Preventing Robberies at Sub-Post Offices:
an evaluation of a security initiative

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Crime Prevention Unit Papers

The Home Office Crime Prevention Unit was formed in 1983 to promote preventive action against crime. It has a particular responsibility to disseminate information on crime prevention topics. The object of the present series of occasional papers is to present analysis and research material in a way which should help and inform practitioners whose work can help reduce crime.

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Foreword

This report describes an evaluation of an initiative by the Post Office to prevent robberies of sub-post offices in London, which had grown dramatically in the late 1970s and early 1980s. The initiative, which included improvements in security procedures and the strengthening of 'anti-bandit screens' in all 1300 sub-post offices in the London Postal Region, was followed by a fall in the number of robberies. For the crime prevention practitioner it is important to know what proportion of this fall might be ascribed to the security initiative, and how much to other factors, including for example police success in identifying and arresting offenders. Evaluation of individual crime prevention initiatives is a valuable aid to improving the effectiveness of preventive measures generally. Yet as this report illustrates, evaluation of real events on the basis of limited information is a difficult exercise inevitably leaving a degree of uncertainty attached to any conclusions.

Nonetheless, this report is able to conclude that, within broad limits, the Post Office security initiative was a success, and contributed to at least some of the fall in robbery rates.

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PAUL EKBLOM

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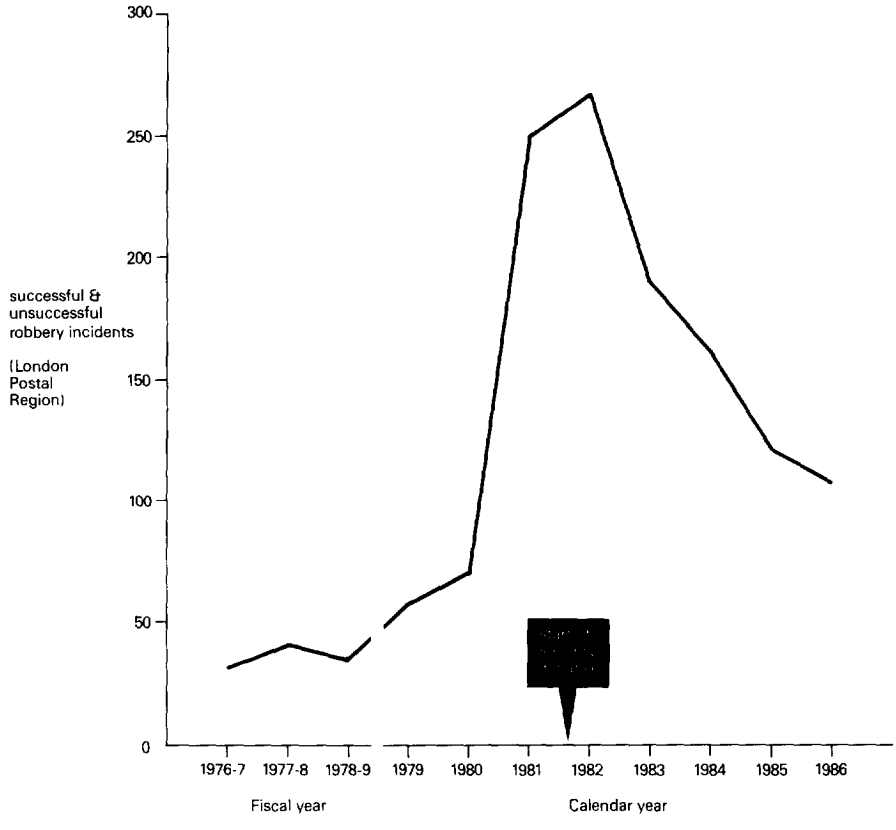
Introduction

During the early eighties the number of sub-post office robberies in the London Postal Region increased substantially: from 70 incidents in 1980 the figure reached 250 in 1981 and continued to rise the following year, to 266. About half of the robberies were failures, with nothing taken and the robbers usually scared off; nevertheless the growth in attacks posed a significant threat to staff and customers, and put in doubt the trading viability of some sub-post offices.

The Post Office responded by embarking on a major security initiative, guided by an analysis of the methods of attack used by the robbers. Since a significant proportion of robberies involved attacks over the counter, it was concluded that the existing anti-bandit screens gave inadequate protection to staff. Between

Figure 1 Number of successful and unsuccessful robbery incidents by year



Note 1) The first 3 points come directly from POID annual reports and relate to fiscal years (April to March); previous years are unavailable. The remainder were from direct inspection of robbery incident records.
2) The PO security initiative started October 1981.
3) The 1986 figure is annualised on the basis of 3 months' records.

October 1981 and March 1985 the counter screen barrier protection in virtually all of some 1300 sub-post offices in the London Postal Region was upgraded to give a higher degree of resistance to physical attack. Several other improvements in security were introduced including a training programme for sub-postmasters. Together these measures form an example of situational crime prevention, where physical and social changes are made in the immediate environment of vulnerable targets with the aim of reducing the opportunity for offending, and heightening the risk to the offender. After their sharp rise robbery incidents steadily declined from the 1982 peak, to 121 in 1985. This pattern is shown in Figure 1.

On the face of it the security initiative seems to have been a success, with the robbery incident rate reduced to less than half the peak level. But this apparently obvious result is hard to interpret, since it is difficult to say what proportion of the fall in robberies should be attributed to the Post Office's own security initiative, and what proportion to unrelated factors such as police action, or totally co-incidental events. The changes in the rate of sub-post office raids occurred at a time when the pattern of robbery in London was itself changing. As Figure 2 shows, the robberies to other premises in the Metropolitan Police District peaked at about the same time as those in the sub-post offices; and there has been a more recent growth in raids on cash and valuables in transit by the Post Office and elsewhere.

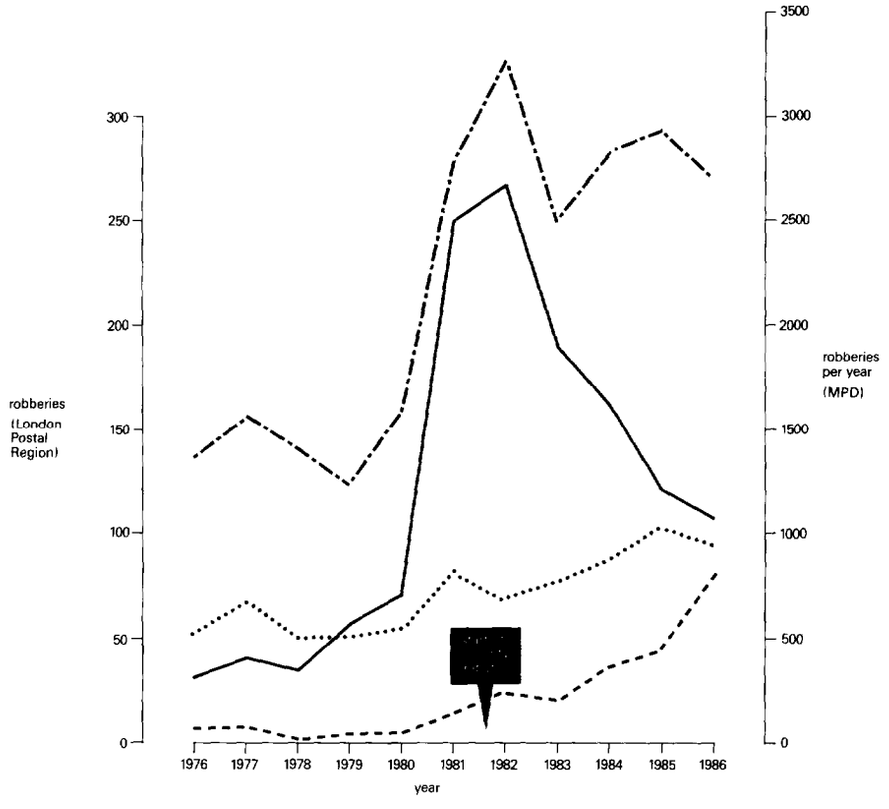
All evaluations are more difficult than they seem at first (and conclusions must ultimately rely on the balance of plausibility of alternative explanations for the observed results) but in this case conclusions are all the more difficult to draw because the data for the evaluation were obtained retrospectively, rather than during the course of a planned experiment.

Despite these difficulties it was decided to proceed with the evaluation for two reasons. First, there is relatively little research on robbery and its prevention; as a result there is some doubt whether situational approaches can be effective in dealing with anything other than opportunist theft. Second, if prevention is to develop practitioners require information on how evaluation can be carried out with often limited resources.

The current report aims to cater for both sets of needs: to present findings on the impact of preventive measures on robbery; and whilst doing so to comment on the issues which must be addressed by those seeking to evaluate preventive initiatives. The text thus goes into rather greater methodological detail than would normally be the case, although much of this detail is consigned to appendices.

'Pure' and 'applied' research differ both in the way they handle *uncertainty*, and in their focus on the general versus the particular. Uncertainty can spring from statistical variation, imperfect or missing items of data, and the broader difficulties in making inferences about cause and effect. Those concerned with pure research follow rigid rules to ensure that their conclusions are above a minimum level of

Figure 2 Raids on sub-post offices and other locations and cash-in-transit, by year



Key: raids inside sub-post offices, London Postal Region
delivery raids outside sub-post offices, London Postal Region
raids on business premises, Metropolitan Police District
raids on cash/goods-in-transit, Metropolitan Police District

Note 1) The figures plotted include successful and unsuccessful incidents.
2) The first 3 points from the sub-post office plot, and the first 5 from the delivery plot, come directly from POID annual reports, and relate to fiscal years (eg April 1976 to March 1977, plotted as 1976); previous years are unavailable. The remainder of the points come from the present data collection exercise. The 1986 figures are annualised on the basis of 3 months' records.
3) The delivery raid figures for 1976 to 1980 include some incidents at locations other than outside sub-post offices.
4) The London Postal Region is rather larger than the MPD.
5) The MPD figures include the respective PO figures, but these never amount to more than 7% of the total – hence the rise in MPD figures is to a large degree independent of the rise in its PO component.

certainty, and can be generalised from the sample to the whole population it represents.

Unfortunately, this is not always possible. Nonetheless the managers of banks, stores or post offices, and those responsible for coordinating local crime prevention projects will still require the best information available regarding the impact of preventive measures. Such people are less interested in making inferences about general populations than their own immediate territory – and they cannot take a categorical 'don't know' for an answer merely because the uncertainty associated with that answer has exceeded an arbitrary cut-off point set by statistical

convention (cf. Oakes, 1986). But the 'applied' researcher cannot simply hand over an unqualified answer and run the risk that it will be taken at face value by the manager. Fortunately the competent manager is accustomed to decision-making under conditions of uncertainty, so the solution is to provide the manager with an assessment which contains an evaluative judgement together with the associated range of uncertainty. This approach often involves a shift from all-or-nothing significance testing to the provision of results accompanied by an estimate of the margin of error (in some cases through confidence intervals).

