LINK Scheme Ltd

An analysis of the impact of proposed changes to the LINK Scheme's multilateral interchange fees on non-branch free-to-use ATMs in the UK

KPMG LLP

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This report contains 24 pages

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1 Important notice

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The opinions and conclusions expressed in this report are (subject to the foregoing) those of KPMG and do not necessarily align with those of LINK.

2 Introduction

The Board of LINK Scheme Holdings Ltd ("LINK") has proposed a change to the level of multilateral interchange fees (MIFs) charged for ATM transactions completed via LINK free-to-use (FTU)[1] ATMs, and circulated the proposed change for consultation to LINK Scheme members in November 2017.

The LINK Scheme is the UK's largest cash machine network,[2] and is operated by LINK. The LINK Scheme currently has 37 member organisations, who can access the network and route ATM transactions through it. LINK informed us that most ATMs that are connected to the LINK network are also Visa and Mastercard enabled, and transactions made using credit cards or foreign payment cards are typically routed through these networks.[3] LINK Scheme members include issuer-deployers (members who issue cards that route transactions through LINK and who deploy LINK-enabled ATMs) and independent ATM deployers (IADs) who do not issue payment cards, but only deploy LINK-enabled ATMs.

LINK currently sets four 'standard' MIFs for its members, depending on the type of transaction taking place:

- non-branch cash MIF – charged for cash withdrawals at ATMs located in a venue other than a bank branch;
- non-branch non-cash MIF – charged for non-cash transactions (balance inquiries) at ATMs located in a venue other than a bank branch;
- branch cash MIF – charged for cash withdrawals at ATMs located in a bank branch;
- branch non-cash MIF – charged for non-cash transactions at ATMs located in a bank branch.

MIFs are paid to ATM deployers by card issuers on a per-transaction basis.[4] While 98% of cash withdrawals in the UK are carried out at FTU ATMs,[5] some ATMs connected to the LINK Scheme sur-charge customers for transactions (i.e., are not

[1] Free-to-use ATMs are those ATMs connected to the LINK network which do not directly charge the customer for usage. Rather, these ATMs collect revenue via a MIF that is paid to the ATM deployer by the issuer of a customer's card.
[2] https://www.link.co.uk/about/intro/
[3] ATMs that are Visa and Mastercard enabled also earn interchange revenue from the Visa and Mastercard schemes for respective transactions that occur through those networks. Visa and Mastercard enabled ATMs may also earn revenue from dynamic currency conversion (DCC) for withdrawals made using foreign cards.
[4] For example, for cash transactions, the same MIF is charged per transaction regardless of the value of cash being withdrawn.
[5] https://www.psr.org.uk/psr-focus/the-UK-ATM-network

FTU) and these 'pay-to-use' (PTU) ATMs are not eligible for revenue from LINK MIFs ('LINK revenue') on cash transactions.[6] Transactions where the issuer of a customer's card is the same as the ATM deployer ('on us transactions') are not processed via the LINK network, and as such also do not receive LINK revenue.

At present, LINK also operates a Financial Inclusion Programme (FIP), which provides a subsidy of 10p in addition to the standard MIF per cash transaction for transactions made at ATMs in low income areas where transaction volumes are not high enough to support an FTU ATM under standard MIF rates.[7]

The proposed changes would see a 20% reduction from the standard MIF levels in place as at January 2018, across all four standard MIFs set for LINK Scheme members. This reduction would be achieved through four reductions of a value equal to 5% of the current MIF levels, starting in July 2018. The proposed values for the MIFs are in Table 1 below, and if the proposal is implemented, LINK has informed us that it will review the proposed changes over the period of implementation and may adjust the MIFs as it sees necessary. LINK informed us that the first two reductions are likely to be firm targets, while the overall 20% decrease over the four year period is subject to review and not a firm target.[8]

Table 1 LINK MIFs and proposed changes (pence per transaction)

[Table redacted as interchange rates are Commercially Confidential]

Sources: LINK data and LINK Cost Study (2016)[9].

LINK considers that it is possible that the proposed changes to the standard MIFs will lead to a decrease in the number of machines in the FTU ATM network in the UK.

In addition to the proposed changes to the standard MIFs, LINK has announced that it will be strengthening the FIP which is intended to provide free access to cash

[6] PTU machines do however receive LINK MIF revenue for balance enquiries.
[7] https://www.link.co.uk/initiatives/financial-inclusion/
[8] Changes to MIFs are proposed to occur in July 2018, and then in January 2019, January 2020 and January 2021.
[9] "The LINK MIF is based on an annual cost survey of the LINK Membership carried out by independent and reputable firms with relevant experience, on behalf of the LINK Board. The methodology which is employed constructs weighted averages for the relevant cost categories, reflecting the total costs of supporting all activity processed through the ATMs. The cost information gathered from Members is compared for reasonableness and consistency, both between Members and with previous cost reviews. The derived average unit cost is then taken to represent the underlying cost of supporting the total volume of activity across the LINK ATM network." Office of Fair Trading (2001), 'Decision of the Director General of Fair Trading - LINK Interchange Network Limited', 16 October, p. 47. To date, LINK MIFs are set using this method, with a cost study/ survey conducted each year which identifies the MIF which will be set from 1 January of the next year: the 2016 study identifies the LINK MIFs which are put in place starting 1 January 2017, and also reports the MIFs in place in 2016.

via ATMs in particular areas of the UK where otherwise financial inclusion may be at risk. LINK has committed to maintaining open all ATMs that are currently located at a distance greater than 1 kilometre from the next free to use ATM.[10] The strengthened FIP is intended to protect machines which provide access to cash in a particular area, and ensure that they will remain open and FTU for customers who otherwise would have little or no alternative for accessing cash. Data on the distance from each FTU ATM to the next FTU ATM has been provided by LINK, and indicates that as of September 2017 there were around 2,000 FTU ATMs that were 1km or more from the next FTU ATM.[11]

LINK has asked KPMG to consider what analysis could be conducted that would help to quantify the expected impact of these changes on the number of FTU ATMs in the LINK network.

