White goods and wellbeing: Measuring the benefits of grants for fridge-freezers and washing machines

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PRO BONO ECONOMICS

Pro Bono Economics uses economics to empower the social sector and to increase wellbeing across the UK. We combine project work for individual charities and social enterprises with policy research that can drive systemic change. Working with 900 volunteer economists, we have supported over 500 charities since our inception in 2009.

The Association of Charitable Organisations (ACO) is the membership body that champions the contribution of charities that provide financial and wellbeing support to individuals. The ACO encourages knowledge-sharing, best practice and collaboration among its charity members. With over 100 charities in its membership, the ACO strives to create impact within its sector and be a representative voice.

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Summary

An estimated 480,000 households, or 1.2 million adults and children, in the UK are missing at least one essential large appliance. Of these, 50,000 households, or 130,000 adults and children, are living both without a washing machine and without a fridge-freezer, appliances that many take for granted in maintaining their health and hygiene.

The importance of these essential appliances goes beyond their obvious functions. Research indicates that living without them could harm people's finances, physical health and emotional health, thereby lowering wellbeing. Analysis by Pro Bono Economics (PBE) suggests support from members of the Association of Charitable Organisation (ACO) for purchasing white goods is likely to lead to improvements in quality of life, while those without appliances report negative impacts on spending, diet, and existing health conditions – which contribute to anxiety, depression and low self-worth.

The cost of living crisis has very likely worsened the situation for those in appliance poverty, as prices of washing machines and fridge-freezers have risen beyond the increases in either wages or benefit levels. In 2022, for example, the prices of major appliances and small electric goods increased by 8.4%, compared with the increase in the National Living Wage of 6.6% and an increase to the standard Universal Credit amount of 3.1%.

However, benevolent charities, such as those in the ACO umbrella body, have been stepping in. These charities provide financial assistance to those in need, including people who are ineligible for state support. Numerous ACO members award grants to individuals who are in appliance poverty.

This analysis shows that providing such support to people in appliance poverty has the potential to improve their wellbeing by a significant amount. Indeed, having large essential household appliances could improve a person's wellbeing by around 0.4 points (out of 10) on the life satisfaction scale. HM Treasury's wellbeing evaluation guidance suggests that this boost in wellbeing has a value of £7,200 per adult for each year lived with appliances – or by as much as £6.7 billion a year across 940,000 adults.

Additionally, this analysis suggests that the typical grant provided by benevolent charities for purchasing these appliances not only helps to address the wellbeing gap experienced by those missing essential appliances, but could also save households between £130 and £160 in interest payments, compared to purchasing the appliance through a typical rent-to-buy scheme, or £30 to £40, compared to the typical costs from using a credit card.

Reforms to welfare which prevent people from falling into appliance poverty in the first place are essential. Nevertheless, there is a clear need for benevolent charities to play this role supporting people in appliance poverty, and particularly people who are ineligible for state help.

PBE's analysis of wellbeing impacts compares the outcomes of households with and without appliances in national data. This is the best proxy available, but does not provide as clear a picture as an analysis that compared the outcomes of those who received ACO support versus those who did not would do. PBE recommends that ACO partners work together to harmonise and improve their data collection to enable a stronger conclusion in future economic evaluations. In particular, they could further strengthen the evidence of their impact by incorporating wellbeing measurement for beneficiaries before and after receiving the grant. This would more directly demonstrate the change in wellbeing associated with the support provided.

An estimated

480,000

households are missing at least one essential large appliance in the UK

Gaining large household appliances could improve a person's wellbeing by

0.4

points (out of 10) on the life satisfaction scale

The wellbeing benefits experienced by a person gaining a complete set of appliances could have value totalling as much as

£7,200

The potential wellbeing improvements over a year arising from lifting people out of appliance poverty could be as much as

£6.7 billion

Introduction

Being in appliance poverty – living without an essential large appliance such as a washing machine or a fridge-freezer - can impact people's wellbeing. This is especially the case for people on low incomes, experiencing deprivation and/or with additional needs. According to qualitative research by poverty charity Turn2us, living without essential household appliances can affect people's finances, their physical health and their emotional health.[1] Respondents to Turn2us' survey listed poor diet, exacerbated pre-existing health conditions, and health and safety risks among the difficulties that they experience if they do not have working large appliances. In turn, they reported emotional impacts. Individuals surveyed noted that appliance poverty can strain their relationships and contribute to feelings of low mood, anxiety, shame and low confidence. These additional difficulties and emotional impacts together indicate that appliance poverty could lead to having a poorer quality of life.

Lacking working large appliances is also thought to add to household expenses. It is thought that some people without a washing machine may instead have to go to the laundrette for their washing needs, which may be more expensive per cycle than running a washing machine at home. Some people without a cooker may have to rely on takeaways and ready meals instead of cooked dishes from scratch, adding costs due to the added expense of microwaveable and takeaway food per serving on average compared to home-cooked food. Some people without a fridge-freezer may have to buy food more frequently because they cannot store food for as long as they would otherwise, which may lead to increased spending on groceries, as they are less likely to be able to buy in bulk and thereby spread the cost over several meals.

For example, people who have received grants from benevolent charity Glasspool have stated:

> "When I moved in, I needed a cooker, a bed and washing machine. I was so blessed to get the cooker, without it I would be really struggling. You end up spending more because of takeaways."

> "[The washing machine] wasn't working properly - wouldn't spin out. It would take ages to get a wash done. I was constantly playing catch up because the kids were wetting their clothes. We went to the laundrette and between me and my mum, we spent a fortune, hundreds of pounds on getting up on top of it."

[1] T Cave, L Evans & M Geer, Living Without, Turn2Us, January 2020.

The issue of appliance poverty has become more pressing of late as the gap between the price of goods and the levels of wages and benefits has increased. In 2021, prices for major appliances and small electrical goods increased by 4.7%, and were followed by an 8.4% rise in 2022 – the highest on record.[2] This overshadowed the 6.6% increase in the National Living Wage, and the 3.1% rise in standard Universal Credit amounts between 2021/22 and 2022/23.[3]

Throughout this time, many local authorities have or have had a Local Welfare Assistance (LWA) scheme in place in order to provide grants to those in financial hardship. While these offer a solution to many who cannot afford white goods, not all in financial hardship are eligible for them and provision of LWA has historically varied across England, with one in seven local authorities not offering a scheme at all as of 2020.[4] Fortunately, benevolent charities provide grants to help with everyday spending, including the costs of essential appliances. People who are in need but otherwise ineligible, or unable to access state support, can apply to them.