This report primarily adopts the applied perspective, although it attempts, cautiously, to generalise from some of the findings. After describing the data on which the study is based, the report raises the question of whether there was a real change in the pattern of robbery which calls for explanation, or a rise and fall that merely reflected random fluctuation. Estimates are then given of the size of the fall in robberies which might be accredited to the Post Office security initiative. In line with the preceding discussion, a range of values is produced, rather than a single figure. Next, it examines possible side-effects of the security initiative: in particular, did the robbers respond by changing their methods of attacking sub-post offices, by for example greater resort to firearms, and did they also shift to other targets? The cost-effectiveness of the initiative is then discussed.

Data for the evaluation

Data on every robbery incident (successor failure) within sub-post offices in the London Postal Region were collected from Post Office Investigation Department records, covering the period 1 January 1979 to 31 March 1986. Also noted were raids on PO vans delivering money and other valuables to sub-post offices. In PO records, each incident was described in a short passage giving details of offenders, weapons, injuries, losses (if any), and the unfolding of the event itself. Altogether a range of data on 1303 incidents were obtained. One of the more complex pieces of information to extract from the records was the method of attack (see Ekblom, 1987 for a discussion of the issues involved in categorising crime data by methods of offence). The categories of attack eventually used are listed below. To put these in context it is useful to recall the layout of a typical sub-post office. Generally operated as part of a private retail business, for example a newsagent's, the sub-post office part of the store in London and many other areas is enclosed by a floor-to-ceiling security screen with a counter and a hatch to take in parcels and a lockable door to the private business area of the shop. Though physically small, sub-post offices often have quite a large turnover of cash and can thus make a tempting target for robbers. They are frequently run as a family concern.

Methods of robbey within sub-post offices

Each robbery incident was put into one of the following categories.

1. *Physical attack on screen* – tools such as sledgehammers may be used, or

bare hands; sometimes in addition threats are made and weapons carried, although these are ancillary to the attack on the screen.

2. *Firearms at screen* – weapons, almost always firearms, are pointed at the screen to threaten staff behind it and occasionally discharged. This category included some cases where a physical attack on the screen failed and the robber then resorted to a firearm threat.

3. *Insecure* – robber forces his way through open parcel hatch, enters through open security door, or via stock room of non-Post Office part of shop etc.

4. *Outside secure area* – staff or customers outside secure Post Office area are taken hostage or threatened, with or without firearms, to force staff to open up secure area. Staff may be attacked when opening or closing the shop.

5. *Miscellaneous* – eg robbers break into sub-post office and await arrival of sub-postmaster.

Methods of robbery outside sub-post offices

6. *Delivery* – robbers await PO staff delivering remittances to sub-post office, and ambush them on street.

Figure 2 gives a general impression of the changes in robbery rates in the London area from the early seventies. It presents sub-post office robberies, robberies on all business premises (the sub-post office robberies were, in 1985, about 4% of the total), delivery raids outside sub-post offices and all cash-in-transit raids. More detailed comparisons are made between these trends at various points below.

Was there a real change in robbery rates?

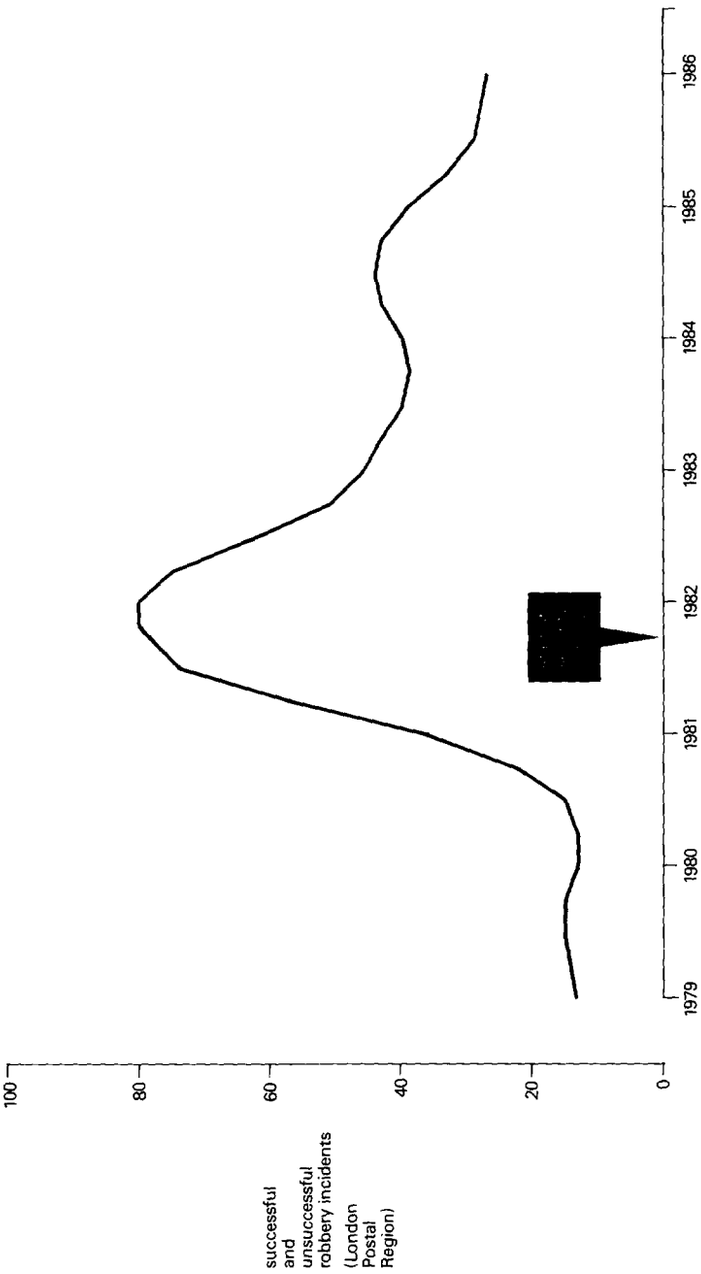
Figure 1 (page 1) shows the rates of robbery incidents (successes and failures) for the London Postal Region by year over the period January 1979 to March 1986, and for several years previously. The pattern appears as a sharp rise followed by a more gentle fall to a rather higher level than intially. The first question is whether this apparently distinct event was no more than one of a string of random peaks and troughs over time commonly seen in crime data, particularly where numbers are relatively small. Such a pattern might result, for example, if one or two highly active offenders were first to enter the area and then to cease to commit robbery for completely incidental reasons (eg illness). With such random fluctuation the Post Office could no more take credit for the fall than the passengers of a roller-coaster for the ups and downs of the vehicle.

It seems clear, by inspection of Figure 1, that there is something to be explained in the pattern of robbery over the period. (1)

(1) If the uncertainties as to cause and effect had been smaller and the observed pattern less distinct, it would have been sensible to use more sophisticated statistical methods to draw this conclusion and provide quantitative estimates of statistical uncertainty.

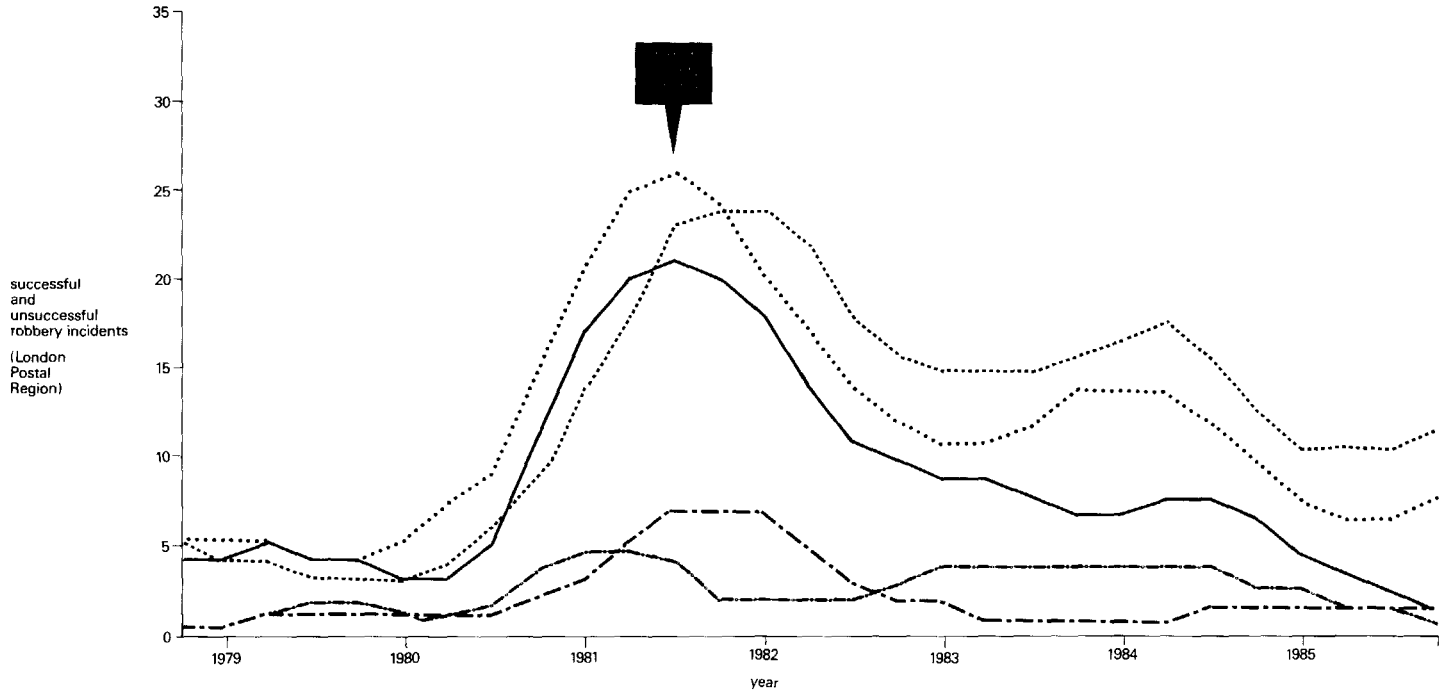
During the seventies robbery incidents remain at consistently low levels, and the 1982 peak stands out very clearly from earlier, and later fluctuations. The peak stands out even more distinctly when robbery rates are presented by quarter (Figure 3).

Figure 3 Number of successful and unsuccessful robbery incidents by quarter



Note 1) The figures are from POID incident records.
2) The figures are smoothed by the Exploratory Data Analysis technique of 'resistant smoothing' (4253H twice) (Velleman and Hoaglin, 1981).

Figure 4 Number of successful and unsuccessful robbery incidents per method, plotted by quarter



Key: 1 ——— physical attack on screen
2 ····· firearm (or other weapon) attack at screen
3 – – – attack via insecure door or hatch
4 • • • • attack on staff or customers outside secure area
5 —•— miscellaneous methods of attack

Note 1) The figures plotted are from POID incident records.
2) The figures are smoothed by the Exploratory Data Analysis technique of 'resistant smoothing' (4253H twice) (Velleman and Hoaglin, 1981).