There are different types of FTU ATMs in the LINK network and the differences between them are relevant to determining what analysis, if any, can be conducted. The deployment or closure of branch ATMs is dependent on a range of factors beyond the LINK interchange revenue. It is dependent on broader considerations relating to where branches are located and the type of service that is provided to customers in branch. The consideration of the impact of a change in the MIF for branch ATMs in therefore beyond the scope of our analysis.

PTU ATMs rely only marginally on LINK revenue (as these machines only receive LINK revenue for balance enquiries), and therefore are also not considered in our analysis.

Our analysis focusses instead on non-branch FTU ATMs. While there are factors beyond LINK revenue that are likely to influence the decision of whether an ATM will be deployed,[12] the link between ATM deployment and LINK revenue is considered to be strongest for non-branch FTU ATMs and therefore better suited to be assessed by our analysis.

There are, in principle, a number of ways in which the impact of changing the standard MIFs, and therefore the revenue earned by non-branch FTU ATMs, could be measured. Ultimately, an important question is whether a non-branch FTU ATM will be profitable if standard MIFs are reduced by 20%, or alternatively, in the case of FTU ATMs deployed under one contract in businesses with more than one retail outlet, whether the set of ATMs deployed at any one given retailer would be profitable as a whole.

One way the impact of the changes to standard MIFs on ATM profitability could be assessed is by calculating whether the change in standard MIFs would lead some

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[10] LINK (2017), 'LINK announces strengthening the Financial Inclusion Programme', Press release, 14 December, https://www.link.co.uk/about/news/link-announces-strengthening-the-financial-inclusion-programme/.
[11] LINK has informed us that the 1 kilometre threshold will be interpreted flexibly to reflect actual travel conditions on the ground, in which case the number of FIP-candidate ATMs may be greater than what we have calculated for the purposes of this report.
[12] The presence of an ATM provides benefits to a merchant beyond the revenue it derives from the deployer, such as for example, increased footfall.

ATMs (or set of ATMs) that are currently profitable to become unprofitable after the change. Such a profitability analysis would present some challenges, for example in terms of accurately identifying costs on a per-ATM basis, and would require some assumptions in order to be informative on long term effects, for example in terms of whether current occupancy costs would still be representative following a change in the standard MIFs.

Data on ATM-level costs that would be necessary to conduct this type of analysis is not available to us or to LINK (we discuss the data we had available in section 3.2) and hence we do not undertake this type of analysis.[13]

We follow a different approach, which we explain in detail in section 3. Our approach uses statistical analysis to estimate the relationship between LINK revenue and the number of non-branch FTU ATMs present in different areas, and uses this relationship to predict the impact of the proposed changes to standard MIFs. We identify a positive and statistically significant relationship between LINK revenue earned in a given area and the number of machines in that area. Given the interrelationship between the number of machines and revenue in a given area, we use specific statistical techniques discussed in the Technical Annexe to establish a causal relationship between revenue and the number of ATMs. We use this statistical approach to consider:

- the expected long-run impact on non-branch FTU ATM numbers of a 20% decrease in standard MIFs;
- the effect of the strengthened FIP in preventing the closure of non-branch FTU ATMs implied by the expected long-run impact; and consequently
- the expected long-run impact on non-branch FTU ATM numbers of a 20% decrease in standard MIFs and the strengthened FIP combined.

In this report we provide an economic analysis of the expected impact of a change in MIFs and the strengthening of the FIP on the number of non-branch FTU ATMs. It is important to note that our analysis abstracts from any and all policy considerations as to whether a change in the MIF is desirable. We consider no social or economic policy implications of the proposed change. KPMG has also played no part in developing the proposed 20% decrease in MIFs and we make no comment on this proposed change.

[13] A financial analysis of ATM-by-ATM profitability has been undertaken for the Payment Systems Regulator by Europe Economics. This analysis considers a 20% reduction in standard MIFs, and calculates the number of non-branch FTU ATMs which are expected to be unable to cover their avoidable costs or incremental costs if this reduction in MIFs were to occur. This analysis is different from the one presented in this report, as, in addition to using a different methodology (a profitability analysis), it captures only the short-term (in the case of avoidable costs) and medium-term (in the case of incremental costs) impact of a decrease in MIFs – as such these figures are not directly comparable to our findings in this report. Europe Economics (2018), 'ATM Impact Study Summary Findings', January.

Summary of results

Based on data provided by LINK on the location, number of transactions and LINK revenues of ATMs in the LINK network, we have estimated a long-run impact on the number of non-branch FTU ATMs of a 20% decrease in standard MIFs and the strengthening of the FIP.

We estimate that the net effect of both changes would be a decrease in non-branch FTU ATMs that would be equivalent to around 8-18% of the FTU ATM network in 2017. This net effect is composed of two impacts:

- a 20% change in standard MIFs would be expected to remove between 9% and 20% of FTU ATMs; however,
- some of these potential removals would be prevented by the strengthened FIP, which we estimate will protect 1 to 2% of FTU ATMs which would otherwise be removed from the FTU estate by a 20% reduction in standard MIFs.

We note that our analysis does not take into account changes in consumer usage of ATMs driven by factors other than a 20% decrease in MIFs. There are also a number of mitigating factors which our analysis does not capture, and which are likely to decrease any impact seen in the FTU estate.