Scope of this report

The Association of Charitable Organisations (ACO) is an umbrella membership body for grant-maker charities. Their 120 members award grants to individuals in need of support across various circumstances each year, including those in need of funds to pay for day-to-day essentials, those in need of household essentials and adaptations to homes, and those facing one-off costs arising from funerals or respite breaks.

A number of ACO members provide grants to individuals to help them purchase large appliances such as washing machines, tumble dryers, fridge-freezers and cookers. A coalition of these ACO partners wish to understand the potential economic benefits of their grant-giving. ACO partners were particularly keen to understand whether, and to what extent, people on low incomes living without essential appliances spend more on laundry and food because they need to use laundrettes, need to buy ready meals or takeaway food, and cannot store larger quantities of food. As a sector, there was no evidence-based research into how spending patterns might vary depending on whether there is an appliance in the home. Conducting rigorous research with recognised methods would allow the

[2] Office for National Statistics, CPI ANNUAL RATE 05.3.1/2 : Major appliances and small electric goods 2015=100, May 2023.
[3] Department for Work and Pensions, Benefit and pension rates 2022 to 2023, November 2021. www.gov.uk/national-minimum-wage-rates, accessed 15 Jun 2023.
[4] The Trussell Trust, Strengthening local welfare support during the COVID-19 outbreak, June 2020.

individual grant-making sector to confidently communicate the economic impact of grant-making.

This study aims to answer the question: "Does grant-giving to individuals in need of a fridge-freezer, cooker or washing machine generate economic benefits?"[5] ACO hopes this will help to communicate effectively the lived experiences and real impacts on those they support.

At this point in time, ACO partners are interested in reviewing their outcomes data collection and thereby understanding the impact of their grants as a collective. While they consider building up their data to enable economic evaluation in future, this study turns to the Living Costs and Food (LCF) survey data analysis and evidence review of high-cost credit alternatives to illustrate the potential implications on an individual's wellbeing if they cannot afford an appliance. This report is intended, therefore, to give an initial indication of what impacts ACO might expect in future evaluation. Part of PBE's work with ACO includes recommendations to the partners to allow for potential evaluation of their grantees' outcomes. This is shared with the partners separately to this report.

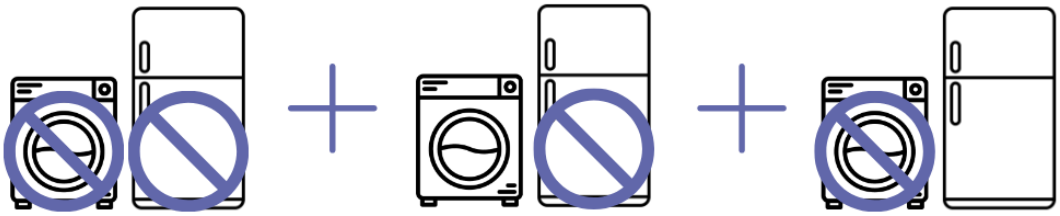
[5] "Fridge/freezer" is a term used in this report to mean "fridge-freezer or deep freezer", based on the corresponding variable in the LCF dataset.

Understanding the scale of appliance poverty in the UK

By using household appliance status in the Office for National Statistics' (ONS') LCF, a national survey holding data on characteristics and detailed spending patterns of households across the UK, PBE estimated the number of people across the country with/without washing machines and/or fridge-freezers.[6]

Analysis of the LCF suggests that 19% of households in the UK are on low incomes – this amounts to 5.5 million households or 13 million people.[7] Of these, 480,000 households, or 1.2 million adults and children, are missing a fridge-freezer and/or washing machine. In other words, 940,000 adults and 210,000 children, or one in eleven low-income households, are missing at least one of these essential appliances.[8]

Figure 1. Over a million people are estimated to be missing an appliance



130,000 people in 50,000 households

350,000 people in 150,000 households

670,000 people in 280,000 households

Further analysis allowed PBE to understand the appliance statuses of those 480,000 households missing appliances. An estimated 280,000 low-income households in the UK have a fridge, but do not have a washing machine; this is about 550,000 adults and 120,000 children. A further 290,000 adults and 60,000 children, or 150,000 households, are estimated to have a washing machine but no fridge. Finally, about 50,000 households

[6] Office for National Statistics, Living Costs and Food Survey, UK Data Service, 2019. Office for National Statistics, Families and households, May 2023. Office for National Statistics, Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland, December 2022, See Annex A for methodology undertaken using this data.

[7] Given DWP guidance and income data available in the LCF, in this report a "low-income household" is defined as one that receives less than 60% of the UK median OECD-equivalised disposable household income. All estimations of the number of people in appliance poverty in this report only account for those on low incomes. See: Department for Work and Pensions, How low income is measured in households below average income., September 2016.

[8] "Adults" are taken to mean adults and older teenagers, i.e. those at least 16 years old. "Children" are taken to mean those less than 16 years old. This is to enable consistency across the report, as PBE's economic evaluation of wellbeing is only applied to those at least 16 years of age, in-keeping with ONS wellbeing questions generally being asked to those in that age group.

do not have either a washing machine or a fridge-freezer, meaning an estimated 100,000 adults and 20,000 children are living without either of these essential appliances.

The existing LCF data does not allow for a credible national picture of those missing other large household appliances such as cookers. However, this analysis of washing machine and fridge-freezer status helps in understanding the potential scale of missing appliances, the regularity of each white good type among low-income households, and therefore some insight into the lived experience of this group as a whole.

Understanding the impact of appliance poverty on household spending

As part of this report, PBE investigated whether the assumption that there are additional costs to households as a result of living without large appliances can be evidenced by the data on observed behaviours and resulting costs in the LCF.

The analysis

Data on reported household spending in the LCF dataset was analysed to investigate whether there could be a relationship between day-to-day spending and having an appliance in the home. The following key steps were carried out for each appliance in the scope of this project:

- Combined the last nine years of LCF household-level data to use a sufficiently large sample size.
- Compared mean spending on food, energy, water and laundrettes by appliance ownership status for a first view of any differences.
- Used a statistical model to understand to what extent differences in expenditure, as fractions of household disposable income, could be related to appliance status.
- Multiplied the resulting differences in expenditure by average household disposable income experienced by low-income households in 2021; these allowed for estimation of spending differences in monetary terms.
- Used a statistical model to compare expenditure on types of foods to understand if quality of food bought differed by appliance status.