Evidence from comparison of the pattern of the different methods of robbery reinforces this impression. Figure 4 presents the different robbery rates by quarter. If the different methods were each showing purely random fluctuations their rates would probably vary independently of one another. However, with the exception of the miscellaneous category, the various methods appear, visually, to a large extent to share a common pattern of rise and fall. This suggests that the overall, combined rise and fall is not due to random fluctuations. It also illustrates the fact that the change in overall robbery rate has not resulted from a sudden rise and fall in just one or two methods of attack, with the rest continuing as before.

The conclusion can be drawn, therefore, that there has been a distinct fall in robbery levels which began about the same time as the Post Office security initiative. What is in question is whether the fall was from a new, and higher 'natural plateau' in robbery levels (ie the rate would have levelled out at the existing peak), or whether the monthly totals would have kept growing further but for the intervention of outside events such as the security initiative. This remains a major source of uncertainty in the evaluation, since it is impossible to make even an informed guess about the crime level that might have been. This report rests on the assumption that there would have been no further growth in robbery rates from the observed peak – hence the subsequent evaluation probably underestimates rather than overestimates the true impact of the security initiative.

What proportion of the fall can be attributed to Post Office action?

In answering this question we have to distinguish between the proportion of the observed fall in robbery levels that can be attributed to the security initiative, as against the proportion that can be attributed to 'background' factors, such as the increased police action against robbers known to have occurred at the same time. Looking at the issue in more detail, there are several possible explanations for the fall in robbery rates, some of which (a to c below) give credit to the security initiative, others to the background factors. The various causes could be operating in parallel, and include:

a) the direct physical effect of the upgraded screen in making physical attacks harder to commit;

b) a general tightening up of security at sub-post offices in response to the robbery wave, with staff becoming more vigilant and careful in their actions such as ensuring that the door from the shop to the protected areas is closed;

c) a broad deterrent effect on robbers, as knowledge that 'somehow security has been improved' becomes widespread.

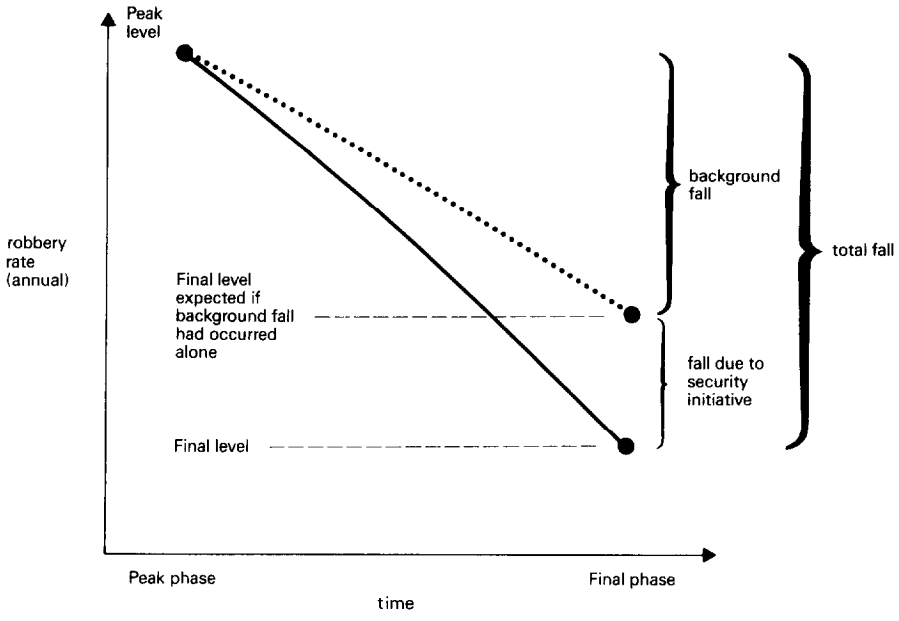
d) The occurrence of 'background' changes independent of the security

initiative, such as increased police attention to robberies in response to their rapid growth. During the growth period a number of operations against post office robbers were in fact conducted.

e) Regression to the *status quo* – ie the possibility of the rise and fall being no more than part of a sequence of random fluctuations. It was earlier argued that this cannot account for the whole pattern; but any partial contribution that regression may have made to the size of the fall in robbery rates will be taken into consideration below.

In an evaluation using an experimental design, control groups (such as a set of sub-post offices *not* fitted with screens) would have made estimation of background changes relatively straightforward. Here, however, it is necessary to derive measures of the background effects by other less-preferred means, involving the use of *indicators.* Once this is done the *background* measures can be subtracted from the *total observed fall* in robbery rates; the remaining figure represents the proportion of the fall arguably attributable to the Post Office. This process is illustrated in Figure 5.

Figure 5 Overview of process of calculation of estimates



The equations used in calculation

1. total fall = peak level – final level
2. background fall = total fall x % fall shown by indicator over same period
3. fall due to security initiative = total fall – background fall
4. final level expected if background fall had occurred alone = peak level – background fall
5. % preventive effect = $\frac{\text{fall due to security initiative}}{\text{final level expected if background fall had occurred alone}} \times 100$

Note for the *upper* estimate the background fall is defined as zero; hence the upper estimate = total fall

To cope with the greater uncertainty of the non-experimental design, three *different* measures are taken of the background fall, each with different sources of error. They are described below in brief; Appendix 1 gives more detail.

– The first assumes that the size of the background fall can be derived from changes, over the time period in question, in the Metropolitan Police figures for robbery in commercial premises – this is called the 'external background fall'. Subtracting it from the total fall and making various corrections produces the *external lower estimate* of the fall due to the security initiative.

– The second assumes that the background fall can be derived from the fall in the rate of one of the five methods of attacking sub-post offices: attacks on staff and customers outside the secure area. This last is judged the method of attack least likely to have been affected by the security initiative, and consequently could serve as a reasonable indicator of the influence of any background factors. This is called the 'internal background fall', and correspondingly subtracting this from the total fall produces the *internal lower estimate* of the fall due to the security initiative.

– The third simply assumes that the background fall was zero, ie that the entire reduction in robbery rates was due to the Post Office; this produces the *upper estimate* of the fall due to the security initiative.

The total fall itself was estimated by comparing robbery rates during two different phases: the first, a 10-month period when robberies were at their peak and the Post Office security initiative began; the second, a 22-month period running up to the end of the study. The establishment of the peak phase in particular was not straightforward, and judgement was needed to resolve a conflict between obtaining a figure for the peak rate that was statistically reliable on the one hand, and representative of quite rapid changes on the other. (The process is fully described in Appendix 1 but in essence it involved dividing the plot of robbery rates by sight into five phases: pre-rise, rise, *peak*, decline and *final*. The internal and external background falls were calculated with reference to the same peak and final phases.)

Measures were calculated separately for the effect of the security initiative on successful attacks alone, and on successes and failures combined. This was because, as with many types of crime, failed attempts may be seen as an indicator that preventive measures, such as target-hardening, are working well (Hough and Mo, 1986). Whilst serving this function, failed attempts at robbery must also be viewed from a more critical perspective, since PO staff and customers may still be subjected to some trauma and physical danger, perhaps facing a shotgun or an iron bar, and PO fittings may be damaged before an attempt is abandoned.

Before presenting the results of the estimation process it is helpful to take stock. While a distinct fall in sub-post office robbery rates reliably appears to have

begun at the same time as the security initiative was started, the various sources of uncertainty in the data have made it necessary to establish three estimates of the size of the fall that is attributable to the security initiative. The two lower estimates assume that only some proportion of the fall was due to the Post Office; the upper one assumes that the entire fall can be thus attributed. For the lower ones, estimating the size of that proportion is to be done using different indicators of the 'background fall', which are subtracted from the total fall: an external one based on MPD robbery figures and an internal one based on the method of post office robbery judged least likely to have been affected by the security initiative. Altogether there will be three estimates of the fall attributable to the security initiative for successful robberies, and equivalent estimates for successes and failures combined.

All six estimates are presented in Table 1; while each is given as an exact value, it is, of course, only a point lying within a fairly broad range of uncertainty, and should not be taken too literally. (2) For successful robberies alone the **upper estimate** of the fall due to the security intiative (based upon the argument that there was no background fall in robbery rates and that the observed change is totally due to the Post Office activity) shows a remarkably good achievement by the Post Office (107 successful incidents prevented per year from January 1984 to March 1986, equivalent to nearly 65% fewer than expected, or 198 successful and unsuccessful incidents, equivalent to a little over 60% fewer than expected). The **external lower estimate** gives only slightly smaller figures (87 successful incidents prevented per year during January 1984 to March 1986, equivalent to nearly 60% fewer than expected, or 158 successful and unsuccessful incidents, equivalent to nearly 55% fewer than expected. By contrast, the **internal lower estimate** is modest (7 successful incidents prevented per year from 1984-6, or about 10% fewer incidents per year than would have been expected if the internal background fall had operated alone. For successes and failures combined, there are 8 incidents *more* than expected with reference to the internal background fall.

The latitude of uncertainty opened up by the three estimates is rather broad; narrowing the gap can only be attempted on the basis of informed judgement. The upper estimate of the reduction, which assumes no background fall, is probably too great – undoubtedly there were a number of major police operations against post office robbers at the same time as the security initiative. The internal lower estimate of the Post Office effect, based upon the 'internal background fall', is the most sensitive to any of the background influences on robbery rates in sub-post offices; but it is very probably too conservative. It excludes by definition any part of the total fall which may have resulted from a broad deterrent effect of the initiative. Unlike the direct effects of the initiative – for example making the screen harder to shatter – such a deterrent effect could have acted simply by arousing robbers' general fears that 'something or other had been done' to

(2) Exact values are used in all but the more general conclusions of this report because figures prepared at one stage of the discussion are often entered into further calculations, and it is therefore wise to keep avoidable sources of uncertainty, such as rounding, to a minimum.

Table 1: The estimates of the fall in robberies at sub-post offices attributable to the security initiative

	successful robberies reduced by	successful and unsuccessful robberies reduced by
external lower estimate (derived from MPD figures)	+87 (+59%)	+158 (+54%)
internal lower estimate (derived from attacks in sub-post offices outside secure area)	+7 (+10%)	–8 (–6%)
upper estimate (assumes no background fall)	+107 (+64%)	+198 (+62%)

Note 1) The numbers are annual rates of robberies estimated to have been prevented during the final phase (June 1984 - March 1986); the percentages are the number prevented as a proportion of the number expected if the background fall had operated alone (see Figure 5).

