Segmented Multipliers: Evidence from Welfare Cuts *

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Abstract

This paper uses a large welfare reform in the UK to show that reductions in transfers have local multipliers that are concentrated in lower-income households. While average "savings per job" from welfare cuts are commensurate with estimates of the "cost per job" from spending increases, the lower employment likelihood post-reform is entirely borne by low-income groups. A feedback loop between lower local demand and employment explains this result: We show that low-income households reduce consumption of goods and services of local firms after the reform. Consistent with this reduction, in areas with higher cuts per capita, employment at small firms in the non-tradable sector drops. Since low-income individuals work in sectors more exposed to local demand, this makes them more likely to bear the drop in employment, which further amplifies the lower demand. The loss in benefits and labor income is associated with an increase in unsecured debt for low-income groups.

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Increases in government spending can have large local multiplier effects, both when they take the form of general spending (Chodorow-Reich (2019) provides a survey) or transfers (Egger et al. (2019); Pennings (2021)). Less is known about local multipliers following contractions in transfers, despite evidence that the direction and nature of the fiscal intervention matters (Barnichon et al. (2022), Alesina et al. (2015), Romer and Romer (2016)). It is important to understand the full magnitude of the effects of transfer cuts, as well as how they are distributed through the economy, as social transfer reforms are a pervasive feature of the political debate.

Cross-sectional fiscal multipliers are generally estimated using sub-national geographies as the unit of interest. However, there are reasons to believe that there may be important heterogeneity in multipliers within geographies. There is evidence of asymmetric responses of high- and low-income households to the business cycle (Guvenen et al. (2014)), monetary policy (Auclert (2019)), and of segmentation in the geography of consumption and prices (Diamond and Moretti (2021); Handbury (2021); Diamond and Gaubert (2022)). This paper shows, with granular microdata, how and why reductions in transfers to economically fragile households are associated with large but also highly segmented multipliers. With the recent exception of Auerbach et al. (2022), the focus in the literature so far has been on the average effects of spending shocks across the population rather than the heterogeneous impacts across individuals.

We exploit the Welfare Reform Act of 2012 in the UK to study the local multiplier effects of welfare cuts and their distributional consequences. This reform was large relative to the UK economy (at roughly £19 billion per year, or 1% of gross domestic product) and was followed by a period of sustained growth. Evidence suggests that the cuts impacted regions unevenly (Beatty and Fothergill (2013)) and were associated with increased support for Brexit and the UK Independence Party (UKIP) (Fetzer (2019)). Our analysis relies on micro-level data from three datasets that include information on income, welfare transfers, employment status, household assets and liabilities, and consumption expenditures

for UK households.[1] Following Fetzer (2019), we use local (district-level) expected losses in benefit income per working-age individual as a measure of the intensity of welfare cuts at the local level. For a subset of tests, we also use the reduction in council tax benefit – a reduction in government support for paying local taxes – as a household-level shock. The reduction in council tax benefit is one of the most affected welfare components in the reform and is the best available indicator that households also lost other benefits under the reform.

The austerity cuts produce significant average negative effects on employment at the district level. A one standard deviation increase in local cut intensity is associated with a 0.3 percentage point lower probability of employment, which translates into a job lost for each £32,000 in welfare cuts (i.e., a government "savings per job" of £32,000). The magnitude of the employment effect is consistent with the estimates of the "cost per job" from several studies using US data and different sources of variation in government spending discussed in detail in Chodorow-Reich (2019).[2]

The average effect on employment masks significant heterogeneity across income groups, which reveals that government multipliers can be highly segmented within the population. Individuals in households earning more than £30,000 net per year (which represents about the 40th percentile of the distribution) see no average change in employment probability due to the local incidence of the cuts, whereas lower earners suffer a drop in employment probability of 0.9 percentage points per standard deviation in local cuts from the mean cut. This result is stronger in districts with a higher pre-reform unemployment rate, indicating that austerity cuts are less likely to be compensated by private demand or investment when there is more "slack." Low-income households suffer a reduction in

[1] Our primary datasets are the UK "Understanding Society" Household Longitudinal Study (UKHLS), the Household Wealth and Assets Survey (WAS), and the Living Cost and Food Survey (LCF) run by the Office of National Statistics.

[2] An incomplete list includes shifts in defense spending (Nakamura and Steinsson (2014); Auerbach et al. (2020)), the American Recovery and Reinvestment Act (Chodorow-Reich et al. (2012); Wilson (2012); Conley and Dupor (2013)), veteran bonuses (Hausman (2016)), population-based government programs (Serrato and Wingender (2016)), municipal bond ratings (Adelino et al. (2017)), and congressional committee membership (Cohen et al. (2011)). Recent evidence on transfers includes Egger et al. (2019) and Pennings (2021).

employment income due to austerity primarily due to a lower probability of being employed (the extensive margin), rather than due to a change in income conditional on being employed.

Why does employment drop for low-income households relative to other households? The large economic impact of the reduction in government transfers is consistent with open economy New Keynesian models with price rigidity, as in Farhi and Werning (2016), Chodorow-Reich (2019) or Pennings (2021). However, our results suggest a novel channel by which austerity cuts not only directly affect lower income households, but also cause *the same segment* of the population to bear the local employment multiplier effects. These models usually interpret the "home" and "foreign" regions as purely geographic concepts. Our results suggest that employment effects can be further separated along the income dimension, with households at different income levels being differentially exposed to local demand shocks because they work in different sectors even within the same region. When low-income households (who have high marginal propensity to consume) reduce local consumption following the austerity shock this creates a feedback loop by affecting the employment also of low-income individuals who are disproportionately employed in the non-tradable sector locally.

We show that low-income households in the UK are, indeed, significantly more likely to work in non-tradable sectors (defined as in Mian and Sufi (2014)), particularly "Food and accommodation," and "Retail trade."[3] This pattern is also present, and to some extent even more pronounced, for very-low income households (those earning less than £20,000). This means that any local shock to demand is especially likely to translate into a lower probability of employment for this group of the population.

In order to trace out the mechanism behind our findings, we use firm-level observations from Bureau van Dijk's FAME dataset to measure revenue and employment growth for firms of different sizes and in different sectors as a function of the intensity of local benefit cuts. If local drops in demand are responsible for employment loss, this should be

[3]We document in the appendix that this is also the case in the US.

especially true for firms in non-tradable sectors (again following Mian and Sufi (2014)), and for small firms that are present in fewer geographic markets and, thus, more exposed to the local demand drops. We find that non-tradable firms with fewer than 100 employees located in more affected districts lose revenue and employment relative to their counterparts in less affected districts. We do not find these patterns for either revenue or employment for large firms (more spread out geographically) or for those in the manufacturing sector (less dependent on local demand).

We further corroborate these patterns with granular household-level consumption expenditures data that allow us to provide direct evidence of the effect of the reform on various consumption goods. We find that, in districts more affected by the cuts, low-income (but not high- or middle-income) households significantly reduce consumption across several categories of expenditures associated with local businesses (e.g., restaurants, healthcare, recreation).

In the last part of the paper, we examine how the loss in income (and employment) affects household balance sheets by measuring assets and sources of borrowing. A small percentage of low-income households are homeowners, and we do not find a differential effect of home-ownership of low-income households in highly affected areas relative to the other areas. In contrast, the reform leads very low-income households to significantly increase usage of unsecured debt, particularly credit card balances. A one standard deviation increase in expected cuts leads individuals in low-income households to be 12% more likely to have a credit card balance outstanding after the reform relative to their probability of having a credit card balance outstanding before the reform. We find suggestive evidence that the combination of reduced income and higher debt usage leads to increased financial distress. We find a positive, though statistically insignificant, relation between the intensity of the cuts and the reported debt burden of low- and very low-income individuals.

Our work is connected to several strands of literature. First, in addition to the cross-sectional multiplier literature discussed above, it relates to a long macro and micro liter-

ature on austerity. Closely related to our work and using the same reform, Fetzer (2019) shows that austerity in the UK is associated with extreme political views and support for Brexit starting in 2013. See also Galofré-Vilà et al. (2021) for evidence on 1930s Germany and the rise of the Nazi party, and Ponticelli and Voth (2020) for long-sample evidence on the connection between austerity and social unrest.

Previous studies on negative fiscal shocks use aggregate (country-level) evidence from a large number of austerity programs (e.g., Blanchard and Leigh (2013); Górnicka et al. (2020)) and discuss how effects depend on tax changes versus spending adjustments (Alesina et al. (2015); Alesina et al. (2019)) or the business cycle (e.g., Huidrom et al. (2020)). Lama and Medina (2019) study the relevance of wage rigidities and total factor productivity for understanding the effect of fiscal consolidation on employment, while Brinca et al. (2021) and Furceri et al. (2022) show a relation between fiscal consolidation and income inequality. In the finance literature, Ağca and Igan (2019) find that austerity is associated with a higher cost of credit, in particular for small and financially constrained firms. Our study shows the very concentrated nature of the multiplier effects of welfare cuts on lower-income households and highlights the heterogeneous effects that fiscal consolidation plans may have.

Our findings also speak to the literature on social assistance and labor outcomes. Across various datasets and empirical techniques, researchers have studied the consumption and labor supply effects of social assistance expansions, in the form of disability insurance (Von Wachter et al. (2011); Maestas et al. (2013)), income tax rebates (Johnson et al. (2006); Sahm et al. (2010); Sahm et al. (2012)), and housing assistance (Jacob and Ludwig (2012)). These studies generally report a reduction in labor supply after an increase in assistance, although the estimates are generally small in magnitude (Krueger and Meyer (2002) provide a survey of earlier literature). Cesarini et al. (2017) and Picchio et al. (2018) show small lifetime labor supply responses to wealth shocks due to lottery wins, while Zator (2021) shows substantial labor supply responses to changes (particularly increases) in mortgage debt repayments. By studying cuts to benefit income, our results provide

novel evidence on the net effect of labor demand (originating in small firms dependent in non-tradable sectors, as in, for example, Goldman (2020)) and labor supply responses due to large-scale welfare reforms on household finances and income.