The results

The analysis found that there is currently insufficient evidence to support the assumption that living in appliance poverty leads to additional costs for households, and that there are cost-savings as a result of having a large appliance in the home.

This is a departure from existing literature and discourse in the benevolence sector. This has most comprehensively been laid out in the Turn2us *Living Without* report,[9] which assumed that people living without a washing machine accumulated additional expenses by going to the laundrette for all their washing needs, that people with a cooker spent more as a result of relying on takeaways and ready meals, and that people without a fridge and/or freezer had to buy food more frequently and therefore did not benefit from bulk-buying cost savings. The *Living Without* report modelled the financial impacts of these three kinds of assumed behaviour.

The reason for PBE's new results not aligning with those found previously may be because the *Living Without* report aims to illustrate the potential or assumed implications of living without appliances, and does so using certain scenarios of behaviours, in absence of observed behaviours. However, PBE's analysis of household spending is focussed on observed behaviours. The actual observed behaviours may deviate from assumed ones because:

- People without washing machines may handwash their clothes, have to restrict their washing, or use washers at friends' or relatives' homes.
- People without cookers may not cook meals from scratch if they do then acquire a cooker, due to, for example, time constraints, ability, or personal preferences.
- People without fridges and/or freezers may minimise their food intake and therefore food spending, instead of spending more on takeaway food and ready meals.

Ultimately, it is important to note that the conclusion of this analysis is not that grants for large appliances have no impact on household spending, but rather that PBE cannot conclude from the existing evidence that such an impact exists. It is also possible that ACO service users are not sufficiently similar to those without appliances, before they receive grants, featured in the LCF and that ACO service users after receiving grants are

[9] Living Without: the scale and impact of appliance poverty, Turn2Us, January 2020

not similar enough to those in the LCF with an appliance. Therefore, using the differences in spending between those with and without a household appliance in the LCF as a proxy for the change experienced by ACO service users is a limitation of this work.

Anita's experience of appliance poverty

Anita* lives with her young son in a council flat after fleeing domestic abuse. When she moved in, it was an empty shell – no major appliances, furniture or flooring. She cannot work due to her son's special education needs and does not receive child support.

By borrowing money from a friend, Anita was able to buy a washing machine, but when it broke down after the guarantee period she could not afford to repair or replace it. Anita managed to get by doing the washing by hand during the summer months, but when winter came, wringing out and drying clothes became very difficult. Living without a washing machine created a lot more physically hard work and took up Anita's time.

After the benevolent charity Glasspool gave her a grant for a washing machine, Anita said it "was such a relief". She said: "When you always stress about these household things, it's hard to think about anything else. Having the washing machine, it's such a relief."

*Names have been changed to protect identities.

Understanding the impact of appliance poverty on wellbeing

Wellbeing evaluation

This analysis used wellbeing evaluation to quantify the impact of appliance poverty. Wellbeing evaluation is an approach to economic analysis that looks to quantify the impact of interventions on the overall quality of life, or wellbeing, of individuals. It is increasingly being used in the UK following the development of standardised wellbeing measures by the ONS and the publication of guidance by HM Treasury encouraging the use of wellbeing to evaluate government policies. [10]

Wellbeing is a broad indicator of how an individual or group of people feel, and includes such drivers as health, relationships, education, the natural environment, and personal finance.[11] As such, it provides a basis for understanding the impact of a wide range of social sector interventions that can have complex and subtle impacts on individuals' lives that go well beyond more traditional economic impacts such as employment or wages.

Wellbeing measurement can provide an alternative way of looking at the impacts of missing out on large appliances that goes beyond the more traditional financial impacts. For example, even if overall spending habits do not change as much as is assumed in the existing literature, shifts in behaviour required to adapt to living without appliances, such as skipping meals or washing clothes by hand, may have a relationship with wellbeing.

Treasury guidance also provides an approach to putting a monetary value to changes in wellbeing based on the ONS life satisfaction measure of personal wellbeing. This provides an indication of how much individuals would be prepared to pay for an equivalent improvement in the quality of their lives. It is used in government policy analysis to provide a "common currency" to compare a range of different costs and benefits of any intervention.

This report presents wellbeing differences between those with and without appliances in monetary terms, thereby estimating the potential wellbeing impacts of having household appliances. This is done in line with Treasury guidance to provide a more intuitive understanding of the scale of wellbeing impacts, to enable ACO's members to consider the cost-effectiveness of their work against the scale of these benefits and to

[10] See: Office for National Statistics, Personal wellbeing user guidance, September 2018; and HM Treasury, Wellbeing Guidance for Appraisal: Supplementary Green Book Guidance, July 2021.
[11] www.whatworkswellbeing.org/about-wellbeing/what-is-wellbeing/, accessed 5 June 2023.

support the aggregation of wellbeing differences to explore the total scale of the problems identified.

The analysis

Data relating to the reported ONS life satisfaction scores for each individual in the person-level LCF dataset was analysed to investigate whether there could be a relationship between wellbeing and having an appliance in the home. The ONS life satisfaction question is worded: "Overall, how satisfied are you with your life nowadays? "The survey respondent ranks their life satisfaction from 0 ("not at all") to 10 ("completely").

The following steps were carried out for each appliance in the scope of this project:

- Combined the last nine years of LCF person-level data and merged this with the household-level data. This allowed for linking the life satisfaction scores in the person-level data to the expenditure, income and household characteristics data in the household-level data.
- Created variables that represent individual and household characteristics that may be linked to life satisfaction. These were included in the regression analyses to try and isolate the relationship between having an appliance and life satisfaction as much as possible.
- Compared mean life satisfaction by appliance ownership status for a first view of any differences.
- Developed a statistical model to predict life satisfaction on relevant appliances and other control variables to understand if there was a statistically significant relationship between life satisfaction and having a large appliance. Control variables used were chosen to reflect those in existing wellbeing literature, to align this study with recognised wellbeing analysis approaches and to help find a model that fits well.[12]
- Once satisfied that the statistical model identified a meaningful relationship between life satisfaction and having an appliance, PBE applied the Treasury's guidance on wellbeing evaluation to give an indicative value of a year lived in higher wellbeing due to the appliance.[13] This involved multiplying the coefficient on the