We also note that the estimates in our model are significantly higher than the percentage of at risk ATMs identified in the Europe Economics study for the PSR. There may be different reasons for this. First the two studies are not directly comparable, since they use different methodologies. Second, our analysis can be seen as reflecting longer term trends, while the Europe Economics study considers measures of economic profitability that can be varied in the short or medium term. In this sense the two results are not necessarily inconsistent, in that it is possible that the kind of effects identified in the Europe Economics study would be the only ones affecting the network for a good number of years. The long-run impact we estimate is likely to be fully realised only after the four year time frame over which LINK plan to decrease MIFs, for instance due to longer contract lengths for ATM provision preventing removal of certain FTU ATMs. [14]

The other aspect to consider is that a predicted longer term effect is often more uncertain and there are several limitations to our analysis. In particular, as stated above, our analysis does not take into account changes in consumer usage of ATMs driven by factors other than a 20% decrease in MIFs and a strengthened FIP. There are also a number of mitigating factors which, again as noted above, our analysis does not capture, and which may well mean that the impact of the proposed changes on the network may be smaller than that which is implied by

[14] We understand from LINK that the length of contracts between ATM deployers and merchants can be in the range of 4-7 years.

our analysis. These limitations to our analysis are summarised next and set out in detail in Section 5.

Summary of limitations of analysis

As mentioned above, in interpreting our results it is important to consider that there are factors which our analysis does not account for, the significance of which is discussed in section 5. In particular:

- we do not capture changes over time in consumer usage of cash or changes in preferences for other types of payment (e.g. of contactless cards, PayPal, online banking payments, Apple Pay);
- the data underlying our analysis is reported for a time when MIFs and the ATM estate were broadly increasing, therefore the relationship between revenues and numbers of ATMs we estimate may not be reflected when MIFs and the ATM estate are decreasing;
- our model provides an estimate of the relationship between LINK revenues and non-branch FTU ATM numbers at the national level, and may not be suitable for an accurate assessment of changes in local areas;
- our analysis does not capture changes to the cost structure of ATM operators which may occur following a decrease in MIFs;
- we do not account for non-LINK income (e.g. dynamic currency conversion, advertising revenue) or non-financial reasons (e.g. brand recognition or marketing) for a deployer to provide FTU ATMs; and
- .our assessment of the role of the FIP does not capture the sequential nature of closures and we do not identify additional ATMs which may become likely candidates for FIP support if other nearby FTU ATMs were to close. Therefore our results underestimate the role of the FIP in preventing closures.

3 KPMG's approach to estimating the effect of a 20% decrease in standard MIFs and strengthening the FIP on the number of non-branch FTU ATMs

3.1 Overview of methodology

We consider the relationship between the number of non-branch FTU ATMs and non-branch Link revenues in local areas.[15] The LINK revenue earned will be dependent on two elements, the volume of LINK transactions at an ATM and the MIFs set by LINK: a 20% decrease in MIFs will impact non-branch ATM revenues, and consequently the number of non-branch FTU ATMs. Based on the relationship between LINK revenues (which are impacted by LINK MIFs) and the number of non-branch FTU ATMs, we estimate the impact that a change in MIFs will have on ATM numbers. We then adjust this impact to account for the strengthened FIP, based on the location of FIP-candidate machines in relation to the location of ATMs that are expected to be removed from the FTU estate.

Our first step (the "**statistical analysis**") identifies the relationship between LINK revenues and number of non-branch FTU ATMs in a given postcode district (i.e. the local areas we use for our analysis). It will be important, in order to isolate this relationship, for other relevant factors such as demographic and geographical characteristics which may also impact the number of ATMs in a given district to be taken into consideration. We therefore use regression analysis, a statistical technique, which has the benefit of allowing us to measure the relationship conditional on several factors which are likely to affect the choice to supply ATMs in a given district. We cover our statistical approach in more detail in section 3.3.

Our second step (our "**supply and demand response analysis**") models how the change in revenue associated with a drop in standard MIFs of 20% will affect the number of non-branch FTU ATMs in a given area. In other words, we calculate how many non-branch FTU ATMs would be expected to be removed from the FTU estate following potential changes in revenues which would follow from a 20% decrease in standard MIFs. Our model here uses the estimate of the relationship between LINK revenues and the number of non-branch FTU ATMs derived from our statistical analysis. We discuss this analysis in more detail in section 3.4.

In our third step (the "**FIP analysis**"), we consider how the strengthened FIP will affect the estimate obtained in the supply response analysis. Given that LINK has committed to support all FTU ATMs that are more than 1km from the next available FTU ATM, we have identified the number of ATMs that are candidates for the FIP

[15] Specifically, we use postcode districts (i.e. characters of a postcode to the left of the space) as the geographic areas on which our analysis is based.

based on the FTU ATM network as of September 2017. Our approach to calculating the impact of the FIP is discussed in more detail in section 3.5.

3.2 Data available

We have received data from LINK on the transactions that took place at each ATM in the LINK network between October 2016 and September 2017, as well as on the number, type and location of LINK-enabled ATMs, reported for each calendar month in that time period. Specifically, the information which we have received from LINK is, for October 2016 – September 2017:

- the number of LINK transactions (including cash withdrawals and balance enquiries) at monthly intervals per ATM in the LINK network
- the type of transaction (branch or non-branch)
- the location of the ATM (postcode)
- the distance to the nearest FTU machine for each LINK-enabled ATM as of September 2017.

