However, we cannot perform this adjustment where there is no data on the number of science teachers.

A range of other assumptions are also technically plausible, so we explore the sensitivity of our findings to two assumptions at opposite ends of plausibility:

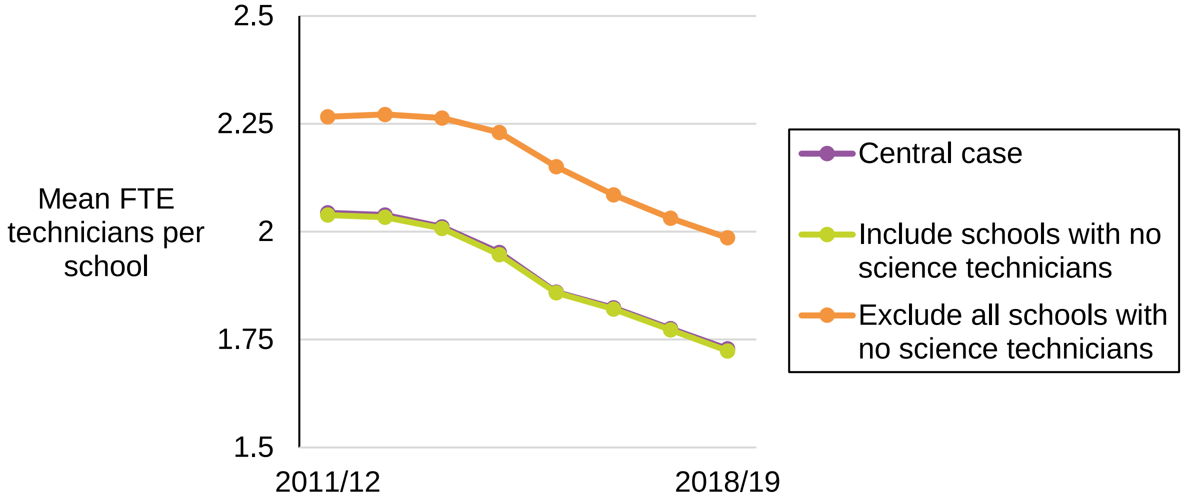
1. all schools with no science technician records genuinely have no science technicians
2. all schools with no science technician records have incorrectly omitted their science technician records, and the school actually has an average number of technicians

Anything between these assumptions is likely to be plausible and therefore bounds our estimates. Further, if the same trends that appear in our main estimates are also evident across different assumptions, then it suggests that the *trends* are likely to be accurate, even if there remains uncertainty about the exact *level* of each ratio.

Figures 20-23 present the sensitivity analysis. We present the central case that we report in the main body, as well as data estimated using the two assumptions above that test the sensitivity of the results to alternative assumptions. The sensitivity analysis shows that while there is uncertainty about the level of each ratio due to missing data, the extent of the uncertainty is not large. Furthermore, the downward time trends in all of the ratios are evident across all assumptions and all measures, suggesting that whatever the true level of the technician support ratios, they are very likely to have declined between 2011/12 and 2018/19.

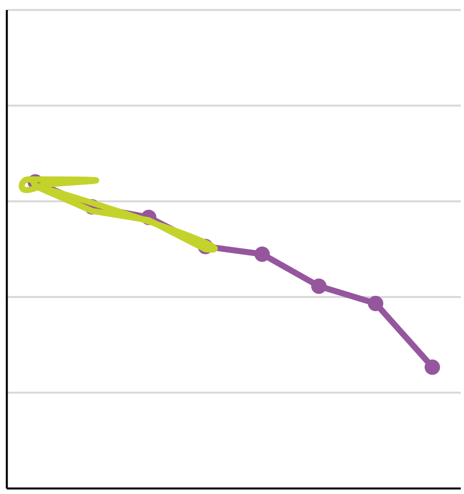
In section 2.2 we compare our estimates of the FTE number of science technicians per school with those estimated in the Durham study for 2015-2017, finding that the Durham estimates are higher than ours for the corresponding years. Figure 20 below shows that even if we make an extreme assumption that all the schools in the SWC that have no records for science technicians have missing data (and actually do have technicians), our estimates remain lower than those in the Durham study. Therefore, potential data quality issues with the SWC are unlikely to entirely explain the differences between the estimates.

Figure 20: Sensitivity of the FTE technicians per 100 pupils measure to different assumptions where a school has no science technician records



Source: NFER analysis of SWC data.

Figure 21: Sensitivity of the FTE technicians per science teacher measure to different assumptions where a school has no science technician records



Source: NFER analysis of SWC data.

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