[12] A Clark, S Flèche, R Layard, N Powdthavee, G Ward, The Origins of Happiness: The Science of Well-Being over the Life Course, Princeton University Press, February 2018.
[13] HM Treasury, Wellbeing Guidance for Appraisal: Supplementary Green Book Guidance, July 2021.

appliance by the Treasury's estimate of £16,400 for one year lived at a one point increase in life satisfaction.[14]

The results

This analysis of life satisfaction and appliance status in the home gives some indication of a positive relationship between the two among individuals in low-income households.[15] In particular, the results suggest that there may be a meaningful positive relationship between life satisfaction and having both a washing machine and a fridge in the home. Those who have essential appliances have wellbeing that is 0.44 points higher than those without appliances, even after controlling for other important drivers of wellbeing. The model indicates this is a fairly robust estimate, with over 90% probability that this result is not down to random noise in the data. This result holds after accounting for other variables that are known to influence wellbeing, such as sex, employment status, relationship status, and assessment of own health.

By applying the Treasury guidance to this figure, it is estimated that, if someone were to live one year with a washing machine and a fridge in the home, the increase in life satisfaction that they might experience, compared to if they did not have both appliances (with all else being equal), could be valued at £7,200.[16]

With an estimated 940,000 adults living without a washing machine and/or fridge-freezer in the UK, these results suggest the monetary value over a year of wellbeing improvements arising from gaining these large essential appliances in the home could be as much as £6.7 billion.[17]

[14] Expressed in 2022 prices to account for inflation using GDP Deflator (as referred to in HM Treasury guidance). See: Office for National Statistics, GDP deflators at market prices, and money GDP March 2023 (Quarterly National Accounts), April 2023.
[15] Due to the assumptions used in proxying having a cooker in the home, PBE does not include the wellbeing analysis by cooker status in the main body of the report. For more details of the analysis and results, please see Annex C.
[16] There is currently insufficient evidence to confidently differentiate impacts between different types of appliance without risk of false precision (i.e. overstating the difference in impact between a washing machine and a fridge/freezer). Therefore the washing machine- or fridge/freezer-specific findings are not included here, but in Annex C instead.
[17] This potential wellbeing evaluation is only applied to adults, as the ONS advise the ONS Life Satisfaction question is only asked of those 16 and above.

Understanding the impact of grants as an alternative to high-cost credit

If individuals cannot afford an essential appliance but need to purchase one, they make take on debt to do so and purchase the appliance with some form of credit. This creates additional costs.

The analysis

To estimate the scale of these additional costs of high-cost credit alternatives to grants, PBE:

- Asked the ACO coalition partners for the average grant size provided by them.
- Researched going annual interest rates of high-cost credit from various banking and retail providers. Through the review, a range of typical annual rates was found against different high-cost credit type:
    - Rent to buy: 69.9%-79.9% (but with a maximum credit cap of 100% the price of the product)[18].
    - Credit card: 0%-50%[19] (The Bank of England (BoE) report that 19.9% is the average as of January 2023).
    - Overdraft: 20.85% (BoE's reported average as of January 2023).
    - Personal loan: 8.35% (BoE's reported average as of January 2023).
    - Payday loan: 1,250% (average indicated by Moneysupermarket.com).
- Applied the average interest rates by high-cost credit (HCC) type to average grant size data from ACO.

It is important to note that informal lending arrangements (e.g. between family members) were excluded from the modelling, as there is insufficient evidence about rates of return expected and therefore the financial implications of these alternatives.

Similarly, it is also important to note that this analysis looked only at the direct financial costs of taking on an appliance on credit. Indeed, the stresses and strains of unmanageable debt are closely related to wider problems in people's lives such as financial exclusion, family breakdown, and poor physical and mental health. It is also a concern for wider society,

[18] Financial Conduct Authority, FCA confirms introduction of rent-to-own price cap, March 2019.
[19] PBE assumes in the scenario analysis that the individual in question is not eligible for the 0% interest credit card option, at least in part because the option is usually an introductory offer.

as it can have resultant costs to public services, including through increased demands for mental health support and statutory housing provision.[20] These additional costs are not included here.

The analysis

Data from ACO partners suggested that most awarded a grant in full (i.e. for the same price as the appliance), with average values of:

- Washing machine: £300.
- Fridge-freezer: £360.
- Cooker: £380.

As there is no evidence available at this time of the HCC alternatives used instead of ACO members' grants, low-, middle- and high-credit payment scenarios were modelled to illustrate the potential additional costs faced by a grantee if they did not have access to the grant.[21]

Credit cards were considered as the low-cost alternative, as they are generally more accessible than a personal loan. If an individual paid £300 to £380 on an appliance through a credit card loan with 19.9% interest, and took 52 weeks to pay it off, it could cost them an additional £30 to £40 on top of that purchase.

For the middle scenario, rent-to-buy loans were modelled. In this scenario, assuming a common interest rate equivalent of 69.9%, and that the individual rented an appliance at the same price that an average ACO grantee would, then they would have to pay an additional £130 to £160 on top of the retail price.

Finally, the costliest option, in terms of interest rate, is the payday loan. However, payday loans are meant to be paid back within a month. Therefore, if a person took out a £300 to £380 payday loan for an appliance and paid it back over a month, they would have to pay an additional penalty of £322 to £392 in interest.

In conclusion, while it is not currently possible to estimate the actual additional cost of HCC payments or interest saved by ACO members providing grants, this evidence review and scenario analysis illustrate that the avoided penalties of seeking HCC due to obtaining a grant could be in the hundreds of pounds per person.

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[20] I Moore & R Shah, The impact of the Covid-19 pandemic on problem debt in the UK, Pro Bono Economics, March 2021

[21] These estimates and scenarios reflect prices and interest rates at the time of writing. Due to a dynamic credit market, and changing regulations for high-cost credit, there is a chance these scenarios may not reflect realistic credit options for individuals in future.