Additionally, we have used publicly available information on the demographic and economic aspects of postcode districts in the UK, including:

- population
- percentage of economically active persons
- population density
- Index of Multiple Deprivation (IMD)

3.3 Statistical analysis of the impact of LINK revenues on supply of FTU ATMs

We use statistical analysis[16] to identify the impact of LINK revenues – which are directly impacted by any change in MIFs – on the number of non-branch FTU ATMs. First we group our data at the postcode district level, in order to be able to identify the number of ATMs in an area, as well as the number of transactions which occur and the value of LINK revenues provided in an area. Additionally, postcode districts are geographic areas at which demographic and economic information is available, and there are sizeable differences in the numbers of non-branch FTU ATMs present.[17]

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[16] For additional detail on our statistical approach see the Technical Annexe.
[17] For comparison, we had considered lower-layer super output areas (LSOAs) as the geographic unit for our analysis, however many of these had no ATMs present, and of those that did have an ATM present, very few had more than one non-branch FTU ATM

Additional variables – such as demographic and economic factors – are of interest, since they allow us to construct an analysis that isolates the relationship of interest: that between LINK revenues and the number of ATMs, removing the impact of other factors which could be conflated with the impact of LINK revenues. For example, consider two postcode districts of equal geographic size and population, where one is largely residential housing and the other includes a shopping district. We would expect more ATMs in the district with the shopping area, as there are substantially more sites available in which to put ATMs, as well as more demand for cash, among other reasons. Such an area is also likely to see higher ATM transactions and therefore revenues. If we don't account for the impact of factors that may vary by location and influence the number of ATMs present, such as site availability or whether an area is a commercial or residential district, we will not be able to identify the impact of LINK revenues rather than these other factors.

In order to isolate the impact of Link revenues of non-branch FTU ATMs, our statistical analysis considers the number of non-branch FTU ATMs in a postcode district as a function of LINK scheme revenues, controlling for regional variation by postcode area in order to account for factors such as population, site availability, local demand for cash, etc.[18]

The relationship we estimate is represented in the equation below ("**equation 1**").

$$N_i = B_1 R_i + B_a G_a + \mathrm{BX} + \mu_i \qquad (1)$$

In this equation:

- N_i indicates the number of non-branch FTU ATMs in an area
- R_i indicates the annual LINK revenues for these ATMs in October 2016-September 2017
- G_a is the postcode area (reflecting geographic regions) of postcode district ***i***
- X is a vector which includes other factors that we have considered that may affect the number of ATMs in a given district.
- B_i represents the coefficient on each of the variables above, and therefore measures the impact of each of the variables on the number of non-branch FTU ATMs, all other factors being equal.

The relationship between LINK revenues and number of non-branch FTU ATMs that we are particularly interested in is represented by the coefficient B1 in

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present. This would therefore provide limited information for us to determine a relationship between LINK revenues – or LINK MIFs – and the number of ATMs available, as in few cases would we have more than one non-branch FTU ATM available in an area.

[18] Specifically, we use a "fixed effects" model, where the postcode area of our dataset is a fixed effect.

equation (1). This coefficient identifies on average, how many additional non-branch FTU ATMs would be expected in a postcode district for an additional level of LINK revenue. For example, suppose that B1 = 0.00005 – this would imply that for every additional £100,000 of LINK revenue in a postcode area, on average, there would be 5 additional non-branch FTU ATMs.[19]

We have estimated a number of models, where we vary what is included within the vector X. Depending on the specification, X may include: the population density of a district, the share of branch ATMs in a district (out of total FTU ATMs in that district), the number of non-LINK transactions at LINK FTU ATMs, the proportion of non-branch FTU ATMs located in supermarkets and the proportion of non-branch FTU ATMs located at transportation venues (e.g. bus and railway stations).[20] We have conducted statistical tests of the models we have estimated to select those which provide a robust estimate of the relationship between LINK revenues and the number of non-branch FTU ATMs – details of this model selection process are provided in the Technical Annexe.

3.4 ATM supply and demand responses to changes in LINK MIFs

The regression analysis outlined in section 3.3 allows us to quantify the relationship between LINK revenues and the number of ATMs. A decrease in standard MIFs of 20% impacts LINK revenues, which in turn impacts the number of non-branch FTU ATMs deployed (i.e. the "supply response"). The decrease in MIF may also indirectly impact the volume of ATM transactions since a reduction in FTU ATMs induced by the decrease in MIF may reduce consumer demand for non-branch FTU ATMs (i.e. the "demand" response), due to the lower availability.

In the short and medium term, as a change in MIFs may lead to non-branch FTU ATMs being removed from the estate, the supply and demand response may be sequential in nature – especially at the local level. For instance, a deployer may choose to close an ATM, which then leads to fewer customer making ATM transactions in the area. Some of the customers that would have previously used that ATM will make transactions at other non-branch FTU ATMs, some will use other ATMs (e.g. branch ATMs), some will use other methods to access cash (e.g. bank teller, cash-back at a supermarket till), and some will use different payment methods (e.g. contactless payment). Then, the deployer may respond further to this change in transactions. Rather than trace out the detailed dynamics of this

[19] In practice, to estimate equation (1) there is one additional technical complication that we must address. Unmeasured factors that cause some locations to be profitable may also cause Ri to be high. As a result direct estimation of (1) is likely to produce biased estimates of B1. To address this we use a method called "two stage least squares" to first estimate a relationship between R and demographic variables that drive demand for transactions and then uses this estimated relationship to eliminate the bias in B1. We describe this method in more detail in the Technical Annexe.

[20] We specifically consider these locations as they are likely to be those with high ATM transaction volumes, and hence we control for the effect that these types of locations may have on the number of non-branch FTU ATMs.

process, our analysis presents the long-term equilibrium impact that incorporates these demand and supply responses. We consider several scenarios for the demand response to a 20% reduction in MIF:

- Scenario A (no change in transaction volumes): in this scenario, we assume all transactions that had previously occurred at non-branch FTU ATMs that are removed occur instead at the remaining non-branch FTU ATMs.
- Scenario B (5% decrease in transaction volumes): in this scenario we assume that the decrease in the number of non-branch FTU ATMs available leads to a 5% decrease in LINK transactions at non-branch FTU ATMs overall. This is consistent with some transactions from the closed ATMs moving to other payment methods, or other types of ATMs.
- Scenario C (10% decrease in transaction volumes): in this scenario we assume that the decrease in the number of non-branch FTU ATMs available leads to a 10% decrease in LINK transactions at non-branch FTU ATMs overall. This is consistent with some transactions from the closed ATMs moving to other payment methods, or other types of ATMs.