2) A + sign indicates preventive gain, ie a fall attributable to the security initiative; a – indicates a loss, ie that the robbery rate was greater than expected.

heighten security (factor c, page 8). The external lower estimate of the effect of the initiative, using the background fall based on the much larger numbers of MPD robberies (and corrected to allow for the possibility of displacement of robberies from sub-post offices to other commercial premises), is more reliable and allows the Post Office credit for the broad deterrent effect; it may however be less representative of influences on sub-post office robbers, so it is difficult to judge whether or not it is over-generous. In sum, the upper estimate is very probably too large; the internal lower estimate is very probably too small; and with the external lower estimate there are no good grounds for characterising it one way or the other. Taking these together, the best estimate is probably a little inclined towards the upper end of the range established - ie the security initiative cut the robberies by something over a third of their expected level, the reduction amounting to some 45 successful incidents per year.

Whichever estimate is used, the overall result of the security initiative is a greater preventive effect for successful robberies than when failed attempts are also taken into account.

What were the side effects of the security initiative?

Displacement within sub-post offices

In order to find out what is happening to the pattern of robberies within sub-post offices, it is necessary to look in greater detail at the changes in the rates of each of the individual methods of attack, over the peak to final phase. Table 2 shows rates of *successful* robberies for the various phases, by method of robbery, and the

percentage fall each method displays from peak to final phase. Although (as Figure 4 showed) there is a marked basic pattern common to all methods, the falls shown by the various methods nonetheless do differ significantly from one another (Chi-squared for the peak, decline and final phases = 16, df 8; p <.05). Therefore this method-to-method variation is unlikely to have stemmed from random fluctuation alone, and constitutes a reasonably sound base from which to make cautious interpretations of the pattern of events,

Table 2: Yearly rates of successful attacks on sub-post offices in London Postal Region, by method and phase

method	phase					
	pre-rise	rise	peak	decline	final	% fall peak to final
1 physical attack on anti-bandit screen	6.0 [10]	25.2 [21]	56.4 [47]	24.0 [51]	9.8 [18]	83
2 firearm threat at screen	1.8 [3]	13.2 [11]	24.0 [20]	16.8 [36]	15.8 [29]	34
3 insecure	2.4 [4]	8.4 [7]	24.0 [20]	7.2 [15]	6.0 [11]	75
4 outside secure area	13.8 [23]	33.6 [28]	58.8 [49]	38.4 [81]	26.7 [49]	55
5 miscellaneous	2.4 [4]	9.6 [8]	4.8 [4]	6.2 [13]	2.7 [5]	44

Note 1) The phases are of unequal length: pre-rise = 20 months; rise = 10 months; peak = 10 months; decline = 25 months; final =22 months.

2) The absolute number of attacks during the relevant phase is listed in square brackets.

3) Based on these absolute numbers (last 3 phases only) Chi-squared = 16, df 8; p <.05.

Table 3 shows the equivalent figures for *successful and unsuccessful* robberies combined; again the falls differ significantly from one another (Chi-squared = 16, df 8; p <.05). The step-by-step interpretations of the pattern of successes and failures shown by the various methods of attack are complicated. They are therefore set out in Appendix 2, where 'preventive gains' and 'preventive losses' for each individual method of attack are estimated relative to the internal background fall, in a manner similar to that employed in calculating the internal lower estimate of the impact of the security initiative on all methods combined.

As shown with a large degree of uncertainty in Appendix 2, the Post Office's security initiative appears to have succeeded in reducing considerably both the physical attacks on the screen, and the attacks which take advantage of insecurities such as open doors or hatches. In both cases, the reduction was achieved through a drop in the number of successful raids and not through a drop in failures,

Table 3: Yearly rates of successful and unsuccessful attacks on sub-post offices in London Postal Region, by method and phase

method	phase					% fall peak to final
	pre-rise	rise	peak	decline	final	
1 physical attack on anti-bandit screen	16.8 [28]	40.8 [34]	86.4 [72]	42.0 [88]	20.7 [38]	76
2 firearm threat at screen	13.8 [23]	38.4 [32]	102.0 [85]	64.8 [136]	55.1 [101]	46
3 insecure	3.6 [6]	8.4 [7]	27.6 [23]	9.6 [21]	8.2 [15]	70
4 outside secure area	18.6 [31]	48.0 [40]	100.8 [84]	61.2 [127]	38.2 [70]	62
5 miscellaneous	4.8 [8]	12.0 [10]	14.4 [12]	14.9 [31]	11.5 [21]	20

Note 1) The phases are of unequal length: pre-rise = 20 months; rise = 10 months; peak = 10 months; decline = 25 months; final = 22 months.

2) The absolute number of attacks during the relevant phase is listed in square brackets.

3) Based on these absolute numbers (last 3 phases only) Chi-squared = 16, df 8; $p < .05$.

ie raids aborted by the robbers. To be set against this, robbers turned to other methods of attack, mainly to simple firearm threats at the screen, but also to a miscellany of others. Fortunately all these methods had their drawbacks as far as the offender was concerned, for altogether twice as many of the 'extra' incidents using these methods were failures than successes.

If the improvement of physical and procedural security had been responsible for the falls in the physical attacks and the 'insecure' method, one might have expected to see a marked drop in the proportion of these incidents which were successful. A greater proportion of physical attacks should have ended in failure for example as the sledgehammers bounced off the now strengthened screens. (3)

Table 4 presents the absolute proportion successful of each method of attack, over the five phases. It shows that the expected drops in the proportion successful did occur, but only to a modest degree. The proportion of physical attacks successful, for example, fell from 0.65 at the peak to 0.47 at the final phase. (4)

(3) The proportions discussed here are the *absolute* proportions. The figures used in Appendix 2 in discussing success and failure by method of attack are relative to the background fall.

(4) If the level in the pre-rise phase (0.36) is taken as base instead of the peak level, there appears to have been in *increase* in the proportion of physical attacks successful. It is felt that this can be discounted, because it is reasonable to assume some discontinuity in the proportion successful with the arrival in the rise and peak phases of a new wave of offending, possibly committed by a new wave of offenders.

There are three explanations for this rather modest effect, which may be operating in concert. First, robbers do not always burst into sub-post offices with weapons or sledgehammers to the fore. Sometimes they enter with the intention of offending but pose as bona-fide customers until a suitable moment (some actually queue up as normal before declaring their hand). If some of those entering covertly are put off by the sight of the upgraded screens or improved security procedures, a number of 'failures' will thus go unrecorded. This will tend to reduce the number of *failures* in step with the fall in the number *successful,* and so mask the expected decrease in the proportion successful. The same goes for the second explanation, which stems from the nature of displacement once an attack has begun. After an initial setback when robbers find they cannot smash the screen or open the door or parcel hatch, sometimes, instead of admitting failure, the robbers turn there and then to the firearm threat at the screen and to a lesser extent, to a miscellany of other methods. The descriptions of the incidents show that a high proportion of robbers physically attacking the screen carried guns anyway; tactically, in some cases the shift to firearm threat at the screen involved the robber in little more than reversing his shotgun from butt first (when being used as a hammer) to barrel first. The third explanation is simply that the security initiative had its effect less through a direct impact on the *difficulty* of making attacks than through the *broad deterrent effect* discussed earlier. This explanation is consistent with the large disparity between the external and internal lower estimates of the preventive effect of the security initiative: the smaller size of the internal estimate may partly be due to its inability to register the deterrent effect, as discussed above (page 11).

Table 4: Proportion of attacks successful, by phase and method of attack

method	phase				
	pre-rise	rise	peak	decline	final
1 physical attack on anti-bandit screen	0.36	0.61	0.65	0.58	0.47
2 firearm threat at screen	0.13	0.34	0.24	0.27	0.29
3 insecure	0.67	1.0	0.87	0.71	0.73
4 outside secure area	0.74	0.70	0.59	0.64	0.70
5 miscellaneous	0.50	0.80	0.33	0.42	0.24

The role of firearms within sub-post offices

It remains to explain why the robbers' decision to turn to 'firearm' (and 'miscellaneous') methods more frequently results in failure than success. It is worth exploring this in some detail, as the robbers' displacement to the use of firearms in particular is seen as a general threat to the effectiveness of situational means of preventing robbery. Where the robbers' decision to switch methods may be

made on the spur of the moment, as an attempt to salvage something from the debacle, this 'instant displacement' gives no time for planning and rehearsal. Even if robbers have decided in advance to make a firearm threat the centrepiece of their attempt, a naive faith in the weapon may prevent them from adequately preparing for the raid, or encourage otherwise nervous or unskilled people to make the attempt. Whatever the case, relative to the other methods of attack firearms threats at the screen have a consistently high failure rate. As Table 4 shows, more than twice as many firearms threats at the screen fail as succeed.(5)

The presence of firearms might be expected to increase the likelihood of success of *any* method of robbing sub-post offices. However, looking at the methods of attack *other than* firearms threat at the screen (where firearms are always present by definition), we see that the presence or absence of a gun made no difference to the success rate. Taken together, these findings suggest that the gun is not always the 'equaliser' it is supposed to be. This runs contrary to some American findings for example by Skogan (1978). Conklin (1972) suggests however that robbers *not* using firearms actually bring their threats up to a similar level of intimidation to that so conveniently achieved with a gun, by deliberately pushing, shoving and shouting at victims. This would tend to mask the inherent advantage of firearms. Another factor possibly contributing to the present findings is that a number of the weapons used in sub-post offices were replicas, in some cases obvious ones. (6)

Unfortunately it was not possible to compare the effect of the presence of guns in sub-post offices with the effect in, say, building society offices or banks, so one cannot say whether sub-post offices are unique in showing no effect of the presence of guns on the success rate of attacks. However, on a broader level, national figures for armed raids in 1985 (Working Group on Commercial Robbery, 1986) show that raids on sub-post offices have a significantly higher failure rate (54%) than raids on high street banks (23%) and building societies (24%) (Chi-squared = 65, df 2; $p < 0.001$). The very small number of raids on crown post offices (failing on 42% of occasions) are rather more like the sub-post offices.

Several factors may explain this pattern. One may be the sub-postmasters and mistresses themselves. They may often be entrepreneurial, 'have a go' individuals with a personal stake in their shop, and a personal commitment to the Post Office. As such their response to a gun waved from the other side of the anti-bandit screen may be one of stubborn resistance, where they bravely call the bluff of what could be an ill-prepared robber on a knife edge between pressing home his attack or fleeing. In displaying such resistance they may be demonstrating considerable confidence in the efficacy of the screen against attack (a factor also

(5) Chi-squared on the total of each method of attack, combining all three phases, is 110, df 4; p = .001. Most of the chi-squared value comes from the firearms method.