Finally, our results on the connection between local spillovers and household debt relate to a recent literature in finance looking at local spillovers of credit and house price shocks. Guren et al. (2021) show the long-term effect of housing wealth shock on local consumption while Huber (2018) shows how lending cuts propagate locally, including for firms that are not directly connected to affected banks. In the mortgage setting, several papers consider how foreclosures affect local housing markets (Campbell et al. (2011), Gupta (2019), Gerardi et al. (2015)). Favara and Giannetti (2017) show that local lending concentration changes the incentive to foreclose on properties. We find that localized government spending cuts affect not only unsecured household credit but also employment.

1 The Welfare Reform of 2012

Following the 2010 general elections, the newly-elected UK government embarked on a major reform of the British social security system. The Welfare Reform Act, passed in 2012 and implemented starting in 2013, profoundly changed how social benefits are allocated in the UK. Beatty and Fothergill (2013) study key elements of the reform that, together, were estimated to generate £19 billion in savings to the UK government.[4] Even though a few welfare-related cuts started in 2011 as part of the withdrawal of stimulus measures implemented during the financial crisis, the vast majority of cuts (in value) started to take effect in 2013.[5] Not directly related to welfare programs and thus less relevant to this

[4]These measures include a local housing allowance, housing benefit for under-occupation, non-dependant deductions, household benefit cap, council tax benefit, disability living allowance, incapacity benefits, child benefit, tax credit, and 1% up-rating.

[5]Some of the changes that started in 2011 included early cuts to the budgets of local authorities (Fetzer (2019)), the beginning of a reduction in some support measures for lone parents, a reform to the local housing allowance, the freeze of child benefit from 2011 (with the main reduction in child benefits starting in 2013), and the start of the implementation of some non-dependent deductions, incapacity benefits, and tax credit changes (Department for Work and Pensions (2015)).

paper, Westminster department budgets and civil servant salaries were also frozen from 2012.

In aggregate, real social and welfare spending fell by about 9% in real terms between 2012 and 2015 (Fetzer (2019)). The timing of our empirical strategy is consistent with the majority of the welfare cuts starting to bite from 2013 with the implementation of the Welfare Reform Act, and it is also consistent with the effect of Fetzer's (2019) overall austerity shock on political support for UKIP (see, for example, Figure 5 in Fetzer (2019)).

To identify individuals most affected directly by the reform, parts of our analysis focus on the reduction in the council tax benefit. The council tax benefit was the largest means-tested benefit in the UK at the time of the reform, providing close to £5 billion in support to just under 5 million recipients (Ashton (2014)). It exempted recipients from paying the council tax (a tax collected by local authorities) or granted them a discount on that tax. Eligibility and receipt of the council tax benefit before the reform is a good marker of households that relied on welfare benefits and were significantly affected by the overall cuts of the Welfare Reform Act (including other out-of-work means-tested benefits). After 2012, there is a sharp and persistent drop in income from benefits for households receiving the council tax benefit before the reform (see Figure 4).[6]

To assess the spillovers and multiplier effects of the welfare cuts across income groups, we use Beatty and Fothergill (2013)'s measure of expected loss per working age individual in a district. This measure is constructed by multiplying the number of individuals affected by benefits cuts by the average expected loss in benefits for a given individual in the district.

[6]The main criterion for eligibility for the council tax benefit before the reform was income relative to a "minimum need" threshold, although the precise benefit level was a function of other considerations like property size, pensioner status, number of children, and others. Only about two-thirds of households eligible for the council tax benefit actually received this benefit, with an even lower percentage for the lowest income households (see Adam and Browne (2012), Figure 2.6 and Appendix C, for the share of individuals eligible for, and receiving, the council tax benefit by income decile). In Figure A.3 in our Appendix, we present the share of individuals who received the council tax benefit by income decile in our data, and we obtain similar results as Adam and Browne (2012) with tax data. The complexity of the system (involving time and effort to apply and receive the benefit), unawareness, and stigma are viewed as the main reasons for the imperfect take-up of the program (Adam and Browne (2012)).

2 Data and Empirical Strategy

The data for the analysis below comes from four different sources: the "Understanding Society" UK Household Longitudinal Study (UKHLS), the Wealth and Assets Survey (WAS), and the Living Cost and Food Survey (LCF), all administered by the UK Office of National Statistics, and the FAME UK firm-level dataset of privately-held and publicly-listed firms (the UK and Ireland equivalent of the Orbis data) from Bureau van Dijk.

The UKHLS is an annual survey with information on respondents' social and economic circumstances and attitudes, as well as the geographic identifiers necessary for our analysis ("local authority districts," or districts, for short). Districts have populations of between 25,000 and 200,000 and coincide with the level at which most austerity cuts were administered (Fetzer (2019)). The WAS is a biennial longitudinal survey that provides information on respondents' finances, including income, savings, investments, and debt. We rely on the UKHLS data for the analyses that compare individual employment and income across districts with different cut intensity due to its significantly larger size, and use the WAS data for analyses of household balance sheets.

Our data span from 2010 to 2016, and so is not contaminated by the changes brought on by Brexit. Our analysis focuses on working-age individuals present in the panels in the last wave before 2013, the year of the reform. The UKHLS and WAS data contain 37,781 and 14,571 such individuals, respectively.

The Living Cost and Food Survey allows us to observe household spending, including detailed information on consumption across different categories (food, services, transportation, among others). The FAME data allows us to run our analysis at the firm level and measure sales and employment effects of the welfare cuts for firms of different sizes and in different sectors.

2.1 Summary statistics

Table 1 provides the descriptive statistics for the four datasets used in this paper. The summary statistics are all for the last survey wave or last firm fiscal year before the welfare reform. In the UKHLS data (Panel A), the average respondent is 39 years old, 70% of respondents are employed, 49% are male, and 66% are homeowners. The average gross annual income per household is about £45,000, and 5% of the individuals receive the council tax benefit before the reform. In the WAS data (Panel B), the average respondent is slightly older, at 43 years old, 77% of respondents are employed, 51% are male, and 76% are homeowners. The average household net annual income in the WAS data is about £39,100, and 8% of individuals receive the council tax benefit before the reform.

Figure 3 presents the distribution of pre-reform household gross income for individuals in the UKHLS. The dashed lines delineate the main categories of individuals that we focus on: individuals in households earning less than £20,000 in net income (who we label as "very low-income"), individuals in households earning less than £30,000 in net income (who we label as "low-income"), individuals in households earning between £30,000 and £60,000 in net income (who we label as "middle-income"), and individuals in households earning more than £60,000 in net income (who we define as "high-income").[7]

We show summary statistics on the consumption by categories from the Living Cost and Food Survey in Panel C. Expenditures in the LCF are expressed on a weekly basis. The average household reports just over £500 in total expenditures, of which £422 are consumption expenditures. Household goods represent about £29 per week, and restaurants and hotels another £40.

Panel D shows the summary statistics for firms in the FAME data. We split firms into manufacturing firms and local sector firms, i.e., those more dependent on local demand and defined in some detail in Section 4.2. Firms with fewer than 100 employees in local

[7]Since net income is unobserved in the UKHLS, we make the conversion between net income and gross income using data from the WAS where we can observe both income types. The gross income levels associated with the net income thresholds that delineate the categories are £21,000, £37,000, and £80,000. They correspond approximately to the 20th, 40th and 90th percentile of household gross income distribution.

sectors have average revenues of about £6.6 million and 29 employees, and they make up the majority of our sample of firms. Firms with over 100 employees in local sectors have revenues of about £114 million and over one thousand employees. In manufacturing, our definition of small firms show average revenues of £13 million and 52 employees, and those with more than 100 employees have over £162 million in revenue and about 700 employees.

Panel E shows the average cuts per capita are £447, with a standard deviation of £121. Figure 1 shows the geographic distribution of cuts per capita at the district level. It is clear from the picture that, while there are broad geographic patterns (North versus South, and London area versus the rest of the country), there is still substantial variation even within regions that we can exploit in the analysis.

2.2 Direct effects of the reform on benefit income

While it is natural to assume that the welfare reform, by definition, primarily affects low-income households, we conduct two analyses to further lend support to this fact. First, we show in Figure 2 that the distribution of welfare benefits is strongly negatively related to individual income. In fact, for the individuals in the lowest decile of income, as much as 60% of their income is derived from state-provided benefits. This becomes progressively smaller as income rises. This simple fact means, as we would expect, that the reform is particularly targeted at low-income individuals.

Second, we show that a good measure of individuals who were particularly affected by the austerity cuts is to concentrate on those who received the council tax benefit before the reform. Figure 4 displays the evolution of income derived from welfare benefits for individuals receiving the council tax benefit (CTB) before the reform relative to other individuals. As we discuss above, CTB recipients are a good proxy for welfare recipients more generally. In Panel A, we estimate a pooled regression of the outcome on year, survey wave, and pre-reform individual characteristics (employment status, age category,

gender, home ownership status, and educational attainment status) for each group and plot the coefficients on the year fixed effects. We observe little difference in the coefficients between groups in the years before the council tax benefit cuts. After the welfare reform takes effect, starting in 2013, we observe a marked decline in welfare recipients' annual income from welfare benefits. In Panel B, we estimate the difference-in-differences regression and plot the coefficients on the interaction of the year fixed effects and the CTB recipient indicator. The marked decline in benefit income for CTB recipients from 2013 onwards is statistically significant from 0.