In scenarios A-C above, we calculate the expected change in the number of non-branch FTU ATMs in each postcode district in the UK, based on the change in revenue implied by a 20% decrease in MIFs and the volume change corresponding to each scenario. We take the sum of the change in non-branch FTU ATMs across all postcode districts in the UK to identify the expected reduction in the FTU estate at the national level. Dividing this number by the FTU estate reported in our dataset – i.e. the average UK-wide FTU ATM estate in October 2016-September 2017 – provides the percentage impact of a reduction in standard MIFs by 20% on the FTU estate. This, however, does not account for the net effect of the change in MIFs on the FTU estate when counterbalanced with the protection of FTU ATMs offered by the strengthened FIP. Our approach to modelling the strengthened FIP is discussed in section 3.5.

3.5 Strengthening the Financial Inclusion Programme

Data we have received from LINK allows us to identify the number of FIP-candidate ATMs in each postcode district in September 2017. At that time, across the UK, there were around 2,000 non-branch FTU ATMs that were candidates for the strengthened FIP – i.e. were 1km or more from the next FTU ATM. We then calculate the proportion of FIP-candidate ATMs in each postcode district, by dividing the number of FIP-candidates by the total number of non-branch FTU ATMs in a postcode district. The proportion of FIP-candidate ATMs in a postcode district varies substantially, as can be seen in Table 2 below.

Table 2 Proportion of FIP-candidate machines by postcode district

Average share of FIP candidate machines in a postcode district	Share of postcode districts with FIP-candidate machines present
14%	43%

Source: LINK data, KPMG analysis.

A FIP candidate ATM will not be removed from the FTU estate, as LINK have committed to maintaining these ATMs open and free-to-use: hence, if the decrease in MIFs would be likely to lead to a FIP-candidate ATM being removed, this ATM would be subsidised by LINK to continue operating as an FTU ATM. Once we have calculated the number of ATMs expected to be removed following a 20% decrease in MIFs only (as per section 3.4) in each postcode district, we estimate how many of these ATMs are likely to be FIP-candidates, and therefore not removed from the estate. We assume that FIP-candidate ATMs are equally likely to be impacted by the decrease in MIFs, and hence we allocate expected removals from the FTU estate proportionally to FIP-candidate and non-FIP-candidate machines, based on the percentage of FIP-candidates observed in each postcode district.

For example, in a postcode district with 12 non-branch FTU ATMs, 3 of which are FIP-candidates, we calculate a FIP-candidate share of 25%. If we calculate an expected removal of 4 ATMs in this postcode district, we would then allocate 25% of these expected removals (i.e. 1 ATM) to FIP-candidates and the remaining 75% (i.e. 3 ATMs) to non-FIP-candidates. Since the FIP-candidate machine will be protected by the strengthened FIP, this 1 ATM will remain in the non-branch FTU estate, and hence the net closures in this postcode district will be 3 ATMs.

Summing the net closures across the postcode districts of the UK, we identify the aggregate net change in the number of non-branch FTU ATMs expected following a decrease in MIFs of 20% and a strengthening of the FIP. We then calculate the net impact as the net closures divided by the average UK-wide FTU ATM estate in our dataset.

4 Impact of a decrease in standard LINK MIFs and strengthening the Financial Inclusion Programme

4.1 Introduction to results

Having implemented the methodology outlined in the previous section, we have obtained estimates of the impact of a 20% decrease in standard MIFs and a strengthening of the FIP. We identify a range of the expected net impact on the FTU ATM estate. This is based on several model specifications for the relationship between LINK revenues and the number of non-branch FTU ATMs – the results of which are provided in section 4.2 – and the range of scenarios we consider for the demand response to a change in MIFs – results for which are reported in section 4.3. Our estimates of the net impact of the 20% MIF decrease and the strengthened FIP are presented in section 4.4.

4.2 Results of the statistical analysis

We consider a range of model specifications for estimating the relationship between LINK revenues and non-branch FTU ATMs. We find that several of these models provide a robust estimate of this relationship, and this estimate varies within the range presented in Table 3 below. The range in values is due to the differences in the relationship estimated between LINK revenues and the number of non-branch FTU ATMs depending on the exact specification of each of the statistical models we have estimated.[21]

Table 3 Estimated relationship between LINK revenues and number of non-branch FTU ATMs

	Min estimate	Max estimate
Change in number of non-branch FTU ATMs per £100,000 LINK revenue	4.4	7.2

Source: LINK data, KPMG analysis.

These results indicate that for a postcode district, all else being equal, a change in LINK revenues of £100,000 will lead to a change in the number of non-branch FTU ATMs of 4.4-7.2, not accounting for support for ATMs that may be provided by the strengthened FIP. This relationship, while it may not hold for individual postcode districts, is reflective of the relationship, on average, across the UK. Further details on the model specifications and model selection process are provided in the Technical Annexe.

[21] For a list of the specifications we have used, the model selection process, and specific estimates for a given specification, see the Technical Annexe.

4.3 Results of the analysis of supply and demand responses

We then use the quantified relationship from our statistical analysis to identify the expected change in the number of non-branch FTU ATMs following a 20% decrease in standard MIFs, as explained in section 3.4. We consider several scenarios for the likely demand responses to the change in MIFs, which in turn lead to different impacts on the number ATMs and proportion of the FTU estate that would be removed following a 20% decrease in standard MIFs. We consider each demand response scenario based on the range of the quantified relationship reported in Table 3. The results of this analysis are provided in Table 4 below, and indicate a likely range of expected impact on the FTU ATM estate of 9-20%.