Key assumptions

The following key assumptions were made in this report to overcome evidence gaps:

- The characteristics and behaviours of those without appliances in the LCF are representative of ACO members' grantees. It is possible that ACO grantees may not be representative of households in the UK without appliances, for example there may be something that enables them to approach ACO members for grants (access to information, word of mouth, referral routes) that are not as pronounced among other households without appliances.
- The impact of getting an appliance through a grant is the same as the difference in outcomes for those with and without an appliance at any given point in the LCF. The LCF data does not allow for an analysis of change in outcomes as a household goes from a "no appliance in the home" to "appliance in the home" state. While this study uses the difference in outcomes of those with and without appliances as proxy, there may be: a) differences in unobserved variables between the two groups that drive whether someone is more likely to get an appliance or not, and b) changes in income over time as a result of getting an appliance (e.g. improved physical and emotional health from having an appliance could improve the likelihood of someone moving into work), which might then push them out of the "low-income" bracket.
- ACO coalition grantees are all classified as "low-income". While numerous ACO coalition members have some means-tested benefit eligibility criteria, and therefore report that their grantees are typically on low incomes, this is not true of all ACO members. While eligibility criteria, and therefore income characteristics, vary across the ACO coalition, for the purposes of this research it is assumed that those who a) seek financial aid, and b) are granted it by ACO members (as not all applicants receive grants) are those who are likely to be in financial need, and therefore tend to be in low-income households. This assumption is tested by extending the regression analysis to all incomes, regardless of income status, in the sensitivity analysis.
- All responses in the LCF are accurate. Most data held in the LCF is self-reported, leaving room for human error in recollecting objective information or measuring subjective information (e.g. wellbeing).

- Modelled scenarios of purchasing appliances using HCC alternatives are reasonably close to what would happen if someone did not receive an ACO grant. In actuality, the evidence on the observed alternatives taken otherwise by ACO grantees is not available. Therefore, this report presents a range of scenarios to illustrate the potential impacts under certain assumptions, in the hope of evidencing the potential magnitude of the HCC penalty.

Because of these assumptions, PBE is not able to say with certainty that any differences in outcomes that are observed are due to someone going from a state of having an appliance to not having an appliance, and further that any difference observed *is* an impact of ACO members' grant-giving for white goods. However, in absence of outcomes data for ACO members that would allow for an economic evaluation explicitly of their grant-giving, this research uses LCF data as a first step in improving understanding of what the direction and magnitude of their impact could be on spending and wellbeing. In other words, these results should be considered as an indicator of the *potential* impact that ACO grant-giving might have.

Conclusion

It is likely that benevolent charities, such as those members of the ACO, are having significant positive impacts as a result of their grants, which lift people out of appliance poverty. While there is currently little evidence of household savings from having large household appliances in the home, there is likely to be both positive wellbeing impacts from lifting people out of appliance poverty and financial savings for people who might otherwise have to take on debt to pay for their appliances.

Those likely benefits are significant. Having large essential household appliances could improve a person's wellbeing by around 0.4 points (out of 10) on the life satisfaction scale. The Treasury's wellbeing evaluation guidance suggests that this boost in wellbeing has a value of £7,200 per person for each year lived with large appliances in the home – or by £6.7 billion overall. Additionally, the typical grant provided by benevolent charities could save households between £130 and £160 in interest payments, compared to purchasing the appliance through a typical rent-to-buy scheme, or £30 to £40, compared to the typical costs from using a credit card.

There are an estimated 480,000 households, or 1.2 million adults and children, in the UK missing at least one essential large appliance. With the gap between wages and benefits and the cost of large appliances growing, it is possible that the problem of appliance poverty will continue to grow in turn. Reforms to welfare which prevent people from falling into appliance poverty in the first place are essential. Reforms to welfare which prevent people from falling into appliance poverty in the first place are essential. Nevertheless, there is a clear need for benevolent charities to play this role, particularly supporting people who are ineligible for state help.

To strengthen the conclusions of analysis of their impact, benevolent charities (including ACO partners involved in this project) should consider developing their impact data collection. There are several significant caveats throughout this report that hinder PBE from saying with confidence that ACO members' grants have a given impact. The main caveat is that the methodology involves comparing the outcomes of households with and without appliances in national data. This is the best proxy available now, but is not as optimal for impact analysis as comparing the outcomes of those who received ACO support versus those who did not. PBE recommends that ACO partners work together to harmonise and improve their data collection to enable a stronger conclusion in future economic evaluation.

Annex A – Scale of missing appliances

Pro Bono Economics (PBE) analysed data in the Office for National Statistics' (ONS') Living Costs and Food (LCF) survey, a national survey used to understand the detailed spending patterns of households across the UK. It also captures household characteristics, including whether the household includes a washing machine or a fridge-freezer. This enabled estimation of the number of low-income households and people in the UK who may be living without appliances.

Methodology

For each of the large appliances in the scope and defined in the dataset (fridge-freezers and washing machines), the following steps were undertaken:

- Combined the last nine years of LCF household-level data – because those without large appliances form a small minority in this data, this allowed a large enough sample size to deduce outcomes for this group with confidence.
- Created a "low-income household equivalised disposable income" indicator variable – this allowed for looking at the outcomes solely of those most likely to be a grantee of an ACO partner. The Department for Work and Pension's (DWP's) definition of "low-income", as less than 60% of the median income, was used in this work.[22] This low-income definition was applied to household OECD-equivalised income rather than unadjusted household income to account for expected income and spending differences by household composition.[23]
- Calculated the percentage of households which qualify as "low-income" out of the total number of households in the data (19%).
- Of those low-income households, estimated the percentage of households:
    - Which are missing a fridge-freezer and/or washing machine (9%).
    - Which are missing both a fridge-freezer and washing machine (1%).
    - Which have a washing machine but no fridge-freezer (3%).

[22] Department for Work and Pensions, How low income is measured in households below average income., September 2016.
[23] Office for National Statistics, Family spending in the UK – Chapter 3: Equivalised Income, December 2015.

    - Which have a fridge-freezer but no washing machine (5%).

- Gathered data on:
    - The total number of households (28,081,000) in the UK.[24]
    - The total numbers of adults (54,711,707) and children (12,314,585) in the UK.[25]

- Used the following to estimate the number of low-income households/people missing appliances

$$Total_{a,b} = 19\% \times a \times b$$

Where a is the percentage missing at least one, only one, or both types of appliance

b is the total number of UK households, adults or children.

The results are summarised in Figure A1.[26]

Figure A1. Over a million people are estimated to be missing an appliance

	Adults	Children	Households
Fridge, no washing machine	549,602	123,705	282,085
Washing machine, no fridge	287,441	64,698	147,530
No fridge, no washing machine	102,676	23,111	52,699
Total	**939,719**	**211,513**	**482,315**

[24] Office for National Statistics, Families and households, May 2023.