2.3 Empirical strategy

In our main empirical analyses, we use a difference-in-differences (DiD) setup with a continuous treatment to compare outcomes for individuals across districts that experience benefit cuts of different magnitudes. Our sample covers 2010 to 2016 to avoid capturing any effects associated with Brexit. The baseline specifications have the following structure:

$$Y_{it} = \beta(ln(Cut) \times Post_t) + \alpha_i + \eta_{rt} + \zeta_{wt} + \Gamma X_i \times Post_t + \epsilon_{it}, \tag{1}$$

where i denotes an index of individuals, t denotes years, and w denotes survey waves. Y_{it} denotes the individual outcomes (e.g., employment, employment income, different measures of consumption and household debt). $ln(Cut)$ is our "treatment variable" of interest, the logarithm of the expected total amount of austerity cuts per working-age individual in the district, and $Post$ takes the value of 0 in 2010-2012 and 1 for the period 2013 through 2016. α_i denotes the individual fixed effects that control for time-invariant characteristics. η_{rt} and ζ_{wt} denote region-by-year and wave-by-year fixed effects, respectively, and control for time-varying shocks that are allowed to be different by region and

survey wave.[8]

Importantly, our analyses control for the possibility that household characteristics may be correlated with $ln(Cut)$, and that differential shocks correlated with these characteristics might drive the individual response to the reform. Specifically, we control for the interaction of X_i, a vector of pre-shock individual characteristics, such as gender, employment status, age category, owner/renter status, household net income, educational achievement, and debt burden, and the post-reform indicator ($Post$, which is a variable equal to one after 2012).

The coefficient of interest is β, the DiD estimator. Throughout the analysis, we cluster standard errors at the region-by-year level, which results in 77 clusters. In this approach, we assume independence of observations between region-years, which represents a large enough number of clusters to avoid biased estimates of the standard errors in the regressions. The results are robust to clustering at the district level.

3 Segmented Multipliers of Welfare Cuts

In this section, we discuss difference-in-differences (DiD) regressions of employment status on district-level cuts that are similar to Chodorow-Reich et al. (2012), Nakamura and Steinsson (2014), Serrato and Wingender (2016), and Pennings (2021), among many others who use tracts, counties or states in the US as the units of observation. We measure changes in the probability of employment using individual-level data from the UKHLS. The district-level shock is the expected loss in total benefit income in British pounds per working-age individual as in Fetzer (2019).

As we discuss in Section 2.3, we use survey data at the individual level rather than total local employment to be able to consider heterogeneous effects by income level and identify the potential segmented effects of austerity cuts *within local areas*, which is the

[8]Since a wave can be administered over several years, a given year can be associated with two different waves, which allows for the inclusion of wave-by-year fixed effects, similar to Fetzer (2019).

central focus of this paper. Measurement at the individual level also allows us to isolate the effect of the cuts from other contemporaneous shocks that might have asymmetric effects on observably different individuals. We do this by adding several individual-level characteristics measured before the reform interacted with a "post" dummy, in addition to individual, region-by-year and survey-by-year fixed effects.

3.1 Employment

Table 2 shows that higher per capita cuts at the district level are associated with a lower probability of employment after the welfare reform. The statistically significant coefficient of -0.014 in column (1) means that a one standard deviation higher cut intensity relative to the mean (a move from £447 in welfare cuts per capita per year to £568) leads to a lower employment probability of 0.34 percentage points on average.

If we aggregate this individual estimate up to the district level, at the average cut of £447, we obtain a "saving per job" of £31,900 (or $47,000 at 2012 exchange rates, an estimate that is remarkably close to the average reported across a variety of studies by Chodorow-Reich (2019)).[9]

Columns (2) through (4) of Table 2 show the first key result of our analysis: the average effect on employment probability is significantly amplified among the sample of households earning less than £30,000 per year. In fact, we find a positive and insignificant 0.017 coefficient for the highest earners, and essentially no effect for the middle group, those living in households earning between £30,000 and £60,000 per year. For the low-income group, we obtain a highly significant coefficient of -0.039, which translates

[9] We obtain this figure by dividing the average cut per capita of £447 by the coefficient of 0.014. This is obtained by assuming a percentage change in benefits relative to the mean of £447 (call this change z) and using the average number of working-age individuals per district N. We can use the point estimate of the coefficient on $ln(Cut)$ from the regression to calculate the predicted change in employment per district measured in number of individuals: $\Delta(Employed) = z * 0.014 * N$. At the same time, at the mean of cuts of £447, a change in z relative to this mean results in an absolute cut per district expressed in pounds of $\overline{Cut} = z * £447 * N$. This results in the estimate of $SavingsPerJob = \frac{\overline{Cut}}{\Delta(Employed)} = \frac{z*£447*N}{z*0.014*N} = \frac{£447}{0.014} = £31,929$ at the mean of the cuts per district.

into a 0.93 percentage point lower probability of employment per standard deviation of welfare cuts. The estimate of "savings per job" obtained above is unchanged (because the total number of jobs lost is unchanged), but the breakdown of the overall effect by income shows that the job loss is concentrated in the lowest income group.

In Figure 5, we show the dynamics of the employment effect of the welfare reform on individuals in the low-income group. In Panel (a), we compare the evolution of the probability of being employed across districts differentially affected by welfare cuts for low-income and other individuals. For each group of individuals (in low-income households and others), we estimate a regression of the probability of employment on the interaction of the extent of welfare cuts in the district and the year fixed effects, and individual, region-year, wave-year, and the interaction of pre-reform characteristics and the post-reform indicator. The figure presents the coefficients on the interaction of the logarithm of cuts and the year fixed effects. We find that the probability of being employed diverges in 2013. By 2016, the gap in the probability of employment across districts differentially affected by the cuts is still substantial at around 1.5 percentage points for a one standard deviation increase in cuts.[10] In Panel (b) we plot the difference between the two groups obtained by estimating the associated triple differences regression, which allows us to confirm that the differences between groups are statistically significant. The figure displays the coefficients and confidence intervals on the interaction between the year fixed effects, the logarithm of cuts, and the low-income indicator.

Returning to Table 2, we observe that, among individuals in the lowest earning group, households earning less than £20,000 (column (5)), we obtain an effect of cuts on the probability of employment that is larger than in column (4), at -0.045. Finally, in column (6), the negative and statistically significant point estimate of -0.089 indicates that among council tax benefit recipients, those located in districts with a higher extent of cuts experience a greater effect of the reform. This effect translates into 2.1 percentage points lower probability of being employed when we move from the average district cuts to one that

[10]The effect is calculated as $(ln(447 + 121) - ln(447)) * 0.06 = 0.0143$.

is one standard deviation above the mean.[11] As we show above, these are also the individuals most affected directly by the reform itself, as they are the ones initially receiving benefits and partially losing them after 2012 (as we show in Figure 4). The additional effects of employment mean that the effects of the austerity reform are exacerbated for these households and reduce both benefits and labor income. In other words, local multipliers are highly segmented in the case of this welfare reform, with even larger employment effects for individuals receiving council tax benefits even relative to other low-income groups.

The differences between the highest-income group and the low-income categories (all low-income individuals and those receiving council tax benefits) are all statistically significantly different from each other, as we show in Table B.1 in the Appendix. This is true even when we control for $District \times Year$ fixed effects, which absorb any contemporaneous shocks at the district level. The point estimates barely change when we add $District \times Year$ fixed effects, suggesting that absorbing contemporaneous local shocks is not an important concern for explaining the heterogeneous effects of the cuts across income categories.

The results are also concentrated in the top tercile of the district cut measure when we replace the continuous $ln(Cut)$ variable with discrete indicators for $ln(Cut)$ terciles (Table B.2 in the Appendix). Finally, the results we describe above are robust to estimating the models without region-year fixed effects, and also without including pre-reform characteristics interacted with the $Post$ indicator (Table B.3 in the Appendix). The exception is the control for $Employed \times Post$ (the employment status before the reform interacted with $Post$), which we include in all regressions. Removing pre-reform employment status significantly affects the individual-level estimates, possibly due to mean reversion (i.e., because unemployed individuals are, on average, likely to return to work), and accounting for this effect is important to isolate the effects of the cuts.

In Appendix Table B.4, we compare the effect of austerity cuts in districts with high

[11] The effect is given by $(ln(447 + 121) - ln(447)) * 0.089 = 0.021$.

and low pre-reform unemployment rates. While the average effects of the reform are similar for high- and low-unemployment areas (columns (1) and (2)), we find a significant gap in the likelihood of employment of low-income individuals (columns (7) and (8)). Districts with a higher pre-reform unemployment rate show a larger effect of the cuts on the probability of employment in the low-income category. These findings underscore the role of labor market "slack" in amplifying the effects for affected individuals by reducing their ability to replace lost income, in line with several results in the literature, starting with Nakamura and Steinsson (2014).

3.2 Intensive and extensive margin in employment income

We establish above that the probability of employment is lower for low-income and very low-income individuals after the welfare reform. In this subsection, we address the question of whether these individuals also experience drops in wage income conditional on being employed (i.e., whether there is also an intensive margin effect). Table 3 shows that the overall drop in employment income after the reform is entirely driven by the extensive margin (i.e., by a lower probability of being employed), and not by a reduction in income conditional on being employed.

Panel A shows how the $ln(Cuts)$ variable is associated with total employment income, including individuals with zero employment earnings. To do this, we use $log(1 + \textit{Labor income})$ as the outcome variable in Equation 1. The point estimates in columns (4) and (5) show that low and very low-income individuals earn 9.3% and 10.6% less (respectively) for a one standard deviation-change in the district-level cuts. Panel B, however, shows no difference in income for employed individuals in any of the low-income categories (columns (4) through (6)).