Table 4 Impact on the FTU ATM estate from a 20% decrease in MIF

	Change in FTU ATM numbers		Change in % of FTU ATM estate	
Scenario	**Min**	**Max**	**Min**	**Max**
A	-4,144	-6,713	-9%	-14%
B	-4,973	-8,055	-10%	-17%
C	-5,801	-9,398	-12%	-20%

Source: LINK data, KPMG analysis.

4.4 Net impact of a 20% decrease in MIFs and a strengthening of the FIP

Based on the results in section 4.3, we calculate the net impact of the decrease in MIFs and introducing the strengthened FIP, using the methodology described in section 3.5. The strengthened FIP will mitigate some of the impact of a decrease in standard MIFs, as it will protect FIP-candidate ATMs that would otherwise be removed from the FTU estate due to a loss of revenues. The net impact of these two changes, under the range of statistical model specifications and the scenarios for demand response to a change in MIFs, is presented in Table 5 below. We find that the strengthened FIP is expected to protect up 1-2% of FTU ATMs, and the net impact on the FTU ATM estate is expected to be 8-18%.

Table 5 Impact of change to MIFs and strengthened FIP

	Strengthened FIP				20% MIF decrease & strengthened FIP (net effect)			
	Change in FTU ATM numbers		Change in % of FTU ATM estate		Change in FTU ATM numbers		Change in % of FTU ATM estate	
Scenario	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
A	388	629	1%	1%	-3,756	-6,084	-8%	-13%
B	466	754	1%	2%	-4,507	-7,301	-10%	-15%
C	543	880	1%	2%	-5,258	-8,518	-11%	-18%

Source: LINK data, KPMG analysis.[22]

[22] Note – the impact of the FIP is calculated as the impact of a 20% decrease in MIFs (as reported in Table 4) less the net impact; this gives the number of FTU ATMs that are preserved due to strengthened FIP protection.

5 Limitations of our analysis

Our analysis, as set out in detail in section 3, looks at the long-term relationship between LINK revenues and the number of non-branch FTU ATMs, and then uses this relationship to predict the long-term impact of a decrease in standard MIFs. However, our approach provides an estimate of the impact that would be expected, and there are a number of assumptions which underlie this estimate and may influence its accuracy. Additionally, there are a number of mitigating factors which our analysis does not capture, and which suggest that in actuality, a 20% decrease in MIFs when coupled with the strengthened FIP may have a lower net impact than we estimate here. These assumptions and mitigating factors are set out separately below.

It is also important to note that, like any statistical analysis, our estimation of the relationship between revenue and ATMs is based on assumptions and limited by available data (for example, we do not have data on ATM costs on an ATM-by-ATM basis), and as such is inherently uncertain. Similarly, our use of this estimated relationship to derive estimated numbers of closures is based on scenarios and also includes a degree of uncertainty. The validity of the results of this analysis and the appropriateness of the scenarios chosen needs to be considered by LINK in order to form a view on the likely impact of the proposed changes to MIFs.

Assumptions underlying our estimates

In our analysis, we do not capture changes over time in consumer preferences for payment methods, demand for cash, or methods for accessing cash (e.g. bank teller versus ATM versus cash-back from a merchant's till), that are driven by factors other than the availability of FTU ATMs. We note that demand for cash and for ATM transactions in the UK may change, in particular as other payment methods may become more popular (e.g. contactless payments). A decline in the use of cash may lead to a decline in the numbers of ATMs which would occur separately to any change caused by a decrease in standard MIFs; our analysis does not account for changes in the FTU estate due to a change in the usage of cash.

Our analysis looks at the relationship between LINK revenues and the number of non-branch FTU ATMs. However, the variability that now exists across postcode districts has been principally driven by a process of expansion in the number of ATMs over time. It is therefore possible that our model is picking up a relationship that is valid while revenues and numbers of ATMs are increasing, but that this relationship might not work in the same way when revenues decrease (for example, due to the proposed changes to standard MIFs).

The statistical relationship we identify is one that holds on average at the national level. As such, our approach is not constructed to provide accurate estimates of the impact of a change in MIFs on ATM numbers in specific local areas, but rather to provide a relationship between LINK revenues and non-branch FTU ATMs for the UK as a whole.

Mitigating factors

There are a number of factors which we do not account for which mean that the impact of a 20% reduction in LINK revenues will in practice be lower than that implied by our analysis (notwithstanding the impact of any assumptions set out in the previous paragraphs). In the short and medium term, ATM deployers may not remove as many FTU ATMs as in the longer term, since ATMs may still cover their avoidable or incremental costs (as per Europe Economics analysis). However, in the longer term as all costs of operating an ATM become relevant, deployers are likely to remove more FTU ATMs. Given the data we have available, we are not able to capture short or medium term effects of a change in MIFs.

In the long-term, there may also be additional factors which would be likely to reduce the net impact we have estimated here:

- Our analysis does not capture changes to the cost structure of non-branch FTU ATMs which may take place following a decrease in MIFs (as is proposed). For instance, pressure on LINK revenues may put pressure on ATM deployers to minimise their cost base – for example by installing machines that are simpler, but lower cost or by seeking to renegotiate rental contracts with merchants in order to reduce rental costs for ATMs.[23] Cost-cutting by deployers would be a potential response to the proposed change in standard MIFs, which may mean that fewer non-branch FTU ATMs need to close as a result of the reduction in LINK revenue. In this context, our analysis may overestimate the number of expected FTU ATMs lost.
- We also do not account for non-LINK income or other reasons why a deployer may choose to open or maintain an FTU ATM (e.g. any brand recognition or marketing value for a bank-operated non-branch ATM). We do not have data on the non-LINK revenues that an ATM may earn, which in some cases may be quite substantial (e.g. in areas that are popular with foreign tourists who may withdraw cash with foreign cards, providing revenue to the ATM deployer via the Visa and Mastercard schemes). To the extent that non-LINK income is positively correlated with LINK revenue, not accounting for non-LINK income would lead to our analysis overestimating the effect of LINK revenue on the number of ATMs. Additionally, we are not able to quantify other reasons – e.g. marketing and brand recognition – that an ATM deployer may have for maintaining a particular ATM.
- As concerns the analysis of the impact of the FIP, we do not identify additional ATMs which may become likely candidates for the FIP (by becoming 1km or