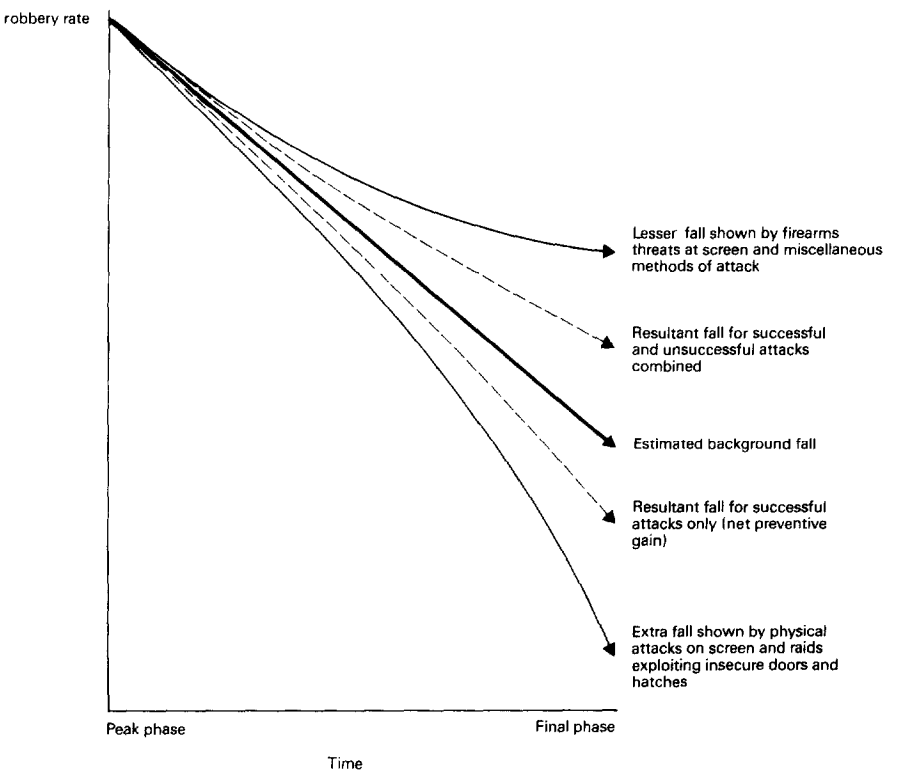
(6) The results of attacks on Post Office staff delivering money are however consistent with conventional wisdom: those involving firearms are half as likely again to be successful.

important in the reaction of building society staff to robberies – cf. Austin, in preparation) and in the consequences of sounding the audible bandit alarm. These alarms are fitted behind all counters and are considered by the Post Office Investigation Department to be a primary reason why so many attacks are unsuccessful. In the London area during the two-year period 1985 and 1986 the alarm was sounded on 150 occasions during an attack and on only 11 occasions was the attack continued; in all other cases the robbers immediately fled empty-handed. There is no evidence that activating the alarm has placed the staff in any danger.

A second factor may be the robbers themselves – those who choose to raid sub-post offices may be particularly inept individuals, whose reliance on guns is all the greater, and who may mistakenly believe that sub-post offices are easy targets. Indeed the apparent success of the audible bandit alarm could suggest that the robbers are often nervous and inexperienced individuals rather than 'professional villains'.

In conclusion, what is happening within London sub-post offices seems to be that there is a general fall in robberies, some of which is due perhaps to police action against offenders. Relative to this background fall, the security initiative

Figure 6 Schematic interpretation of the impact of the Post Office security initiative



has blocked methods of attack which in the past were successful, and in doing so has encouraged offenders to direct their efforts to methods that are more likely to fail. In many respects this can be considered a gain for the Post Office. However, one consequence of the displacement may be that the robbers are following the maxim of 'if at first you don't succeed…', and generating an excess of failures (an excess that, on the basis of the internal lower estimate of the background effect, more than wipes out the number of successes prevented). A visual impression of this pattern is presented in Figure 6. A related process – an increase in attempts masking a tailing-off in the growth of successful offences – may have occurred in domestic burglaries as measured by the British Crime Survey (Hough and Mo, 1986).

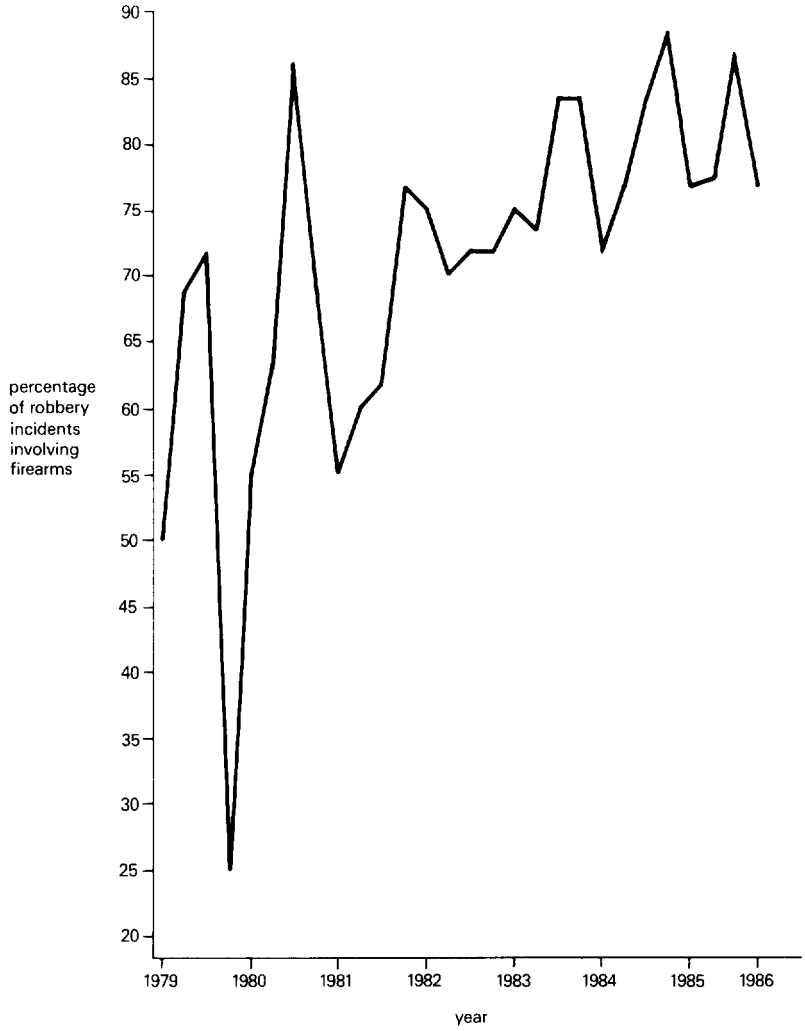
Are sub-post office staff worse off in real terms?

The reduction in successful attacks is a notable achievement; there are grounds too for believing that the Post Office initiative has not worsened the plight of the staff in exposing them to more failed attacks, or by encouraging offenders to carry guns. The vast majority of failed attacks, in the experience of Post Office Investigation staff, are over in far less than a minute and normally with no injuries. When the staff are able to feel that they have contributed to the 'defeat' of the robber, they gain confidence in the security procedures and facilities, and enjoy heightened morale both of which are likely to significantly offset any trauma.

On firearms, while the use of guns across all methods of attack seems to have increased steadily in recent years, the security initiative cannot be held fully responsible because the trend seems to have begun well before the programme started (Figure 7). Moreover, the shift to the firearm threat at the screen has not involved the 'conventional' image of displacement where target hardening of the screen leads robbers to go off and return with a gun. In two-thirds of the *physical* attacks on the screen robbers were carrying guns anyway. What has happened instead seems more like a *restriction* on the tactical alternatives open to the robbers than the addition of a new and more deadly resource: rather than fetching a gun as a response to the improved screen, they have abandoned their sledgehammers and have been forced to fall back on the gun that many of them were carrying as a second line of offence.

The threat of lethal force associated with firearms in the majority of raids contrasts markedly with the actual rate of injury. The proportion of robberies at sub-post offices that result in any kind of injury is very low. In the fiscal year 1985-6, 90% of robbery incidents passed without any injury (whether success or failure making little difference), 7% involved slight injury and 3% serious. Consistent with American research (Cook, 1982), robberies where guns are used are less likely than those involving other types of threat or force to injure: 94% of incidents with guns involved no injury compared with only 73% of incidents without guns (the whole pattern being statistically significant with Chi-squared = 10.65, df 2; $p < .005$). Moreover, injuries that did occur in gun incidents were

Figure 7 Proportion of robbery incidents within sub-post offices where firearms were involved, by quarter



Note 1) The earlier points fluctuate more strongly owing to the smaller numbers on which they are based.
2) Figures from POID records, London Postal Region.

far more likely to result from pushes or blows than from gunshot. In explanation, MacDonald (1975) suggests that when robbers use strong-arm methods alone (ie reliance on sheer physical strength and surprise, sometimes supplemented by a blunt instrument) the victims are more likely to 'have a go', and then get hurt. (7)

(7) Conklin (1972) studying a sample of robberies in Boston discusses the complex and interrelated issues of victim resistance, the level of intimidation offenders need to supplement the threat from their principal weapon and their unwillingness to step over the high threshold of actually using the weapon to wound.

On balance, it seems that as a result of the preventive initiative sub-post office staff may be very little worse off in terms of any trauma from the extra number of robbery attempts that fail. While firearms threats have tended to become the centrepiece of the robbers' technique they were likely to be present anyway – hence the staff are no worse off in terms of the probability of weapons being produced in any one incident, and the probability of injury per incident. However, American statistics suggest that on the rare occasion that a gun is fired at someone, the risks alter dramatically: Cook (1982) shows that fatal injuries are five times as likely with the use of guns (9 fatalities per thousand gun robberies compared with 1.7 fatal injuries per thousand non-gun robberies).

Displacement from sub-post offices to other Post Office targets

There remains the possibility that robbers, frustrated within the sub-post office, will turn their attention to other, less well-defended targets. The closest alternative target, as far as the Post Office is concerned, is the daily delivery of cash and other valuables to sub-post offices by official mail vehicles. Robbers generally lie in wait for the van and spring out on the PO staff as they are carrying the valuables across the pavement to the sub-office.

Figure 2 (page 3) shows that whilst the within-sub-post office robberies declined, delivery raids rose; they reached 42 per year in the final phase, of which 32 were successful. (8)

The key question here is, was the increase in the delivery raids a *result* of the security initiative or was it *coincidental?* There are two reasons for believing it to be at least partly coincidental.

First, the rise in delivery raids was not confined to the Post Office. In Figure 2, the MPD raids on cash-in-transit show a similar increase. It is possible that the impetus for growth in robberies in the Post Office and elsewhere has come as much from 'pull' as 'push' – that is, as much from robbers themselves being attracted away to richer pickings, as from robbers being thwarted in their attacks on premises such as sub-post offices. There are indications from the plots of both sub-post office delivery raids and MPD cash-in-transit robberies that the rise in both types of offence began *before* the Post Office's security initiative.