Finally, Panel C extends the income definition to gross income, which encompasses all types of income earned by individuals (e.g., labor income, insurance income, benefit income, investment income, rental income). We find that greater district cuts are associated

with lower gross income after the reform for low-income individuals.

4 Investigating the mechanism

The previous section establishes that low-income individuals living in areas that are most exposed to austerity cuts are less likely to be employed after the reform. In this section, we investigate each causal link in the feedback effect in open economy New Keynesian models with nominal rigidities (Farhi and Werning (2016)). The feedback loop starts with a shock to spending or transfers that leads to changes in demand that, in turn, affect local employment and income and cause further shifts in demand. While this is the model underlying most previous work investigating local multiplier effects, the links in this causal chain are rarely explicitly tested.

Below we show that each step in this chain is concentrated in low-income individuals in the case of the austerity reform. First, we provide descriptive evidence that low-income individuals in our sample are more likely to work in sectors that are more exposed to local demand. Second, we consider firm-level employment and revenues in different sectors and show that firms more exposed to local demand are more sensitive to local austerity cut intensity. Third, we use consumption data to establish that low-income individuals in areas more exposed to the cuts reduce spending in categories that are associated with those local sectors. Finally, we show that household balance sheets adjust as a result of austerity.

4.1 Sectors of employment

The employment results described in Section 3 suggest that low-income individuals (and council tax benefit recipients) are more likely to be employed in sectors that are more dependent on local demand. We use information on individuals' sector of employment from the UKHLS to verify that this is the case. In Figure 7 we run regressions where the

outcome variable is a $0-1$ indicator for whether a particular individual works in a given sector. We plot the point estimate and the standard errors of the coefficient for belonging to the low-income group. The sample includes all employed individuals, and the regressions control for individuals' age category and gender, as well as year and district fixed effects.

Panel A of Figure 7 shows that, indeed, relative to all other employed individuals, the low-income group is significantly more likely to work in the food and accommodation sector (one of the sectors most dependent on local demand), as well as in retail trade (the third sector with the largest difference between low-income and the rest). There are no differences for other local sectors like construction, but low-income individuals are much less likely than others to work in the finance or information sectors, which are less likely to be affected by local shocks. Panel B shows that similar results apply to very low income-households. In Appendix Figure A.1 we document that employed individuals in low-income households are more likely to work in firms with less than 100 employees, which are also more likely to depend on local demand – see next section (Section 4.2). We also show in Figure A.2 of the Appendix that a similar sectoral pattern occurs in the US: low-income (those with an income in the bottom 40%) and very low-income (bottom 20%) households are much more likely than the rest of the population to work in the food and accommodation and retail trade sectors. In fact, the patterns are more pronounced in the US than what we observe in the UK.

Overall, this evidence suggests that a shock to local demand, like the austerity cuts, would hit these individuals particularly hard. The next subsection shows that firms in the sectors in which the low-income segment is more likely to be employed are the ones that are sensitive to the cross-sectional variation induced by the $ln(Cut)$ variable.

4.2 Firm-level evidence of local spillovers

The New Keynesian mechanism that explains the effect of austerity on employment above works through weaker demand, and, consequently, lower firm revenue and employment. We turn to Bureau van Dijk's FAME firm-level dataset for private and public firms in the UK to confirm this channel. Our hypothesis is that both revenue and employment losses should be concentrated among firms in sectors and firms most exposed to local demand (the non-tradable sector) located in districts that are most affected by the reform. This represents a direct test of the hypothesis that local demand is responsible for the employment effects we see in Table 2. To be clear, this does not mean that there are no employment effects in other sectors due to the austerity reform, simply that the employment effects in the non-tradable sectors should correlate with the local district-level cuts variable.

We identify sectors that are dependent on local demand using the definitions in Mian and Sufi (2014) (essentially firms in retail, and food and accommodation), and those that are least dependent on local demand by selecting manufacturing firms. We also construct a broader definition of "local sectors" that includes not only retail, and food and accommodation, but also services other than motion pictures. In addition, we distinguish between small and large firms (we define a firm as small if it has fewer than 100 employees) as small firms are more likely to operate in one or few locations. Large firms even in non-tradable sectors are more likely to operate in many locations, and thus total firm-level employment is less likely to be affected by shocks in the firm's headquarter district.[12]

Table 4 shows the firm-level results of the local effects of the welfare reform. As we describe above, results are split by firm size, as well as firm industry, particularly non-tradable and manufacturing sectors. Column (1) shows that revenues of small firms in the non-tradable sector are negatively affected by the welfare reform in the districts where they are located. The point estimates suggest that being one standard deviation above av-

[12]The FAME data do not contain plant- or branch-level location information, so we cannot construct a firm-level shock across all its locations for large firms. We use a firm's headquarters to assign a firm to a district.

erage per capita cuts leads to a 1.9% reduction in revenue for small firms in non-tradable sectors defined as in Mian and Sufi (2014), and a 1.0% reduction for small firms in local sectors defined as retail and services. We find that local per capita cuts do not have a statistically significant effect on the revenues of manufacturing firms, consistent with the customers of these firms (even the small ones) being located, on average, far from where the firms themselves are located (Adelino et al. (2015)). Figure 6 illustrates the results graphically and depicts the relative decline in revenue for firms active in the non-tradable sector after the reform.

Column (2) of Table 4 shows that large firms in the non-tradable sector do not suffer similar revenue losses as large firms, nor do large manufacturing firms. This is consistent with larger firms being less dependent on demand from the specific district in which they are headquartered, as they are much more likely to have operations spread over large geographic areas, even if they are in non-tradable sectors (e.g., by having multiple retail locations).

Columns (3) and (4) present very similar results when we use employment as an outcome. Consistent with the mechanism we have in mind and with the revenue results, small firms in "local" sectors reduce employment in districts most affected by austerity cuts due to the reform.

4.3 Consumption

We now directly assess the local demand mechanism by measuring changes in household consumption expenditures across districts and income categories. The segmented multiplier channel predicts that low-income households with high marginal propensity to consume decrease consumption relatively more in districts more affected by the reform. Individuals in other categories should be less affected, as they are less impacted by the welfare benefit cuts and do not suffer employment losses.

We exploit data from the Living Cost and Food Survey (LCF) that record information

on household expenditures on various categories of goods and services, together with demographic information about households. One caveat is that the LCF it is a repeated cross-sectional dataset, so it does not track the same households over time and we cannot include household fixed effects in the regressions.

Table 5 displays the results of estimating equation 1 on the LCF data. Each cell of the table displays the difference-in-differences coefficient (*ln(Cut)* $\times$ *Post*) of a separate regression. All regressions include year, district, region-year, as well as household size, number of adults, and home ownership status fixed effects. The household size fixed effects ensure that the expenditures are compared within the set of households of similar size.

The first row of Table 5 presents the results for households' total weekly consumption expenditures. Column (1) shows only a statistically insignificant decrease in total expenditures for districts more exposed to the reform when all households are included in the regressions. If we focus on high- and middle-income households (columns (2) and (3)), there is no effect of the *ln(Cut)* variable on consumption. In contrast, in column (4), the statistically significant -0.121 coefficient indicates that low-income households reduce total weekly expenditures by about 3% for each standard deviation increase in district cut.

Rows (2) and (3) separate total expenditures into consumption and non-consumption expenditures. We see that the effect on total expenditures is concentrated among consumption expenditures. The rest of the table displays the effect for each type of consumption expenditure. In line with the segmented multiplier channel, column (4) displays particularly large effects for expenditures on restaurants and hotels. A one-standard deviation increase in exposure to cuts reduces restaurant and hotel expenditures by low-income households by about 8%. Low-income households also significantly reduce weekly consumption in Alcohol, tobacco, and narcotics; Households goods and services; Health; Transport; Recreation and culture, and, to a smaller extent, Education. We observe similar patterns when examining households with less than £20,000 in income, though the

coefficients tend to be estimated less precisely. Overall, these regressions indicate that low-income households adjust to their post-reform loss of income by reducing consumption of goods and services sold by local firms.

5 Household Finance Effects

We next examine whether affected individuals also adjust to the reform through the usage of financial products, and whether the reform affects their liabilities.

We start by considering the effects on home ownership (via mortgage debt). Even though home ownership rates are low among low-income households in the UK, housing debt is the most important liability for most households that hold a mortgage, and home ownership is often hailed as an important policy goal in Western economies. In Row (1) of Table 6, we find that the reform has little effect on home ownership across income categories, including low-income households. All coefficients are close to zero and statistically insignificant.

We next assess how unsecured borrowing behavior, in particular credit card usage, changes after the reform. Panel B of Table 6 presents the results of estimating equation 1 for the probability of having a credit card balance outstanding. The results of columns (5) and (6) indicate that individuals in households earning less than £20,000 and council tax recipients in low-income households experience an increase of 2.1 and 3.2 percentage points in the probability of holding a credit card balance after the reform for each standard deviation increase in their district exposure to the reform. This represents an increase of 12% and 19% from the mean probability of having a credit card balance before the reform for these categories.

Panels C and D decompose the probability of having a credit card balance into the probability of having a credit card, and the probability of having an outstanding balance conditional on already having a credit card. In the latter case, the regressions with individual fixed effects are only estimated on individuals who have a credit card before and

after the reform. We find that for council tax recipients there is a significant increase in the probability of getting a credit card (Panel C column (6)), while low-income individuals are particularly likely to open outstanding balances on credit cards they already have (Panel D column (5)).[13] Across panels, we do not find any significant effect of credit card usage for middle- and high-income households (columns (2) and (3)).