[23] By way of comparison, LINK has informed us that some ATMs in Ireland are paid to locate within a merchant's premises (as opposed to the case in the UK, where merchants are paid a rent for accepting an ATM in their premises) – while this dramatic of a shift may not be the case following the reduction in standard MIFs, this is indicative of how agreements between deployers and merchants may differ substantially.

more from the next FTU ATM) over time. As the FTU ATM network fluctuates over time, the number and location of FIP-candidate machines may change; if closures occur as a result of the proposed changes to standard MIFs, additional remaining ATMs may meet the strengthened FIP criterion of being 1km or more from the next FTU ATM. These ATMs would then also be maintained by the FIP. In our analysis we do not account for changes to the FIP-candidate ATMs over time, which likely leads to our analysis underestimating the impact of the FIP. This may be particularly relevant at the local level if there are particular areas where there are few FTU ATMs, but no single FTU ATMs is more than 1 km from the next FTU ATM, as any initial closures would lead to remaining ATMs likely becoming FIP-candidates.[24] This process is not captured in our analysis, leading to an underestimate of the impact of the FIP.

[24] For example, suppose a postcode district (Z1) which has only two FTU ATMs, and these are located within 100m of each other, with the next-closest FTU ATM located outside of district Z1 and more than 1km away from either ATM. In this case, neither FTU ATM in district Z1 is a FIP-candidate; however, if one of the FTU ATMs in district Z1 closes, then the remaining ATM would become a FIP-candidate. As our analysis does not identify which specific ATMs are likely to be removed from the FTU estate, any changes to the estate similar to this example, which would lead to additional FTU ATMs being protected by the strengthened FIP are not captured.

6 Technical Annexe

We expect LINK revenues and the number of non-branch FTU ATMs to be closely interrelated. While we may consider that more ATMs will be opened where more revenue can be captured, it is also true that more revenues will necessarily arise in areas with more ATMs. As a result, R in equation (1) is not "exogenous", it is "endogenous" because it is correlated with the error term u in equation (1).[25] Therefore, in estimating equation (1), we must take care that we estimate the causal impact of revenues (R_i) on ATMs (N_i).

As R_i is endogenous in the relationship above, in order to provide accurate estimation of the coefficients in the relationship, we use a method called instrumental variables regression to eliminate the endogeneity problem. To do this, we estimate a first-stage equation which provides an estimate of R_i which does not correlate with the error term u in the model for N_i. We then use this constructed variable in the main equation above to produce an unbiased estimate of the true coefficient in the relationship. In the first stage, we employ several variables that are good predictors of R (population, population density, IMD, proportion of economically active population) but that are not correlated with the unobserved error term u. These variables are our "instrumental variables". The first stage equation estimated is provided below:

$$R_i = \mathrm{B}_1\mathrm{E} + \mathrm{B}_2\mathrm{Z} + \nu_i \qquad (2)$$

Revenue R_i is regressed on the exogenous variables in vector E and the instruments in vector Z. The variables in vector E are those variables from equation (1) which are not endogenous (e.g. the geographic region indicator variables). The variables in Z should be selected such that they are uncorrelated with the error term in equation (1) – and hence are valid instruments – but are strongly correlated with R_i – and hence are informative instruments. The estimates for R_i provided by the first stage equation are then used in the main equation in place of R_i, and the coefficients of that equation are estimated.[26] Where we use the number of non-LINK transactions or the number of PTU ATMs as controls in equation (1), we also

[25] The endogenous variable is correlated with the error term either because of an omitted variable, measurement error, or simultaneity. We have also statistically tested that revenue is endogenous in Eq. 1.

[26] The instrumental variable regression was tested for weakness of instruments and consistency of using an IV regression compared to OLS using Wu-Hausman test. The tests indicated that the instruments were statistically significant predictors of the variable which we were instrumenting for, and that the instrumental approach we take provides a consistent estimate of the core relationship between LINK revenues and non-branch FTU ATMs, while a standard OLS approach (i.e. without the instrumental variable estimation) would not provide a consistent estimate.

estimate first stage equations for these variables, as we expect these to be endogenous in equation (1) as well.

As mentioned in section 3.3, we consider a number of variables to include as controls in equation (1). We have estimated a range of models using different combinations of controls in equation (1) and instruments in equation (2), and for each of these we have conducted the following tests:

- Test for weak instruments – we test whether the instruments we select for equation (2) are sufficiently correlated with R_i to provide a robust and informative estimate of R_i to use in equation (1). In cases where we include the volume of non-LINK transactions or the number of PTU ATMs, we also conduct this test for the first-stage regressions for these variables.
- Wu-Hausman test – we test the statistical consistency of models of equation (1) estimated using instrumental variables against the statistical consistency of an equivalent model, but where the actual value for R_i (or other potentially endogenous variables) is used rather than the estimated value based on the first stage equation.
- Sargan test – where we include more than one instrumental variable to estimate R_i, we conduct this test to identify whether the instruments used are sufficiently exogenous to provide valid estimates of R_i that are not endogenous in the equation determining N_i. This test can only be conducted if more than one instrumental variable is included, as it is otherwise undefined.