[25] Office for National Statistics, Estimates of the population for the UK, England, Wales, Scotland and Northern Ireland, December 2022. The ratio of adults to children assumed in this report is from this source. LCF data indicated that 84% of those in low-income households are adults, whereas this source data suggests 82% are. PBE has used the 82% figure in this analysis because a) the sample size for the source data is larger than that of the LCF and b) it allows for a more conservative estimate of the potential wellbeing benefits arising from pulling all adults out of appliance poverty. Note also that "Adults" are taken to mean adults and older teenagers, i.e. those at least 16 years old. "Children" are taken to mean those less than 16 years old.

[26] Estimates in this table have been rounded to the nearest whole number (as they a product of percentages calculated from sample survey data applied to national household and population data). As a result, the total number of households presented in the final row may not exactly align, at first glance, with the preceding rows of the table.

Annex B – Spending analysis

Methodology

For each of the large appliances in the scope (fridge-freezers, washing machines and cookers), the following steps were undertaken:

- Combined the last nine years of LCF household-level data – because those without large appliances form a small minority in this data, this allowed a large enough sample size to deduce outcomes for this group with confidence.
- Created a "low-income equivalised disposable income" indicator variable – this allowed for looking at the outcomes solely of those most likely to be a grantee of an ACO partner. DWP's definition of "low-income", as less than 60% of the median income, was used in this work.[27] This low-income definition was applied to household OECD-equivalised income, rather than unadjusted household income, to account for expected income and spending differences by household composition.[28]
- Created variables that represent spending on certain items as a percentage of household OECD-equivalised disposable income. This avoided issues arising from differing price levels over the years.
- Unlike fridge-freezers and washing machines, LCF does not include data on whether the household has a cooker. In absence of this evidence, two variables were created to proxy for owning a cooker:
    - An indicator of having bought a cooker.
    - An indicator of having bought fish or seafood (as it seems more likely that a cooker is used to prepare fish or seafood).
- Compared mean expenditure (as a percentage of household disposable income) on the following by appliance ownership status:
    - Total food (for fridge-freezer and cooker).
    - Takeaways (for fridge-freezer and cooker).
    - Energy bills.
    - Water bills (for washing machine and fridge-freezer).
    - Laundrette (for washing machine).

[27] Department for Work and Pensions, How low income is measured in households below average income., September 2016.
[28] Office for National Statistics, Family spending in the UK – Chapter 3: Equivalised Income, December 2015.

- Regressed each of these on relevant appliances to understand if there was a statistically significant household saving with having a large appliance.
- Multiplied the coefficient for the relevant appliance (representing spend as percentage of household disposable income) by the mean OECD-equivalised household disposable income in 2021 to estimate the difference in spending associated with having appliances.
- In addition, to help get a sense of any changes in quality of food bought by appliance status, spend on the following (as percentage of total food spending) was regressed by fridge status: fresh, chilled or frozen meat, fish, fruit, vegetables, milk, and their respective processed counterparts.

Overall, the results from this analysis of spending patterns by appliance status in low-income households was mixed – i.e. it was not possible to say that there was a cost saving to those with large appliances, compared to without. Given these mixed and inconclusive results, more detailed analysis of spend on food by "quality" was undertaken to understand whether diet (and therefore potentially health outcomes) might differ if the household had a fridge.[29] However, these, too, were mostly inconclusive. Figure A2 summarises the outputs of spending regression models.

Results

Washing machines

The results suggested that low-income households spent 21p more per week on laundrettes if they did not have a washing machine, compared to those that did. The underlying simple regression analysis suggests that this might be statistically significant (i.e. only a 0.2% chance that the difference in spend is zero between those with and those without a washing machine), but the magnitude is very low at only £11 a year. This indicates that any additional cost of using a laundrette due to not having a washing machine would be small, or just 3% of the average price of a washing machine through an ACO grant (£310). While the reason cannot be deduced from the data, the results could reflect that those without washing machines have to wash more by hand, and/or reduce the amount they wash their clothes.

The analysis also suggested that the average low-income household spent £17 more on water and £20 more on energy per week if they had a washing machine, compared to if they did not. However, owning these appliances

[29] Because of the large assumptions around the proxy cooker variables, food type spend by cooker analysis is not included here.

may indicate the presence of other large electrical goods in the home (e.g. a television), and as the data does not allow to control for these other appliances in the home, it is not credible enough to consider this a significant finding.

Fridges

Analysis of overall food spend suggested that, even after accounting for equivalised income, having a fridge has a potentially significant positive relationship with food spending, with a less than 0.05% chance of the difference in food spending being zero. Results from the basic regression analysis suggests that a household with a fridge spends £105 more on food per week compared to an otherwise identical household without a fridge. While this may be driven by unseen wealth factors beyond equivalised disposable income in the model, it means that it is not prudent to say that, given the evidence, having a fridge saves on food spending.

In light of this, more detailed analysis was completed to understand whether the types of food bought differed depending on fridge status (while taking equivalised disposable income into account). Interestingly, spend on hot and cold takeaways (as a percentage of total food spend); preserved vegetables and fruits; preserved milk; and preserved meat all had a negative but statistically insignificant relationship with having a fridge in the home. On the other hand, the difference in proportion of food spend on preserved fish was much more statistically significant, but small in magnitude; with only a 10.7% probability of actually being zero, the model estimated that a household with a fridge spent 0.007 percentage points less on preserved fish as a proportion of their total food spend.

When analysing fresh, chilled and frozen foods, again the model found statistically insignificant differences in spend on fruit and vegetables, and fish. However, the results suggest that those with a fridge spent 0.02ppts more of their total food expenditure on meat, compared to those without; this analysis indicates there is only a 0.1% probability of this actually being zero. Oddly, milk spend seemingly took a lower proportion of food spend (0.009ppts) when a household had a fridge – with a 4% probability of this difference actually being zero.

Overall, these results suggest that not only is there not evidence of a white goods grant potentially lowering food costs, but that there is even limited evidence on an impact on quality of food bought as a result.

Cookers

Unfortunately, due to the limitations of using PBE's two proxy variables for owning a cooker, it was most difficult to conclude much about spend by cooker status. These limitations are as follows:

- Buying fish is an indicator of owning a cooker – in reality, one could buy chilled, fresh or frozen fish without needing a cooker, e.g. if it is microwaveable. Further, not all who own a cooker would buy fish because of their dietary requirements.
- Buying a cooker is an indicator of owning a cooker – as cookers usually remain in the home for years, it is highly unlikely that cooker owners are only those who bought cookers.