Finally, in Panel E we exploit a question in the WAS that directly asks respondents about their perceived debt burden (i.e., whether keeping up with payments on their existing debt feels burdensome). We do not find significant results for any of the income categories, but we find positive coefficients for low- and very low-income individuals. While they are insignificant, the point estimates represent an increase of 11% and 12% increase from the pre-reform means for a one-standard deviation increase in the district-level $ln(Cut)$ variable.

6 Conclusion

We exploit a large welfare reform in the UK to examine the heterogeneous multipliers of benefit cuts. We show that welfare recipients not only lose benefit income, but are also less likely to be employed following the reform. Although the employment effects of the welfare cuts result in average government "savings per job" that are in line with the "cost per job" estimated in existing studies of fiscal stimulus, they are segmented and entirely concentrated in low-income households.

The fact that low-income households tend to be employed in firms that are dependent on local demand shapes this segmentation. Indeed, the sales and employment losses of firms are only apparent in areas more severely affected by the cuts and in small firms in the non-tradable sector where low-income households are more likely to work when

[13]The point estimate for the coefficient on the having a credit card balance conditional on having a credit card for council tax recipients is large (0.309 in Panel D column (6)) but not precisely estimated (t=1.51). This is likely because of the small number of council tax recipients holding a credit card before and after the reform (these regressions can only be estimated on 604 individuals).

they are employed. This suggests that benefit cuts lead to a reduction in consumption of households with a high marginal propensity to consume, and these local demand reductions play a role in propagating the shock beyond households already directly affected by the welfare cuts to other low-income individuals.

The most financially fragile individuals respond by trying to access liquidity by borrowing on credit cards. Overall, the reform might make them more likely to feel pressure from accumulated debt and enter financial distress in the future.

Together, our micro-level evidence suggests that austerity policies and welfare cut programs have financial implications for affected households that go well beyond the direct effect of benefit income reduction, and are likely to increase disparities between low- and middle-income households. The evidence on highly segmented multipliers also provides a plausible mechanism for some of the large political implications of austerity programs. How, in the longer term, the multipliers that we document affect the future prospects of individuals raised in the most affected areas, how they affect economic mobility, well-being, as well as country economic performance more broadly are interesting avenues for further research.

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Figure 1: Expected Austerity Cuts across Districts

The figure shows the expected austerity cuts per working-age individual (in British pounds) across local authority districts. Data are from Beatty and Fothergill (2013) and Fetzer (2019).

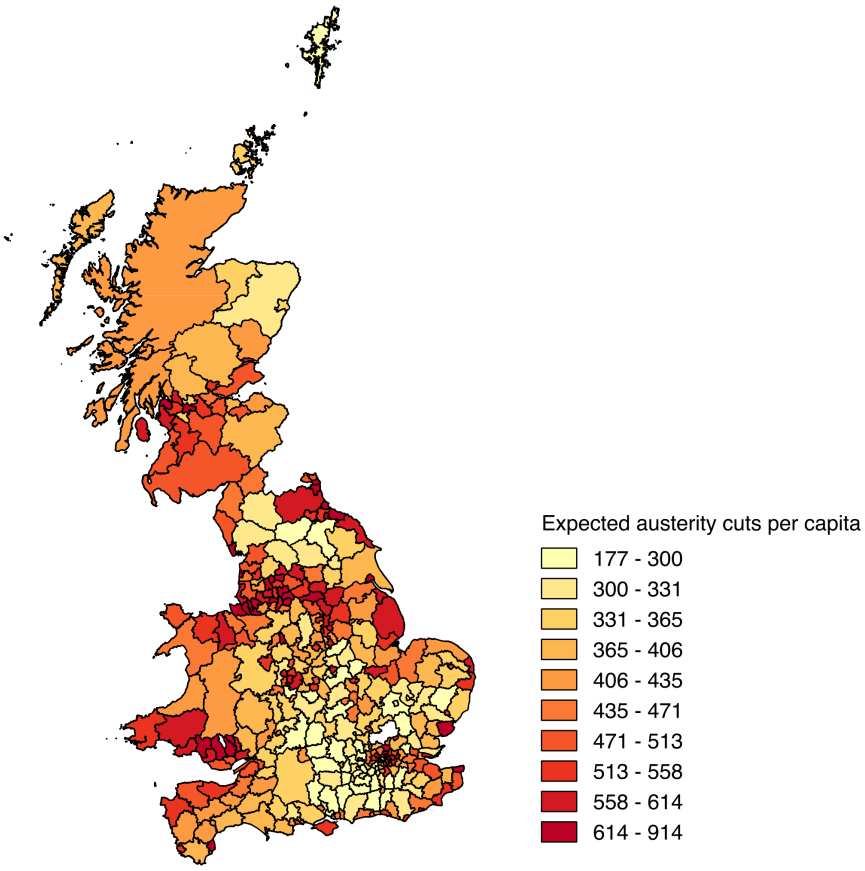


Figure 2: Fraction of Income Derived from Welfare Benefits by Income Decile

The figure shows the fraction of income derived from welfare benefits before the reform in each decile of the income distribution. The data is from the UK Household Longitudinal Survey (UKHLS).

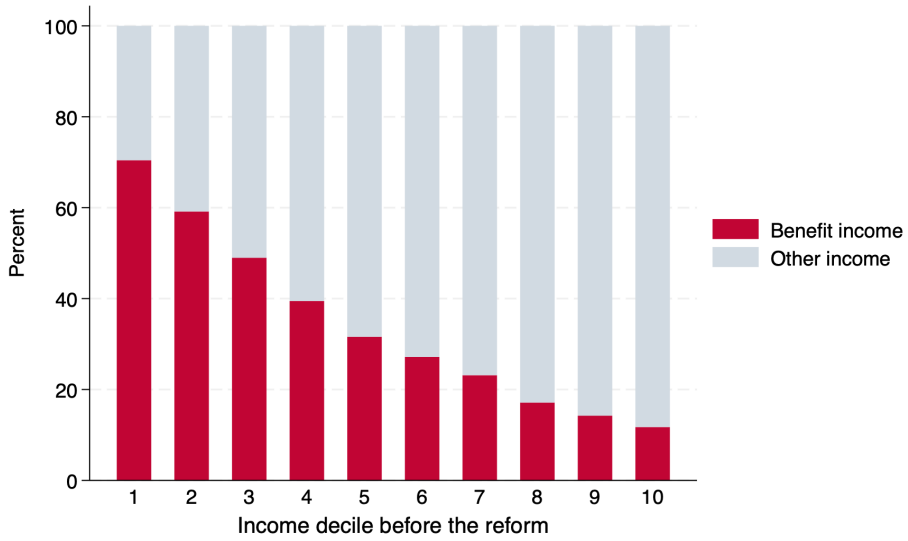


Figure 3: Distribution of Household Gross Income

The figure shows the distribution of pre-reform household gross income for individuals in the UK Household Longitudinal Survey (UKHLS). The dashed lines indicate household gross income levels equivalent to a household net income of £20,000, £30,000, and £60,000. The conversion between net and gross income is performed using data from the Wealth and Assets Survey (WAS) where both income types are reported.

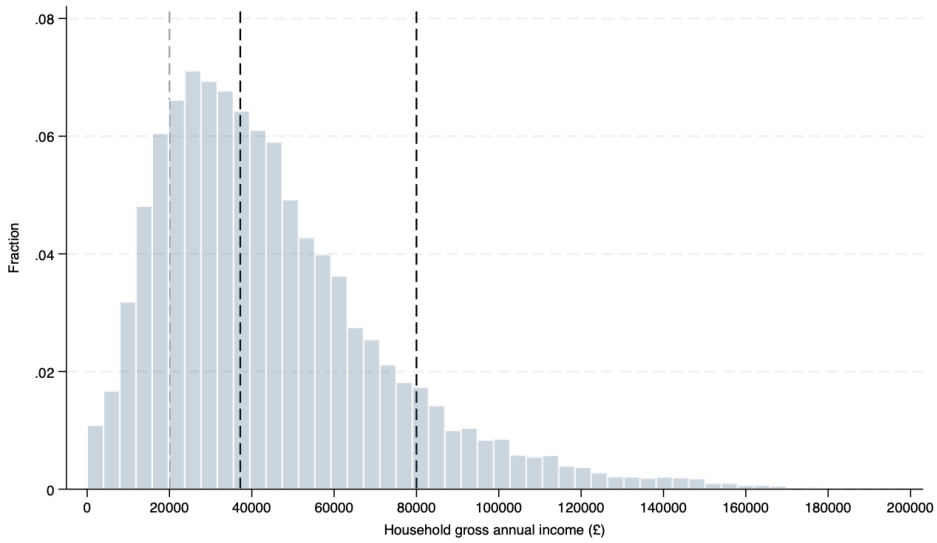
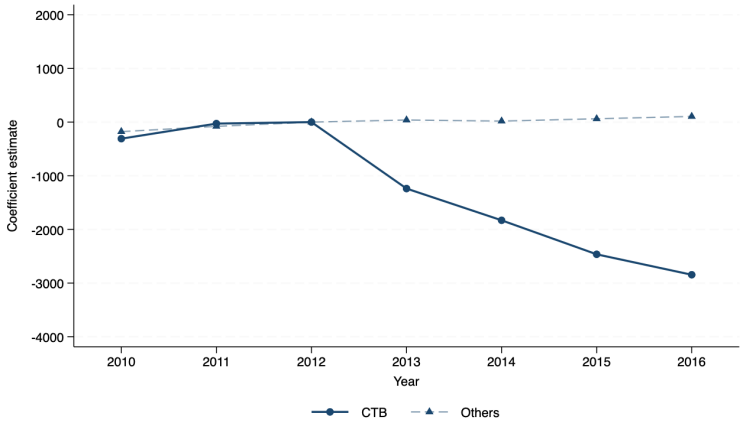


Figure 4: Reduction in Income from Welfare Benefits

The figure shows the effect of the council tax benefit cut on affected individuals' income from welfare benefits. In Panel (a), for each group of individuals (individuals receiving council tax benefit before the reform (CTB) and others) we estimate a regression of income from welfare benefits on year, wave, employment status, age category, gender, home ownership and educational attainment fixed effects. The figure presents the coefficients on the year fixed effects. In Panel (b), we estimate the difference-in-differences regression: we regress income from welfare benefits on the interaction of the year fixed effects and the CTB recipient indicator, as well as individual, region-year, and wave-year fixed effects, and pre-reform characteristics (employment status, age bin, gender, educational attainment) interacted with the post-reform indicator. The figure presents the coefficients on the interaction of the year fixed effects and the CTB recipient indicator together with their 95% confidence intervals based on standard errors clustered at the region-year level. Benefit income is winsorized at 2.5% in the right tail. The data is from the UK Household Longitudinal Survey (UKHLS).