Second, Post Office Investigation Department officials believe that the offenders conducting delivery raids are in part a different set of individuals or gangs from those involved in the within-sub-post office robberies: the former, whilst more often successful and involving larger sums of money (Working Group on Commercial Robbery, 1986), require much more planning and accurately timed

(8) For successful robberies within sub-post offices, this more than neutralises the estimate of the preventive gain based upon the 'internal background fall'; for successes and failures combined, it drives the net figure further into loss. The result is not so discouraging for the external lower estimate, where the net saving is 55 (87 minus 32) successful robberies per year, and 116 (158 minus 42) successes and failures combined.

execution. While some offenders progress from sub-post office raids to delivery raids this is seen as more a case of 'career development' – in terms of greater returns from greater investment in planning and skill – than of displacement from a favoured target. While the security initiative may have forced some robbers to progress in this way, it is equally likely to have caused others, with less ability to shift to the more demanding and sophisticated delivery raids, to dropout. Unfortunately it was not possible to study offender records to settle the issue.

Displacement beyond the Post Office

Another question is whether or not the community as a whole has gained from the Post Office security initiative: will the frustrated sub-post office robbers simply move on to attack other targets? The answer will turn on the extent to which robbers fit the stereotype of the determined professional who, it is assumed, will relentlessly seek out other targets if baulked in his current choice. Little research has been done in this area though Conklin (1972) and Walsh (1986) find they can divide commercial robbers into planners (or professionals) and opportunists. From the Post Office data, the accounts of the incidents studied suggest that many of the robberies were clumsily executed and frequently ended in farce, with quite a number of the robbers, despite their guns, being easily deposed from their initial command of the situation (one, for example, who waved a gun at a sub-postmaster behind the screen and demanded money, fled on being informed that the Post Office section of the shop was closed; another ran off when the handle to the safe came off in his grasp). Such robbers may turn to other targets, like building societies, but as each successive opportunity for robbery is first discovered by the robbers and then made more secure by its defenders, the longer-term trend is one in which the risk-and-effort-to-reward ratio of *all* society's opportunities for robbery slowly but inexorably increases, and a progressively higher proportion of robbers choose to drop out entirely rather than try to increase their level of organisation, skill and firepower. This may be a slow and haphazard process, and there may be some advantage to the community of handlers of commercial sums of cash – banks, building societies, the Post Office, and security delivery firms – if they sought to coordinate security measures, rather than in effect seeking simply to 'pass the parcel' by displacing robbers to other organisations, and hoping none will be displaced onto them in their turn. Such a coordinated approach has been recommended in the recent report by the Home Office Standing Conference Working Group on Commercial Robbery (Home Office, 1986).

Cost effectiveness

Assessing the cost effectiveness of the screen upgrading programme is not easy, as some of the more important benefits are imponderable or intangible. Taking the tangible ones first, on the *cost* side, the security initiative amounted to £2.2 millions of which about £1.4 millions was spent on improvements to the

screens themselves. on the *benefit* side, one can calculate financial savings from the average haul in a successful robbery during the decline and final phases, and estimates of the number of robberies prevented. With the *external lower estimate,* the scheme has already paid for itself and is yielding a handsome return on investment of approximately 50% at current robbery rates. With the *internal lower estimate,* about a seventh of the initial cost has been recouped; the scheme appears to break even only after some 20 years. On the basis of the *upper estimate* of the preventive effect, the scheme is yielding a 65% return on investment at current robbery rates. With all of these estimates it is assumed, probably unrealistically, that a) the number of robberies prevented in each year from now onwards will remain constant and b) the increase in the more lucrative delivery raids was a wholly incidental development rather than a consequence of the upgrading programme. Despite the latter qualification, it is judged reasonable to evaluate the sub-post office initiative on its own terms, as the existence of vulnerabilities within the cash-in-transit area does not seem good grounds for failing to attend to the vulnerabilities in premises which handle cash.

Imponderable and intangible *costs* include a move towards more direct use of firearm threats at the screen. While making threats with a firearm is a more serious matter as far as the courts are concerned, as the earlier discussion suggested, the likelihood of injury to those threatened is actually less; and it is likely that the guns would have been present anyway, although not playing such a central role in the robbery incident. With fewer robberies (and fewer still successful ones) the trauma to the victims will have been reduced. In the longer term, a poorer reward-to-risk ratio for the robbers may discourage them from robbing post offices again. This would bring with it decreased risk for sub-post office staff and their customers and may make the difference between a particularly victimised branch remaining open, or closing with consequent loss of amenity, revenue and employment. Finally, taking the broadest view of the initiative, it is perfectly possible – but completely unknowable – that had the Post Office not moved into check the robbery wave (and had the police not also acted), the level would have continued to grow as more and more robbers moved in to exploit the continuing weaknesses in the security of sub-post offices. The fact that the current level of robbery is still higher than the pre-peak level has to be seen in this light: it is not a sign of failure but of a wave of offending countered and brought under control.

Next moves for the Post Office

The Post Office has already taken steps to introduce similar security measures in other parts of the UK. Following detailed analysis of incidents in the provinces the security measures at some 2,400 sub-post offices, out of a total of 18,000, have been upgraded. These provincial offices were selected because of their location and vulnerability to attack.

A degree of control of the current problem should not lead to complacency however. The robbery scene is always changing as robbers and defenders

continually shift ground, and technological developments give one or the other side momentary advantage. In the case of sub-post offices, there is always the possibility that the current drop in robberies is no more than a 'holding period' while robbers cast about for more effective tactics or lie low as a result of the broad deterrent effect of the security initiative. The more skilled and determined robbers seem currently to be favouring delivery raids; once the Post Office (and other agencies) has made these less vulnerable in their turn, some of the 'harder men' may return to the sub-post offices, perhaps to exploit the hostage-taking method. The Post Office, like other cash-handling agencies and indeed the police, will always be somewhat behind the developments in robbery methods, as the initiative here lies with the robbers, and it takes time both to reliably detect the emergence of a new pattern and then to devise and implement a response. However, the lag before an intelligently targeted response is made can be greatly reduced by the Post Office's use of crime analysis on a routine basis; computerisation of robbery incident records would make this still faster and easier.

Final Points

It is uncertain how far the results of this evaluation can be generalised to other sites to be protected from robbery, such as building societies or banks, where attacks have a much lower failure rate. But in principle it seems reasonable to conclude that robbery can be reduced by a blend of target-hardening strategies and improvements in security procedures appropriate to the particular sites to be protected, and their particular vulnerabilities. It is also apparent that changing the situation in which the offence is committed will differentially affect the various methods of offending. This must be taken into account when information on crimes is analysed to suggest preventive measures which might be taken, and when the impact of those measures is evaluated. While some displacement of attacks to other methods and other targets is likely, at least in the short term, it is not inevitable, and as has been seen does not guarantee the robbers success.

This study has illustrated the evaluation of a crime prevention initiative as an exploratory process, with a sequence of questions to be answered as best one can by drawing on whatever data is available and dealing with obstacles and ambiguities. During this process one attempts to make numerical estimates of changes and to keep track of uncertainty. In doing so one must strike a sensible balance between attending to the uncertainty that comes from statistical sources, versus that which originates elsewhere, such as the difficulty of apportioning responsibility between the various possible causes of the fall in crime levels. It is feasible to cope with a fairly wide latitude of uncertainty, as this study has done, although this is not a soft option for the evaluator (nor for the managers who will use the results) – it needs a professional input and the application of reasoned judgement to arrive at the most plausible answer, rather than the following of a simple recipe. But as the weary reader may acknowledge, it is even better to reduce uncertainty by using an experimental design rather than a retrospective evaluation.

Appendix 1

Choice of indicators of the background fall and calculation of the estimates of the fall in robberies due to the security initiative

As the main text explains, in estimating the proportion of the total fall in robberies that can be accredited to the security initiative, two lower figures and an upper one will be derived. The two lower figures are calculated on the basis of two different indicators of the background fall, an external indicator and an internal one. The first section of this appendix describes the grounds for choosing these indicators. The second section presents the actual calculations for all the estimates, in which the background falls are subtracted from the total fall in robbery rates.

Choice of indicators for the background fall

a) The external indicator for the background fall

The external background indicator chosen is derived from the level of robberies of business premises in the Metropolitan Police District of London. (By comparison very few business robberies occurred in the City of London so these were not included.) Because the MPD figures included the sub-post office figures, the indicator was produced by subtracting these from the corresponding monthly totals obtained from the Metropolitan Police. The plots of the external background indicator and the sub-post office robberies are compared in Figure A1.1.

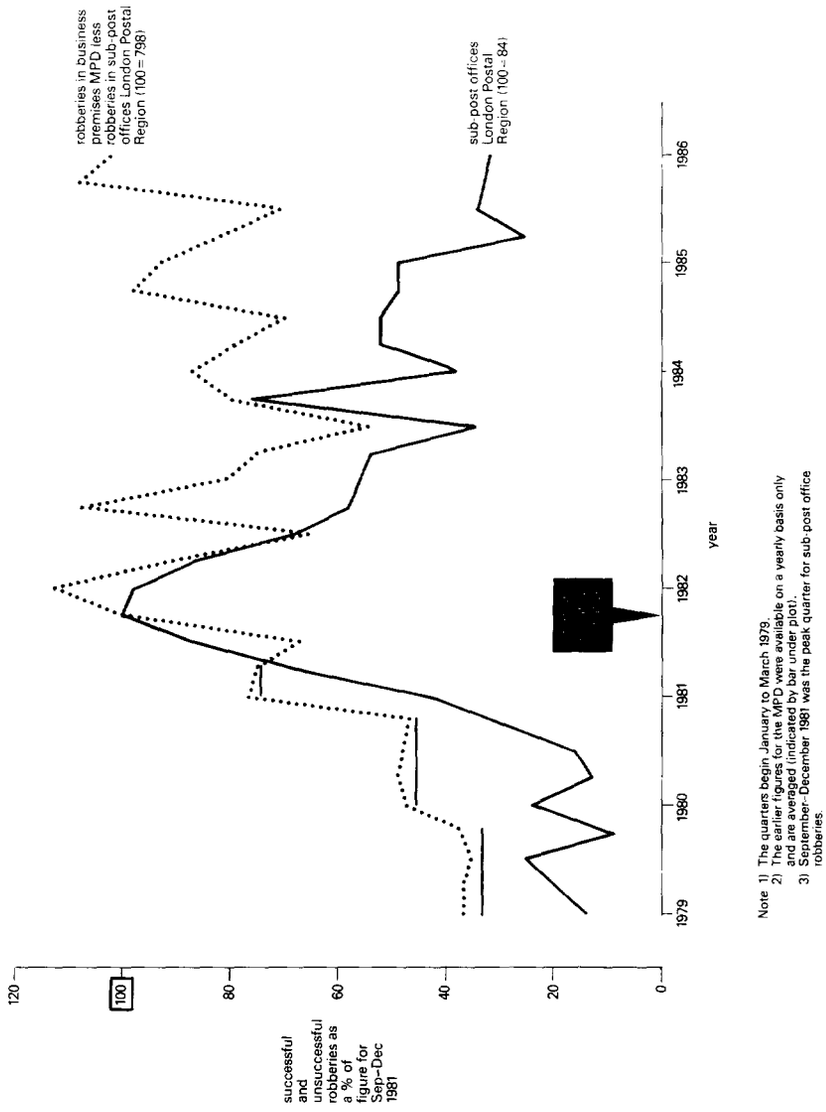
As Figure A1.1 shows, the other business robberies behave in a broadly similar way to the sub-post office raids, suggesting that some of the fall in the rate of the latter was indeed due to background changes that affected all robberies in the London region. The MPD figures do not provide an ideal indicator, as they could have been the province of different sets of criminals (eg bank raiders, factory wage robbers) and could have excited different levels of response on the part of the police. In addition, the MPD area is somewhat smaller than the London Postal Region, which stretches, for example, as far as St Albans. For these reasons it is helpful to have the other perspective on background changes which is very much closer geographically, and situationally, to the sub-post offices themselves.

b) The internal indicator for the background fall

Out of all the methods used to attack sub-post offices, it is possible to identify the one which is least likely to have been affected by the security initiative. The fall in the rate of this method of robbery can then be used as the second indicator of the background fall.