Bearing those limitations in mind, analysis indicated buying a cooker in the last year had no significant relationship with total food expenditure or with energy costs. Furthermore, the sample size of those low-income households that bought cookers was small at 65, weakening the use of this variable further beyond its existing limitations.

On the other hand, buying fish seemed to be very strongly associated with total food spending and energy costs. However, fish itself is a large driver of food spend and/or may indicate preferences for higher spending on food as a proportion of total expenditure anyway.

Due to the mixed results and assumptions applied when using these indicators for a cooker in the home, these findings are not included in this report's headline results. Wellbeing analysis results using these cooker proxy variables are not included for similar reasons.

Figure A2. It is not possible to conclude from this data that household savings arise from having appliances

Variables	(1) Laundrette	(2) Water	(3) Energy	(4) Total food	(5) Total food	(6) Total food	(7) Energy	(8) Energy
Washing machine	-0.001**	0.090*	0.109**					
	(0.000)	(0.048)	(0.053)					
Fridge				0.522**				
				(0.262)				
Bought cooker					-0.007**		-0.003	
					(0.003)		(0.002)	
Bought fish						0.593		0.339
						(0.696)		(0.443)
Constant	0.001***	0.043***	0.012***	0.272***	0.981***	0.850***	0.337**	0.262
	(0.000)	(0.002)	(0.002)	(0.055)	(0.256)	(0.273)	(0.164)	(0.176)
Observations	7,124	7,124	6,050	7,124	9,058	9,058	7,984	7,984
R-squared	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Coefficients represent spend on dependent variable as fraction of household disposable income

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Annex C – Wellbeing analysis

Methodology

For each of the large appliances in our scope (fridge/freezers, washing machines and cookers), the following steps were undertaken:

- Combined the last nine years of LCF household-level data – because those without large appliances form a small minority in this data, this allowed a large enough sample size to deduce outcomes for this group with confidence. Household-level data holds the variables that indicate whether the household has indicated there is a fridge-freezer in the home and whether there is a washing machine in the home.
- Combined the last nine years of LCF person-level data – because those without large appliances form a small minority in this data, this allowed a large enough sample size to deduce outcomes for this group with confidence. Person-level data holds the variable "Satis", which records the individual's reported ONS life satisfaction score on a scale of 0 to 10.
- Created a "low-income equivalised disposable income" indicator variable – this allowed for looking at the outcomes solely of those most likely to be a grantee of an ACO partner. DWP's definition of "low-income", as less than 60% of the median income, was used in this work.[30] This low-income definition was applied to household OECD-equivalised income, rather than unadjusted household income, to account for expected income and spending differences by household composition.[31]
- Merged the household-level and person-level data to enable regression analysis of life satisfaction scores against appliance status in the home, and other independent variables.
- Unlike fridge-freezers and washing machines, LCF does not include data on whether the household has a cooker. In absence of this evidence, two variables were created to proxy for owning a cooker:
    - An indicator of having bought a cooker.
    - An indicator of having bought fish or seafood (as it seems more likely that a cooker is used to prepare fish or seafood).

[30] Department for Work and Pensions, How low income is measured in households below average income., September 2016.
[31] Office for National Statistics, Family spending in the UK – Chapter 3: Equivalised Income, December 2015.

- Conducted linear regression analysis of life satisfaction score against the following main dummy independent variables:
    - Washing machine in the home.
    - Fridge-freezer in the home.
    - Both appliances in the home.
    - At least one appliance in the home.
    - Cooker in the home:
        - Using the dummy variable indicating that the household bought a cooker in the past year.
        - Using the dummy variable indicating that the household bought fish in the past year.
- Additional explanatory variables included in the regression equations to isolate any relationship between the appliance variables and life satisfaction, so that interactions between life satisfaction and other drivers of wellbeing are not inaccurately attributed to having appliances. In line with other wellbeing empirical research, the following variables were included as explanatory variables in this research:[32]
    - Working age – dummy.
    - Sex – dummy.
    - Female – dummy.
    - Attained GSCE qualifications – dummy.
    - Income – logged.
    - Reported satisfaction with health – discrete five-point scale.
    - In a relationship – dummy.
- The following checks were undertaken to check the robustness of these regressions:
    - R-squared and RMSE to check the fit of the model to the observations.
    - Ramsey's RESET test to check functional form misspecification of the regression model.
    - Hypothesis testing to check whether the coefficients in for the appliance variables of interest are statistically significant.
- Uprating of the WELLBY value:

[32] A Clark, S Flèche, R Layard, N Powdthavee, G Ward, The Origins of Happiness: The Science of Well-Being over the Life Course, Princeton University Press, February 2018.

- Published HM Treasury guidance on wellbeing evaluation presents the central estimate of a value of one WELLBY, equal to a one-point increase in the ONS life satisfaction score over a year, as £13,000 in 2019.
- The guidance recommends uprating this figure for other years using the following formula:

$$WTP\ (WELLBY_t)\ =\ WTP\ (WELLBY_{base})\ \times \frac{GDP\_deflator_t}{GDP\_deflator_{base}} \times \left(\frac{GDP\_per\_capita_t}{GDP\_per\_capita_{base}}\right)^{1.3}$$

- Following this method results in an estimated value of one WELLBY as £16,400 (£16,369.42) in 2022 prices.

- Multiplying this value of a WELLBY by the coefficient of the appliance variable of interest allows for the evaluation of the wellbeing benefit in monetary terms.

Results

When analysing each type of appliance in detail, PBE found a 7% probability that having a washing machine is not related to higher life satisfaction. The results show that having a washing machine in the home might indicate an individual with the appliance has a 0.57 point higher life satisfaction score than they might otherwise, even after accounting for other variables such as sex, employment status, relationship status and assessment of own health. Figure A3 summarises the outputs of main regression models of this report.

While the data suggested that those with a fridge had a higher life satisfaction score (0.27 points higher with a fridge than without, all else being equal) as well, regression analysis did not indicate that this was statistically significant. In other words, the model estimated a 46% probability that there was no difference in life satisfaction score associated with having a fridge in the home. Therefore, while there is some evidence that having a fridge indicates a higher life satisfaction, the results are not conclusive enough to confidently present this as a finding.