(a) Sample split



(b) Difference-in-differences

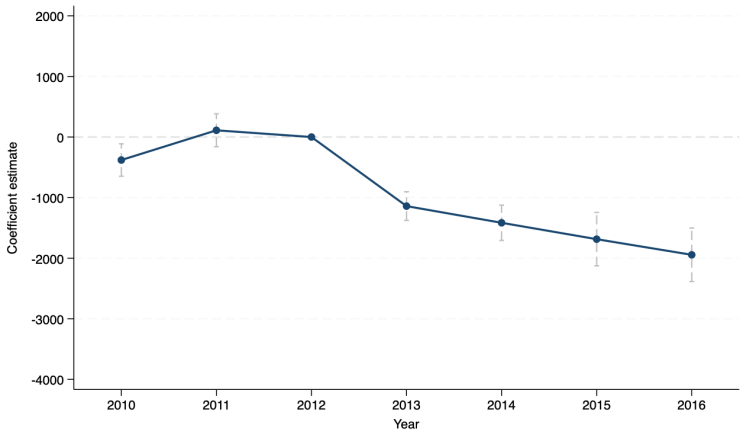
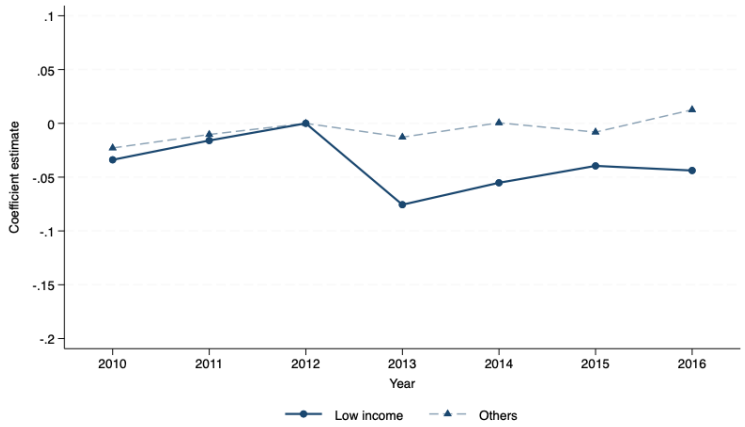


Figure 5: Probability of Employment

The figure shows the effect of the extent of benefit cuts at the district level on the probability of employment of individuals belonging to households earning less than £30,000 before the reform ("Low-income") and others individuals ("Others"). In Panel (a), for each group of individuals (in low-income households and others), we estimate a regression of the outcome on the interaction of the extent of welfare cuts in the district (logarithm of Cut, where Cut is the expected total amount of austerity cuts per working-age individual in a district (Fetzer (2019))) and the year fixed effects, and individual, region-year, wave-year fixed effects, and the interaction of pre-reform characteristics and the post-reform indicator. The figure presents the coefficients on the interaction of the logarithm of cuts and the year fixed effects. In Panel (b), we estimate the triple difference regression and plot the coefficients on the interactions of the logarithm of cuts, the year fixed effects, and the low-income indicator. The dashed lines represent the 95% confidence intervals based on standard errors clustered at the region-year level. The data is from the UK Household Longitudinal Survey (UKHLS).

(a) Sample split



(b) Triple difference

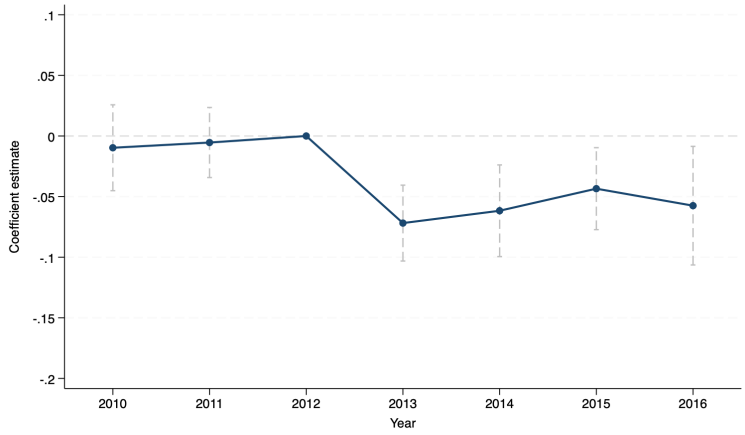
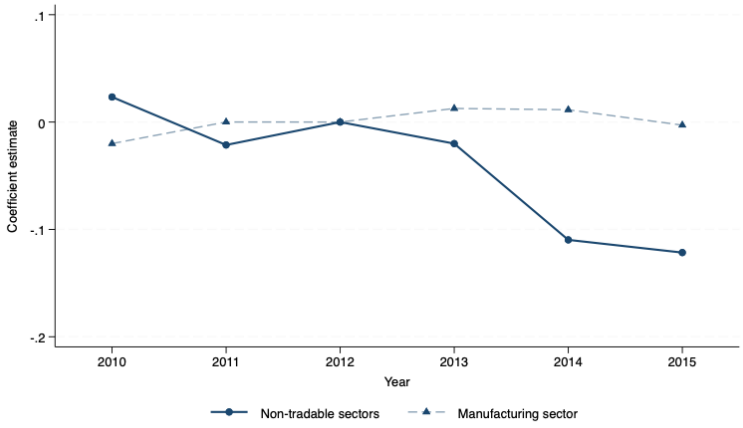


Figure 6: Firms' Revenue

The figure shows the differential effect of the extent of benefits cuts at the district level on the revenue of local firms in manufacturing and non-tradable sectors as defined in Mian and Sufi (2014). In Panel (a), for each group of firms (in manufacturing and non-tradable sectors), we estimate a regression of the logarithm of revenue on the interaction of the extent of welfare cuts in the district (logarithm of Cut, where Cut is the expected total amount of austerity cuts per working-age individual in a district (Fetzer (2019))) and firm and year fixed effects. The figure presents the coefficients on the interaction of the logarithm of cuts and the year fixed effects. In Panel (b), we estimate the triple difference regression and plot the coefficients on the interaction of the logarithm of cuts, the year fixed effects, and the non-tradable sector indicator. The dashed lines represent the 95% confidence intervals based on standard errors clustered at the region-year level.

(a) Sample split



(b) Triple difference

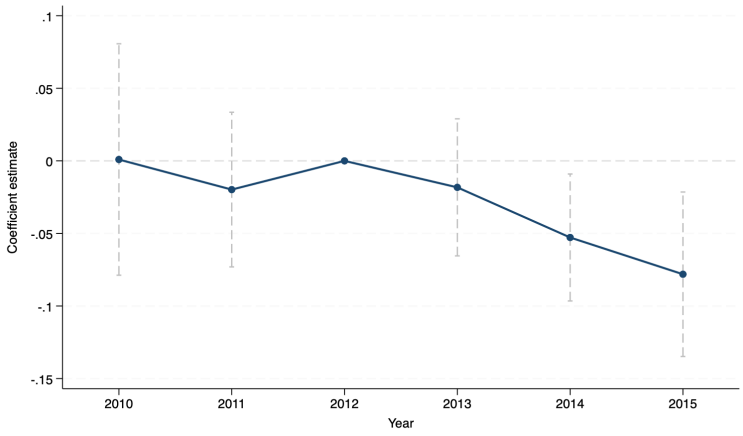
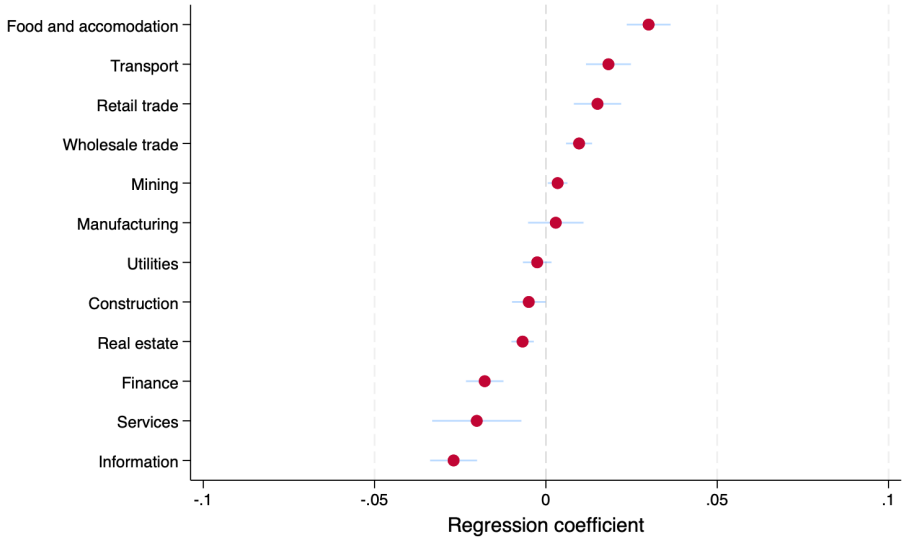


Figure 7: Employment Sectors of Low-Income Households

The figure shows the coefficients of OLS regressions comparing the probability of employment in a particular sector for employed individuals in low-income households (Panel (a)), and very low-income households (Panel (b)) relative to other employed individuals. Each regression regresses an indicator for employment in the particular sector on an indicator for the group of interest (low-income or very low-income households), as well as local authority district, year, gender, and age category (3 categories) fixed effects. Each dot represents the coefficient on the group indicator. The models are estimated on the last pre-austerity year. Sectors of employment correspond to UK SIC 2007 classification. The data is from the UK Household Longitudinal Survey (UKHLS).