The most appropriate internal indicator of the background fall is the robbery method of threats to staff and customers *outside* the secure area. Logically it

Figure A1.1 Sub-post office robberies and other robberies at business premises compared, by quarter



cannot be directly affected by a physical improvement in the secure area itself: however good the anti-bandit screen, there will always be vulnerable people outside it, whether staff serving in the non-post office part of the shop, or customers awaiting service. Nor are attacks outside the secure area very likely to be reduced by a general tightening of security practice, as the staff cannot avoid spending time there, and the customers will frequently be present.

Like its external counterpart, the internal background indicator is not perfect; but the consequent errors in the estimates it produces are different. It excludes from the estimate any broad deterrent effect on robbers caused by their suspicion

that ‘something has been done’ to boost security in sub-post offices (factor c in the main text, page 8). Such deterrence could be expected to influence the indicator method to the same degree as the other robbery methods. It will therefore underestimate the preventive effect of the security initiative; more so than the external background indicator. The estimate could also be affected if robbers change from making physical attacks on the screen to employing the indicator method itself. The present evaluation assumes that this is of minimal significance as quite a change in technique is required (and as will be seen, the robbers have another method of attack to which they turn – the firearms threat at the screen – which is sufficiently similar to the physical attack as to be considered no more than a tactical shift). Consistent with this, the proportion of robberies using the indicator method remains virtually unaltered at about 30% from the robbery peak to the present time, while the other methods swell or shrink markedly.

Calculating the various estimates

Calculating the estimate of the fall due to the security initiative first requires the establishment of precise figures for the peak and the final robbery rates, so that the one can be compared with the other to yield the total fall. Second, it involves deriving the alternative values for the background fall; and third, subtracting each of these figures from the total fall. Figure 5 (main text, page 9) gives an overview of the process and the principal equations involved. Before moving on to the calculations themselves, three further points are in order. The calculations are done to one decimal place and rounded, which makes several of the additions and subtractions apparently one unit out. The fact that exact figures are necessarily used in the calculations should not be taken to imply a similar level of accuracy in the estimates, because the various sources of uncertainty are too great; besides the calculations themselves each stage involves an element of judgement.

a) Establishing appropriate values for peak and final robbery rates

The establishment of peak and final rates must be done in the face of conflicting constraints. On the one hand the figures derived must be sensitive to the real changes in robbery rates, whilst on the other they must try to minimise the statistical uncertainty due to random fluctuation. (This is akin to the problem of trying to get better performance out of a radio: if one increases the sensitivity of the receiver one does obtain a stronger signal from the transmissions, but the inevitable penalty is a matching increase in random background ‘noise’.) The problem is particularly acute for the peak rate, because the peak seems to be so sharp and short-lived. The shorter the time period over which the peak figure is calculated, the more likely it is that it partly owes its high value to random fluctuation. It would thus be a less reliable figure, statistically speaking, and one would be open to criticism for ‘fishing’ for the highest point in the plot with which to get the most impressive estimate for the fall. Calculating the peak over a longer time period would improve the reliability of the figure, but would

significantly reduce the sensitivity of the estimation procedure – and in so doing flatten the appearance of the plot and reduce the peak value to an unrepresentative level. Because the value of the total fall would consequently be reduced, all the estimates of the effect of the security initiative would be too conservative.

An attempt to strike a compromise between statistical reliability and sensitivity to the 'true' pattern was made by first increasing the sensitivity of the picture of the changing robbery rates, by 'zooming in' on the plot of *monthly* robbery rates, and then aggregating the robbery figures into *phases*, by sight from the plot, Figure A1.2 shows the phases on a yearly plot for clarity. (A1.1)

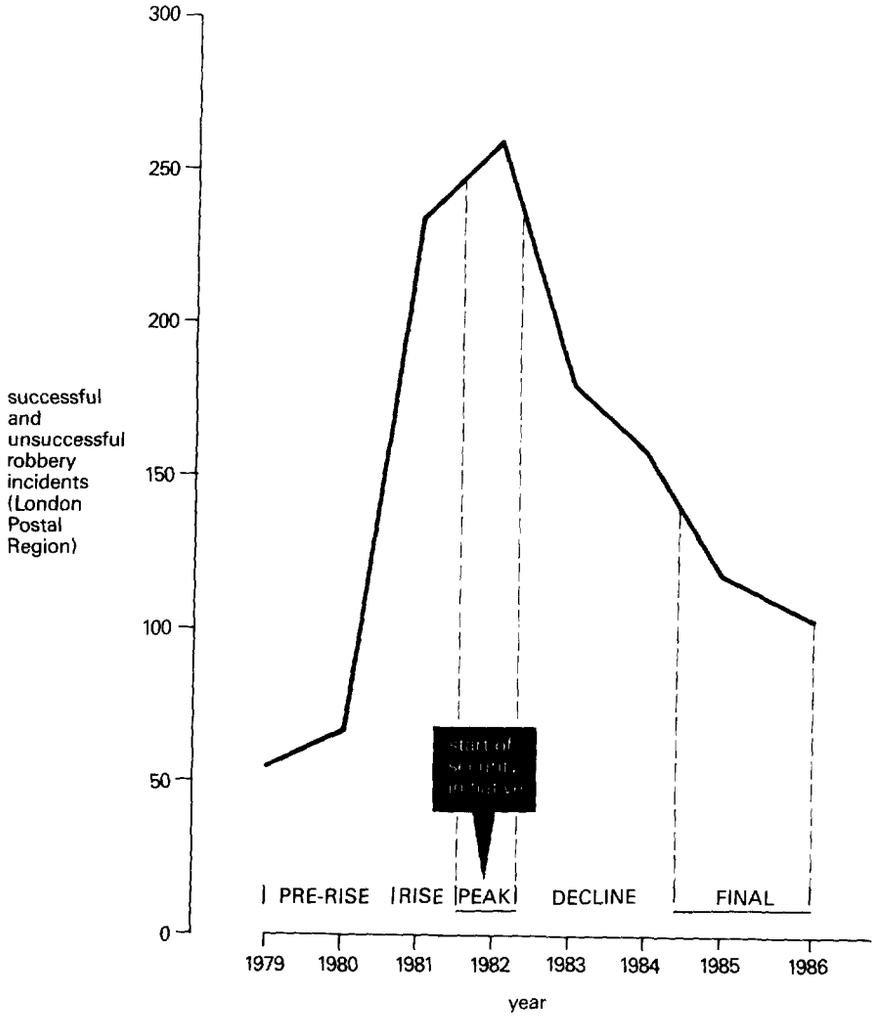
The phases constructed in this way are pre-rise (20 months), rise (10 months), peak (10 months), decline (25 months) and final (22 months). The resultant figures for each phase are presented in the main text in Tables 2 (successful robberies) and 3 (successful and unsuccessful robberies), in the form of yearly rates of robbery for each of the methods of attack, together with the absolute numbers of incidents on which each figure is based. The absolute numbers give some idea of the reliability of the robbery rates derived from them. The peak figures are taken from some 10 months' worth of consistently high levels of robbery. For successful and unsuccessful robberies combined the absolute numbers on which they rest range from about 70 to 80 incidents for each of the three main methods of attack; and about 20 to 50 for successful robberies only. These figures are judged reasonably reliable. It was possible to aggregate the 'final' values for the robbery rates over a longer period (22 months) because the change in rates at this stage appears much slower than at the peak, and the conflict between reliability and representativeness is therefore relaxed.

b) Establishing the size of the background fall

With both external and internal indicators it was judged appropriate to use the combined figure for successful robberies and failures, rather than that for successes alone, since background factors can be expected to affect the rate of attacks irrespective of whether or not these succeed. With the external background indicator, aggregating the monthly figures for robberies on business premises in the MPD into the same phases as before, and subtracting the corresponding sub-post office robbery totals, this shows a fall from 2963 per year in the peak phase to 2804 in the final phase, ie 159 incidents per year. In percentage terms this is only 5%. If there has been any *displacement* of robberies from sub-post offices to other business premises, this figure will be too low, since displacement would have had the effect of *reducing the fall* in the MPD figures. It is impossible to measure the amount of displacement that actually

(A1.1) Had the appropriate statistical software been available. It would have been better to use the technique of 'spline regression' (Block et al, 1983) to derive the phases with more objective regard to statistical reliability. A computer program splits the line of the plot into several segments which best describe the ups and downs of the line; as the authors make clear however, this approach does not avoid the need to make reasoned judgments.

Figure A1.2 Number of successful and unsuccessful robbery incidents by year, with phases superimposed



Note 1) The 1986 figure is annualised on the basis of 3 months' records.
2) The peak phase is 10 months long; the final phase 22 months.

occurred, but assuming, conservatively, that the maximum possible happened, an adjusted estimate of the external background fall can be made. The maximum possible displacement simply equals the total fall in the rate of sub-post office robberies from peak to final phase – in other words, all the robberies that would have been committed in sub-post offices are now committed at other premises in the region. Subtracting this figure (198 per year) from the final level of the external background indicator gives a revised final level of 2606. Subtracting

this in turn from the peak rate of 2963 gives a fall of 357 or 12%. This figure will be used as the external background fall.