If a model specification does not pass all of the tests listed above, we exclude it from our analysis. Where a model specification passes the three tests listed above, we then consider the statistical significance of the coefficients estimated in equation (1) under that specification. Where we find a control variable which is not statistically significant, we exclude this specification from our analysis, and use instead the simpler specification which excludes the statistically non-significant variable. Following this process, we identify a number of specifications which are reported in Table 6, along with the values for B1 we have estimated in each specification.

We summarise the variables used in Table 6 as follows:

- total_revenue = LINK revenue earned by non-branch FTU ATMs;
- postcode_area = geographic indicator variables for each postcode area across the UK[27]
- non_link = number of non-LINK transactions at non-branch FTU ATMs;

[27] The postcode area is the region which shares the same alphabetic character(s) as the beginning of a postcode, and includes multiple postcode districts. For instance for the postcode 'E14 5GL', 'E14' is the postcode district and 'E' is the postcode area.

- share_branch = share of branch ATMs out of all FTU ATMs;
- share_transport = share of non-branch FTU ATMs that are located at transport venues (e.g. rail or bus stations);
- share_supermarket = share of non-branch FTU ATMs that are located at supermarkets;
- pop_district = population;
- pop_density_district = population density;
- sh_active_district = share of the population that is economically active; and
- deprivation_postcode_district = index of multiple deprivation (IMD).

Table 6 identifies the specific variables we include in equation (1), as well as the variables we include in equation (2) for a given specification. We also report the coefficient for R_i from equation (1) from each specification, multiplied by 100,000 to reflect the change in number of ATMs, on average, due to a change in LINK revenue of £100,000. Finally, the standard error represents the degree of uncertainty around the specific relationship between the number of ATMs and LINK revenues – the higher the standard error, the more uncertain the specific relationship between LINK revenues and ATM numbers for a particular specification.

Table 6 Model specifications and statistical estimates of the relationship between LINK revenues and the number of non-branch FTU ATMs

Equation 1	Equation 2	Change in ATMs for a £100,000 change in LINK revenue	Standard Error
atms = total_revenue + postcode_area + share_supermarket + share_transport + non_link + share_branch + pop_density_district	total_reveue = postcode_area + share_supermarket + share_transport + share_branch + pop_density_district + sh_active_district	7.2	0.9
atms = total_revenue + postcode_area + share_supermarket + share_transport + non_link + share_branch	total revenue = postcode_area + share_supermarket + share_transport + share_branch + pop_district + sh_active_district	7.2	0.4
atms = total_revenue + postcode_area + share_supermarket + share_transport + non_link + share_branch + pop_density_district	total revenue = postcode_area + share_supermarket + share_transport + share_branch + pop_density_district + pop_district	7.2	0.3
atms = total_revenue + postcode_area + non_link	total revenue = postcode_area + pop_district + sh_active_district	7.1	0.5
atms = total_revenue + postcode_area + share_supermarket + share_transport + non_link + share_branch	total revenue = postcode_area + share_supermarket + share_transport + share_branch + deprivation_postcode_district + pop_density_district	7.0	0.3
atms = total_revenue + postcode_area + non_link + share_branch	total revenue = share_branch + postcode_area + pop_district + sh_active_district	7.0	0.4
atms = total_revenue + postcode_area + non_link	total revenue = postcode_area + pop_density_district + deprivation_postcode_district	7.0	0.3

atms= total_revenue + postcode_area + non_link+ share_branch	total revenue = share_branch + postcode_area + pop_density_district + deprivation_postcode_district	6.8	0.3
atms= total_revenue + postcode_area + share_branch + pop_density_district	total revenue = postcode_area + share_branch + pop_density_district + pop_district	6.0	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport	total revenue = postcode_area + share_supermarket + share_transport + deprivation_postcode_district + pop_district	6.0	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport + non_link	total revenue = postcode_area + share_supermarket + share_transport + pop_district	6.0	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport	total revenue = postcode_area + share_supermarket + share_transport + deprivation_postcode_district	6.0	0.1
atms= total_revenue + postcode_area + share_branch + pop_density_district	total revenue = postcode_area + share_branch + pop_density_district +deprivation_postcode_district	6.0	0.1
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + pop_district	6.0	0.1
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + deprivation_postcode_district	5.9	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + pop_district	5.9	0.1
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + pop_district + sh_active_district	5.9	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + deprivation_postcode_district	5.9	0.1
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + pop_district + deprivation_postcode_district	5.9	0.1
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + pop_district	5.9	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + pop_district + sh_active_district	5.9	0.1
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + deprivation_postcode_district	5.9	0.1
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + deprivation_postcode_district + pop_density_district	5.8	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + pop_density_district	5.4	0.1
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + pop_density_district	5.4	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport + non_link	total revenue = postcode_area + share_supermarket + share_transport + pop_density_district	5.4	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport	total revenue = postcode_area + share_supermarket + share_transport + pop_density_district	5.4	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + pop_density_district + sh_active_district	5.4	0.1

atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + pop_density_district	5.4	0.1
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + pop_density_district + sh_active_district	5.4	0.1
atms= total_revenue + postcode_area + share_supermarket + share_transport	total revenue = postcode_area + share_supermarket + share_transport + pop_density_district + sh_active_district	5.3	0.1
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + pop_density_district + sh_active_district	5.3	0.1
atms= total_revenue + postcode_area	total revenue = postcode_area + sh_active_district	4.6	0.4
atms= total_revenue + postcode_area + share_branch	total revenue = postcode_area + share_branch + sh_active_district	4.5	0.4
atms= total_revenue + postcode_area + share_branch +share_supermarket + share_transport	total revenue = postcode_area + share_branch +share_supermarket + share_transport + sh_active_district	4.4	0.3