(a) Low-Income Households



(b) Very Low-Income Households

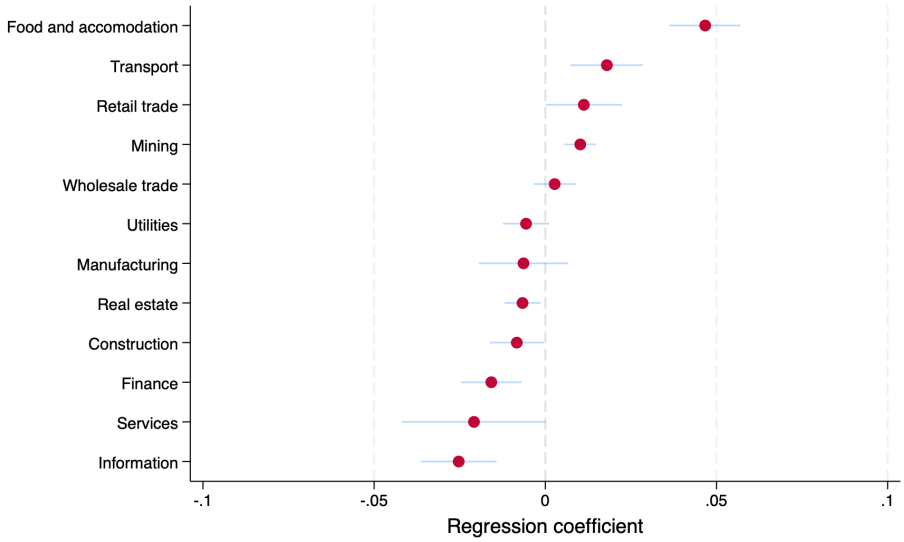


Table 1: Descriptive Statistics

This table presents the descriptive statistics for individuals in the UK Household Longitudinal Survey (UKHLS), Wealth and Assets Survey (WAS), Living Cost and Food Survey (LCF), for firms in the FAME dataset, and for expected cuts across districts. In Panels A, B, and C, the statistics are calculated on working-age individuals in the last survey wave before the reform. All income variables are reported on an annual basis. In Panel C, consumption expenditures are reported on a weekly basis. In Panel D, the statistics are calculated on the cross-section of firms in 2012. We focus on firms with positive revenues and more than three employees. We exclude firms with year-on-year growth rate in assets greater than 300%.

	Mean	S.D.	Median	Obs.
Panel A: UK Household Longitudinal Survey				
Age	39	13	39	37,781
Employed	0.70	0.46	1.00	37,756
Self-employed	0.12	0.33	0.00	26,387
Male	0.49	0.50	0.00	37,781
Owner	0.66	0.47	1.00	37,771
Has degree	0.36	0.48	0.00	37,248
Council tax benefit recipient	0.05	0.00	0.00	37,781
Welfare benefits (£)	2,440	4,773	0	37,781
Gross income (£)	45,467	30,157	39,250	37,771
Employment income (£)	31,382	32,131	26,400	37,775
Panel B: Wealth and Assets Survey				
Age	43	12	42	14,571
Employed	0.77	0.42	1.00	14,571
Self-employed	0.10	0.30	0.00	14,571
Male	0.51	0.50	1.00	14,571
Owner	0.76	0.43	1.00	14,571
Has Degree	0.28	0.45	0.00	14,571
Debt burden	0.23	0.42	0.00	14,571
Council tax benefit recipient	0.08	0.27	0.00	14,477
Welfare benefits (£)	3,983	5,785	1,580	14,571
Net income (£)	39,143	31,140	33,200	14,571
Employment income (£)	38,326	44,469	32,500	14,571
Panel C: Living Cost and Food Survey				
Total expenditures (£per week)	513	471	422	5,593
Non-consumption expenditures (£)	91	272	44	5,593
Consumption expenditures (£)	422	328	351	5,593
Alcohol, tobacco & narcotics (£)	12	20	4	5,593
Household goods and services (£)	29	78	9	5,593
Restaurants and Hotels (£)	40	57	24	5,593
Number of adults	2	1	2	5,593
Household size	2	1	2	5,593
Gross income (£)	34,844	24,974	27,992	5,593
Panel D: FAME				
Revenue				
Local sectors, <100 Emp.	6,628	54,923	1,409	20,996
Local sectors, >100 Emp.	114,032	1,128,317	18,356	8,991
Manufacturing, <100 Emp.	13,172	44,550	8,551	4,676
Manufacturing, >100 Emp.	162,453	941,194	31,588	4,022
Employment				
Local sectors, <100 Emp.	29	29	17	21,659
Local sectors, >100 Emp.	1,036	10,944	209	9,090
Manufacturing, <100 Emp.	52	30	52	4,774
Manufacturing, >100 Emp.	706	4,105	201	4,047
Panel E: Local Authority Districts				
Expected district cut per capita (£)	447	121	435	378

Table 2: Local Multipliers of Welfare Cuts (UKHLS)

This table presents the results of regressions assessing the effect of welfare cuts on working-age (18-65) individuals' employment status. The data are from the UKHLS survey. Cut is the expected total amount of welfare cuts per working-age individual in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (2) to (5) present the results from regressions estimated on individuals in high-, middle-, low-, and very low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income (very-low) households are those with less than £30,000 (£20,000). In column (6) (Low CTB sample), the regressions are estimated on individuals in low-income households and receiving council tax benefit before the reform. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employed					
	(1) All	(2) High	(3) Middle	(4) Low	(5) Very low	(6) Low CTB
ln(Cut) × Post	-0.014**	0.017	0.003	-0.039***	-0.045**	-0.089**
	(0.006)	(0.020)	(0.008)	(0.010)	(0.022)	(0.036)
Individual	Yes	Yes	Yes	Yes	Yes	Yes
Wave × Year	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year	Yes	Yes	Yes	Yes	Yes	Yes
Pre-char. × Post	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	166721	15826	75555	75270	29409	7795

Table 3: Income Effects of Welfare Cuts (UKHLS)

This table presents the results of regressions assessing the effect of welfare cuts on working-age (18-65) individuals' income. The data are from the UKHLS survey. Cut is the expected total amount of welfare cuts per working-age individual in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (2) to (5) present the results from regressions estimated on individuals in high-, middle-, low-, very low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income (very-low) households are those with less than £30,000 (£20,000). In column (6) (Low CTB sample), the regressions are estimated on individuals in low-income households and receiving council tax benefits before the reform. Panel A presents the results for employment income, where employment income takes a value of zero if the individual is unemployed. Panel B presents the results for employment income conditional on being employed. Panel C presents the result for gross income, which encompasses all types of income earned (including labor income, insurance income, benefit income, investment income, rental income). The regressions dependent variable is expressed as one plus the logarithm of the variable associated with the relevant panel heading. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) All	(2) High	(3) Middle	(4) Low	(5) Very low	(6) Low CTB
Panel A: Employment income						
ln(Cut) × Post	-0.154**	0.226	0.008	-0.390***	-0.442**	-0.726**
	(0.065)	(0.175)	(0.074)	(0.107)	(0.209)	(0.329)
Obs.	166521	15821	75493	75137	29311	7788
Panel B:Employment income if employed						
ln(Cut) × Post	-0.033	-0.097	-0.018	-0.035	-0.049	-0.548
	(0.023)	(0.075)	(0.023)	(0.048)	(0.124)	(0.351)
Obs.	121658	13621	63229	44742	13164	1459
Panel C: Gross income						
ln(Cut) × Post	-0.084**	0.066	-0.035	-0.131*	-0.072	-0.161**
	(0.038)	(0.128)	(0.044)	(0.075)	(0.127)	(0.076)
Obs.	166657	15828	75531	75228	29371	7798
Individual	Yes	Yes	Yes	Yes	Yes	Yes
Wave × Year	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year	Yes	Yes	Yes	Yes	Yes	Yes
Pre-char. × Post	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Firm-Level Evidence on the Local Multipliers of Welfare Cuts (FAME)

This table presents the results of difference-in-differences regressions assessing the effect of welfare cuts on firms of different sizes and active in different sectors. The regressions compare revenue and employment of firms before and after the welfare cuts, as a function of the total amount of welfare cuts per capita in the district in which the firm is located. Each cell of the table represents the coefficient on $ln(Cut) \times Post$ of a separate regression. Cut is the expected total amount of welfare cuts per capita in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (1) and (3) ((2) and (4)) give the estimates of the regression on firms with fewer (more) than 100 employees (average over the sample period). Row 1 presents the results for firms in non-tradable industries (defined as in Mian and Sufi (2014)), row 2 presents the results for firms in in local sectors (retail and services), and row 3 presents the results for firms in the manufacturing sector. The regressions dependent variable is expressed as the logarithm of the variable associated with the relevant column heading. Standard errors presented in parentheses are clustered at the district level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Revenue		Employment	
	(1)	(2)	(3)	(4)
	<100 empl.	>100 empl.	<100 empl.	>100 empl.
Panel A: Non-tradable (Mian and Sufi 2014)				
ln(Cut) × Post	-0.081***	0.024	-0.088***	-0.024
	(0.031)	(0.030)	(0.030)	(0.026)
Obs.	11226	9772	11966	9997
Panel B: Local sectors (retail and services)				
ln(Cut) × Post	-0.040*	0.019	-0.027***	0.014
	(0.023)	(0.016)	(0.008)	(0.032)
Obs.	123296	52970	130661	54164
Panel C: Manufacturing				
ln(Cut) × Post	0.013	0.012	-0.003	-0.011
	(0.021)	(0.029)	(0.016)	(0.036)
Obs.	27723	26640	29336	23907
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

Table 5: Consumption Expenditures (LCF)

This table presents the results of regressions assessing the effect of welfare cuts on households expenditures. The data are from the Living Cost and Food Survey (LCF). Cut is the expected total amount of welfare cuts per working-age individual in a district (Fetzer (2019)). $Post$ is a dummy variable equal to one after the welfare reform, from 2013 onward. Columns (2) to (5) present the results from regressions estimated on individuals in high-, middle-, low-, very low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income (very-low) households are those with less than £30,000 (£20,000). Household characteristics include home ownership, household size, and number of adults. The regressions dependent variables are expressed as one plus the logarithm of the variable associated with the panel heading. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels.