The fall shown by the internal background indicator (attacks outside the secure area) was 62% for successful and unsuccessful attacks combined. This is taken as the internal background fall. This is a substantially larger background fall than that derived from the external background indicator – a finding consistent with the observation above (page 11) that using the internal background indicator may give insufficient credit for the fall to the security initiative.

c) Estimating the fall in successful robberies due to the security initiative

c.1) Successful robberies

The figures for successful robberies are taken from Table 2, main text.

c.1.1) External lower estimate

If the original 168 attacks had fallen by the same degree as the external background indicator – 12% – they would only have fallen by 20 per year. This is the external background fall, and subtracting it from the total fall of 107 yields a fall due to the security initiative of 87 robberies per year. This is the **external lower estimate.** There are several ways of presenting the results for purposes of comparison, but it is judged closest to the 'spirit' of crime prevention if the fall attributable to the security initiative is converted to a proportion of the robbery level that would have been *expected* in the final phase if the security initiative had not occurred (see Figure 5, main text, page 9). The expected level can be regarded as the robbery rate which would have been observed if the background factors had operated alone. The final level expected if the background effect had operated alone equals (168 – 20 or) 148. As a proportion of this expected level, the fall due to the security initiative is 59%.

c.1.2) Internal lower estimate

In calculating the internal lower estimate a similar approach is used, with a slight variation introduced because the internal background indicator originates as the rate of one of the methods of robbing sub-post offices. As such it has been defined out of consideration in estimating the total fall. One can therefore only base the total fall on the robberies which were committed by the other methods of attack (that is methods 1, 2, 3 and 5 in the main text, page 4). Together these robberies fell from 109 per year to 34, a fall of 75. The internal background fall was earlier estimated to be 62%, and if the other methods of attack had fallen by this degree they would only have fallen by 68 per year. The difference between the total fall and the background fall is 7. The **internal lower estimate** of the effect of the security initiative is thus 7 successful robberies prevented in each year. In converting the estimate of the preventive effect to percentage terms, the expected final level must now include the robberies committed using the indicator method, for comparability with the other estimates. The expected final level was

68 per year *(27* from the indicator method (outside secure area) + 41 other robberies); as a proportion of this, the preventive effect was 10%.

c.1.3) Upper estimate

The number of robberies was 168 per year in the peak phase, which fell to 61 in the final phase. The total fall therefore amounts to 107 robberies per year. This figure also provides the **upper estimate** of the fall due to the security initiative because it was assumed here that there were no background changes. For the same reason, the expected level in the final phase was the same as the peak level, namely 168 incidents per year. As a proportion of this expected level, the fall due to the security initiative (107) was 64%.

In sum, the external lower estimate for successful robberies prevented by the security initiative in each year of the final phase is 59% (87 robberies); the internal lower estimate is 10% (7 robberies); and the upper estimate is 64% (107 robberies).

c.2) Successful and unsuccessful robberies combined

The three estimates for successful and unsuccessful robberies combined are arrived at by identical means to their successful counterparts above. The relevant figures on which the estimates are based are presented in Table 3, main text.

c.2.1) External lower estimate

If the original 331 attacks had fallen by the same degree as the external background indicator – 12% – they would only have fallen by 40 per year. The difference between this background fall and the total fall of 198 is 158. The **external lower estimate** of the effect of the security initiative is thus 158 successful robberies prevented in each recent year. As a proportion of the expected final level of successful robberies (331 – 40 or) 291, the fall is 54%.

c.2.2) Internal lower estimate

With successes and failures combined from robbery methods 1, 2, 3 and 5, the robbery rate declined from 230 incidents per year to 95, a fail of 135, which is slightly *smaller* than the internal background fall of 143.

Thus in the final phase although robberies fell, there were still 8 more per year than would have been expected. With the **internal lower estimate,** therefore, there is no preventive effect; indeed, the level of robbery incidents is 6% more than expected.

c.2.3) Upper estimate

The total number of incidents per year in the peak phase was 331, which fell to 134 in the final phase, The **upper estimate is** a fall of 198 per year, or a preventive effect of 62%.

In sum, the upper estimate for successful and unsuccessful robberies prevented by the security initiative in each year of the final phase is 62% (198 robberies); the external lower estimate is 54% (158 robberies); but the internal lower estimate is 6% (8 robberies) *greater* than expected on the basis of the background fall.

Appendix 2

Interpreting the pattern of falls shown by the various methods of attack

The aim of the exercise is to interpret the pattern of falls shown by the different methods of attack, for successes and for failures. The key figures are the 'preventive gains and losses' similar to those referred to in the main text. Preventive gains and losses are calculated from the difference between a) the actual fall from peak to final phases shown by a given set of robberies, and b) the fall expected if the background factors had operated alone. A preventive gain means that the robbery rate has been reduced in relation to the background fall, and that the security initiative has left the Post Office better off than it would otherwise have been; a preventive loss, although sounding rather strange, means that the robbery rate has increased in relation to the background fall, and that the security initiative seems to have left the Post Office actually worse off than it would otherwise have been. The magnitude of the background fall means though that the PO is almost never worse off in absolute terms.

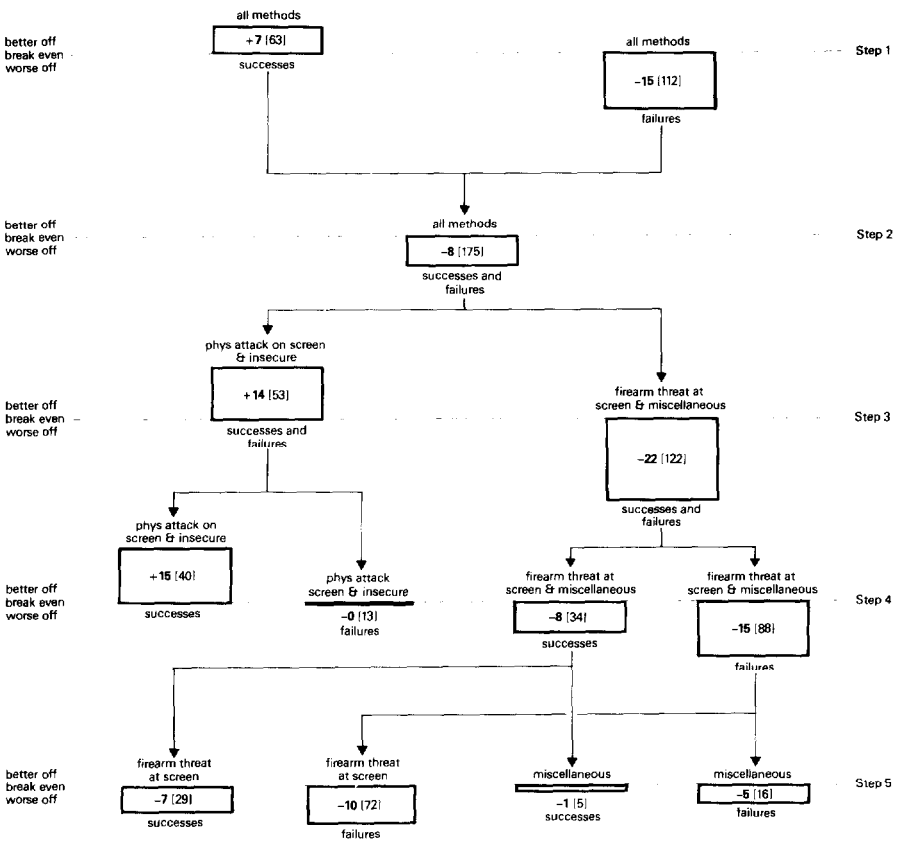
To calculate the expected fall, the internal background indicator – customers or staff attacked outside the secure area – is used in preference to the external background indicator. It is situationally very close to the other methods of robbery in sub-post offices (and therefore more sensitive to influences on sub-post offices in particular) and its frequency relative to the other methods remains quite stable throughout the study period. The likelihood that the internal background indicator fails to register any broad deterrent effect of the security initiative (see Appendix 1), now becomes an advantage as it highlights the *distinctions* between the changes in the rates of the various robbery methods rather than a change which may be common to them all.

In seeking to interpret the pattern of preventive gains and losses obtained, the approach used is to begin with relatively global sets of gains and losses – for example, the gain shown by all successful incidents (for all methods of attack) – and to split them into progressively smaller subsets representing, for example, the gain shown by physical attacks on the screen plus attacks on insecure doors and hatches, that end in success. The decision to split the gains and losses one way rather than another was made with the aim of highlighting similarities and differences between particular subsets of robberies. (The attacks outside the secure area are omitted in all cases since they constitute, as said, the internal background indicator, and provide the 'expected background fall' as a reference level.)

The process of splitting is illustrated in Figure A2.1, where preventive gains and losses are shown with reference to a 'break even' point. This point represents a state of affairs where the robberies in question fell by exactly the same degree as expected on the basis of the background fall; above it, in a box, are preventive gains (denoted with a '+' sign); below it are preventive losses (denoted with a

'–' sign). The numbers in each box are small, but they are difference scores, not absolute robbery rates; moreover, the numbers on which they are based are fairly large, because the annual rates used in comparison have been compressed from the numbers of robberies occurring in the 22 months of the final phase. The values of the actual numbers of incidents occurring in the final phase are shown in the boxes in brackets, and some of them appear also in Tables 2 and 3.

Figure A2.1 Preventive gains and losses



Note 1) The bold numbers in the boxes are the preventive gains (+) and losses (–) as defined in the text.
2) The numbers in brackets are the 'actual' numbers in the final phase, from which the preventive gains and losses are calculated.
3) 'All methods' in fact excludes the attacks on staff and customers outside the security area, for reasons explained in the text.

The splitting process

Step 1

The grand total number of successful robberies prevented per year, or preventive gain, is estimated at 7. When failures are examined, however, the Post Office is worse off by 15 incidents per year.

Step *2*

Successes and failures combined result in a net preventive loss of 8 incidents per year.

Step 3

Splitting successes and failures combined, by method of attack, the methods which show reductions in crime are the physical attacks on the screen (method 1) and the attacks via insecure doors and hatches (method 3). Together these add up to a preventive gain of 14. The preventive losses on the other hand derive from methods 2 and 5: firearm threats at the screen and miscellaneous means of attack. together these add up to 22. This figure probably represents the side-effect of the security initiative, with the robbers displacing their methods by turning away from physical attacks on screens and exploitation of insecure doors and hatches in favour of using firearm threats and a miscellany of other strategies. Displacement normally serves to reduce or at most neutralise any direct preventive gains. In the present case, however, it appears that the security initiative had an 'excess' displacement effect that increased the number of robbery incidents to such a degree that the net outcome was a preventive loss of 8 – that is, there were 8 *more* robbery incidents occurring than expected. To explore this more fully, the final steps in the splitting process involve looking separately at successes and failures by method.

Step 4

With the two methods that demonstrate a net preventive gain, most of this gain comes from a reduction in successful incidents, and little or none from a reduction in failures. Taking together the two methods that demonstrate the net loss, however, while there are quite a few (8) more successful incidents occurring than expected for these methods, about twice as many of the extra losses (15) stem from the failures.

Step 5

Looking separately at the two methods that show the loss, for the firearms threats at the screen, there are somewhat more excess failures (10) than excess successes (7); but for the 'miscellaneous' methods of attack, there are many more excess failures (5) than successes (1).

An interpretation of this pattern is that the overall preventive loss observed in sub-post office robberies when successes and failures are taken together, results from a displacement from physical attacks at the screen and attacks exploiting insecure doors and hatches, in favour of firearm threats at the screen and a miscellany of other strategies. The displacement, moreover, has been from successful attacks by the first two methods, to failures by the second two. It is plausible that the excess displacement of failures results from the robbers' desire to 'try, try and try again'.

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