Figure A3. Regression analysis suggests the strongest link between life satisfaction (LS score) and having both appliances in the home

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	LS score	LS score	LS score	LS score	LS score	LS score	LS score
Washing machine	0.566*				0.540*		
	(0.312)				(0.319)		
Fridge		0.254			0.187		
		(0.345)			(0.353)		
Bought cooker			1.574				
			(1.646)				
Bought fish				0.181			
				(0.111)			
At least one appliance						-0.458*	
						(0.273)	
Has both appliances							0.437*
							(0.256)
Working age	-0.069	-0.070	-0.197	-0.187	-0.075	-0.082	-0.081
	(0.153)	(0.154)	(0.123)	(0.123)	(0.154)	(0.154)	(0.154)
Female	-0.125	-0.107	-0.108	-0.105	-0.127	-0.124	-0.125
	(0.094)	(0.095)	(0.077)	(0.076)	(0.095)	(0.096)	(0.096)
GCSE	0.032	0.033	0.022	0.024	0.032	0.032	0.032
	(0.036)	(0.036)	(0.031)	(0.030)	(0.036)	(0.037)	(0.036)
Unemployed	-0.779***	-0.775***	-0.732***	-0.718***	-0.776***	-0.785***	-0.778***
	(0.198)	(0.200)	(0.160)	(0.162)	(0.199)	(0.199)	(0.199)
ln(Income)	0.078	0.083	0.096	0.097	0.078	0.079	0.078
	(0.084)	(0.085)	(0.061)	(0.060)	(0.084)	(0.084)	(0.084)
Health score=2	-0.503***	-0.511***	-0.471***	-0.472***	-0.507***	-0.511***	-0.512***
	(0.120)	(0.119)	(0.101)	(0.100)	(0.119)	(0.120)	(0.119)

Health score=3	-1.260***	-1.271***	-1.167***	-1.164***	-1.263***	-1.267***	-1.267***
	(0.148)	(0.148)	(0.117)	(0.117)	(0.148)	(0.148)	(0.148)
Health score=4	-2.791***	-2.804***	-2.527***	-2.520***	-2.792***	-2.796***	-2.795***
	(0.220)	(0.219)	(0.179)	(0.178)	(0.220)	(0.220)	(0.220)
Health score=5	-3.303***	-3.316***	-3.469***	-3.451***	-3.312***	-3.319***	-3.321***
	(0.392)	(0.390)	(0.292)	(0.293)	(0.391)	(0.391)	(0.391)
Relationship	0.470***	0.485***	0.455***	0.433***	0.466***	0.468***	0.466***
	(0.117)	(0.117)	(0.093)	(0.094)	(0.117)	(0.117)	(0.117)
Constant	6.882***	7.154***	7.452***	7.400***	6.739***	7.468***	7.036***
	(0.528)	(0.553)	(0.343)	(0.342)	(0.584)	(0.467)	(0.497)
Observations	1,754	1,754	2,585	2,585	1,754	1,754	1,754
R-squared	0.220	0.219	0.206	0.207	0.221	0.221	0.221

Coefficients represent life satisfaction score difference estimated to be related to dependent variable

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Annex D – High-cost credit analysis

Methodology

To present some scenarios of high-cost credit (HCC), and thereby estimate the additional penalty of these alternatives to grants, the following steps were undertaken:

- Averaged the data collated on the average grant size provided by various ACO partners, by appliance type.
- Researched going annual interest rates (or their equivalents) of HCC from various banking and retail providers. This allowed also for the understanding of the length of repayment time that may be reasonable in these scenarios. Sources included the Bank of England, bank account providers, comparison websites, the FCA, and rent-to-buy retail websites.
- Summarised the findings from the evidence review by producing (where appropriate) "low", "high" and "central" estimates of interest rate equivalent and payback length by HCC type.
- Applied the average interest rates and assumed repayment length by HCC type to average grant size data from ACO. For a given scenario, the following formula was used to estimate the additional penalty of HCC:

$$Penalty = \frac{Equiv.\ annual\ interest\ rate \times Grant\ amount \times Years\ to\ pay\ off\ loan}{1-(1+[Equiv.annual\ interest\ rate])^{Years\ to\ pay\ off\ loan}} - Grant\ amount$$

Results

This table summarises the full list of scenarios modelled to understand the potential penalty of HCC alternatives to grants

Figure A4. The size of the penalty for high-cost credit varies by scenario

Appliance	Credit scenario	Payback plan	Cost (£)
Washing machine	Rent to buy cap	Credit cap of 100% of price of product	309
	Rent to buy	69.9% over 52 weeks	129
	Rent to buy	79.9 over 104 weeks	318
	Credit card	19.9% over 52 weeks	34
	Credit card	19.9% over three months	10
	Credit card	0% over 52 weeks	0
	Credit card	50% over three months	26
	Credit card	50% over one year	90
	Overdraft	20.85% over three months	11

	Overdraft	20.85% over 12 months	36
	Personal loan	8.35% over three months	4
	Personal loan	8.35% over 12 months	14
	Payday loan	1250% for 14 days	220
	Payday loan	1250% for one month	322
Fridge/freezer	Rent to buy cap	Credit cap of 100% of price of product	360
	Rent to buy	69.9% over 52 weeks	150
	Rent to buy	79.9 over 104 weeks	371
	Credit card	19.9% over 52 weeks	40
	Credit card	19.9% over three months	12
	Credit card	0% over 52 weeks	0
	Credit card	50% over three months	30
	Credit card	50% over one year	105
	Overdraft	20.85% over three months	13
	Overdraft	20.85% over 12 months	42
	Personal loan	8.35% over three months	5
	Personal loan	8.35% over 12 months	16
	Payday loan	1250% for 14 days	256
	Payday loan	1250% for one month	375
Cooker	Rent to buy cap	Credit cap of 100% of price of product	377
	Rent to buy	69.9% over 52 weeks	157
	Rent to buy	79.9 over 104 weeks	388
	Credit card	19.9% over 52 weeks	42
	Credit card	19.9% over 3 months	13
	Credit card	0% over 52 weeks	0
	Credit card	50% over three months	32
	Credit card	50% over one year	110
	Overdraft	20.85% over three months	13
	Overdraft	20.85% over 12 months	44
	Personal loan	8.35% over three months	5
	Personal loan	8.35% over 12 months	17
	Payday loan	1250% for 14 days	268
	Payday loan	1250% for one month	392

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