	(1) All	(2) High	(3) Middle	(4) Low	(5) Very low
Total expenditures (=Sum of non-consumption and consumption expenditures)					
ln(Cut) × Post	-0.043	0.005	0.035	-0.121***	-0.106**
	(0.036)	(0.058)	(0.041)	(0.041)	(0.050)
Non-consumption expenditures					
ln(Cut) × Post	0.028	-0.029	-0.02	-0.002	-0.067
	(0.068)	(0.109)	(0.072)	(0.084)	(0.102)
Consumption expenditures (=Sum of the expenditure categories below)					
ln(Cut) × Post	-0.049	0.023	0.036	-0.136***	-0.121**
	(0.035)	(0.062)	(0.043)	(0.039)	(0.049)
Food and non-alcoholic beverages					
ln(Cut) × Post	-0.035	-0.054	0.075	-0.08	-0.111
	(0.033)	(0.079)	(0.053)	(0.055)	(0.067)
Alcohol, tobacco & narcotics					
ln(Cut) × Post	-0.133*	0.237	-0.103	-0.241**	-0.192
	(0.077)	(0.180)	(0.110)	(0.113)	(0.131)
Clothing					
ln(Cut) × Post	-0.033	0.109	0.013	-0.121	0.058
	(0.087)	(0.190)	(0.151)	(0.110)	(0.138)
Housing, fuel, water					
ln(Cut) × Post	0.063	0.151	-0.011	0.03	0.021
	(0.043)	(0.099)	(0.053)	(0.055)	(0.074)
Household goods and services					
ln(Cut) × Post	-0.125*	-0.322	0.219*	-0.249***	-0.284***
	(0.067)	(0.198)	(0.115)	(0.084)	(0.105)
Health					
ln(Cut) × Post	-0.170***	-0.178	-0.035	-0.214***	-0.152*
	(0.059)	(0.159)	(0.125)	(0.073)	(0.088)
Transport					
ln(Cut) × Post	-0.083	0.03	-0.001	-0.232***	-0.173
	(0.079)	(0.167)	(0.116)	(0.087)	(0.114)
Communication					
ln(Cut) × Post	0.032	0.035	0.036	-0.007	-0.035
	(0.037)	(0.080)	(0.051)	(0.050)	(0.056)
Recreation and culture					
ln(Cut) × Post	-0.089	-0.241*	0.093	-0.153*	-0.144*
	(0.061)	(0.124)	(0.109)	(0.080)	(0.084)
Education					
ln(Cut) × Post	0.085**	0.590***	0.088	-0.100**	-0.061
	(0.040)	(0.156)	(0.080)	(0.040)	(0.049)
Restaurants and hotels					
ln(Cut) × Post	-0.210**	-0.214	-0.08	-0.328***	-0.313**
	(0.085)	(0.141)	(0.129)	(0.106)	(0.123)
Misc good and services					
ln(Cut) × Post	-0.024	0.105	-0.016	-0.089	-0.02
	(0.052)	(0.120)	(0.070)	(0.067)	(0.082)
Year	Yes	Yes	Yes	Yes	Yes
District	Yes	Yes	Yes	Yes	Yes
Household char.	Yes	Yes	Yes	Yes	Yes
Region x Year	Yes	Yes	Yes	Yes	Yes
Obs.	29943	4957	9739	15234	9839

Table 6: Household Finance (WAS)

This table presents the results of regressions assessing the effect of welfare cuts on working-age (18-65) individuals' finances. The data are from the WAS. Cut is the expected total amount of welfare cuts per working-age individual in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (2) to (5) present the results from regressions estimated on individuals in high-, middle-, low-, very low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income (very-low) households are those with less than £30,000 (£20,000). In column (6) (Low CTB sample), the regressions are estimated on individuals in low-income households and receiving council tax benefit before the reform. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) All	(2) High	(3) Middle	(4) Low	(5) Very low	(6) Low CTB
Panel A: Owner						
ln(Cut) × Post	-0.002	-0.002	-0.007	0.003	-0.010	-0.004
	(0.007)	(0.014)	(0.012)	(0.013)	(0.018)	(0.021)
Obs.	36984	5098	16283	15603	7361	2618
Panel B: Has a credit card balance						
ln(Cut) × Post	0.006	-0.034	-0.006	0.032	0.087**	0.137**
	(0.018)	(0.036)	(0.024)	(0.029)	(0.035)	(0.065)
Obs.	36527	5020	16071	15436	7289	2589
Panel C: Has a credit card						
ln(Cut) × Post	0.007	0.020	-0.009	0.023	0.044	0.105**
	(0.017)	(0.039)	(0.022)	(0.024)	(0.038)	(0.048)
Obs.	36651	5037	16147	15467	7303	2589
Panel D: Has a credit card balance if has a credit card						
ln(Cut) × Post	0.004	-0.045	-0.014	0.061	0.119**	0.309
	(0.021)	(0.041)	(0.026)	(0.044)	(0.055)	(0.204)
Obs.	21212	3951	10535	6726	2827	604
Panel E: Feels a heavy debt burden						
ln(Cut) × Post	0.005	0.015	-0.035	0.051	0.066	0.104
	(0.020)	(0.030)	(0.025)	(0.037)	(0.065)	(0.123)
Obs.	21509	3187	9957	8365	3911	1412
Individual	Yes	Yes	Yes	Yes	Yes	Yes
Wave × Year	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year	Yes	Yes	Yes	Yes	Yes	Yes
Pre-char. × Post	Yes	Yes	Yes	Yes	Yes	Yes

ONLINE APPENDIX
for
"Segmented Multipliers: Evidence from Welfare Cuts"

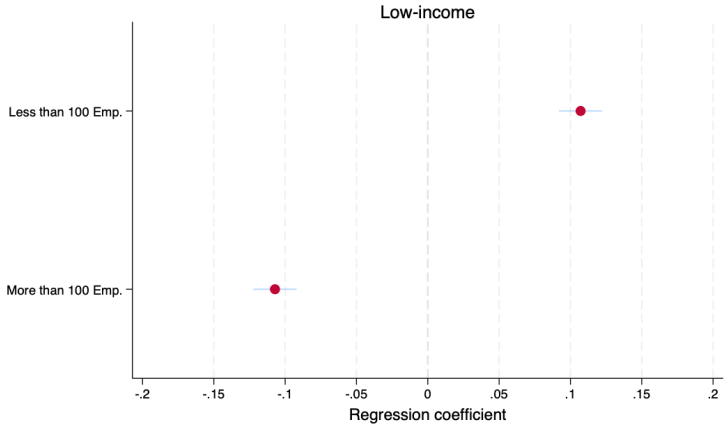
Manuel Adelino and Jim Goldman

A Appendix Figures

Figure A.1: Size of Firms in which Low-Income Employed Individuals Work

The figure shows the coefficients of OLS regressions comparing the probability of employment in a firm of a particular size for employed individuals in low-income households (Panel (a)) or very low- income households (Panel (b)) relative to other employed individuals. Each regression regresses an indicator for employment in the particular type of firms on an indicator for the group of interest (low- or very low- income household), as well as local authority district, year, gender, and age category (3 categories) fixed effects. Each dot represent the coefficient on the group indicator. The models are estimated on the last pre-austerity year. The data is from the UK Household Longitudinal Survey (UKHLS).

(a) Low-Income Households



(b) Very Low-Income Households

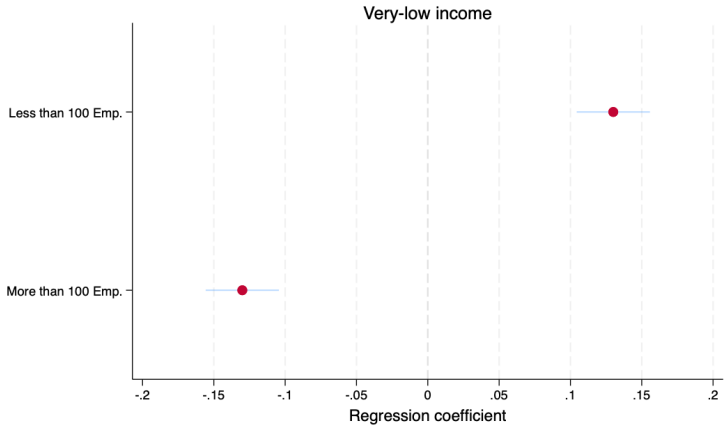
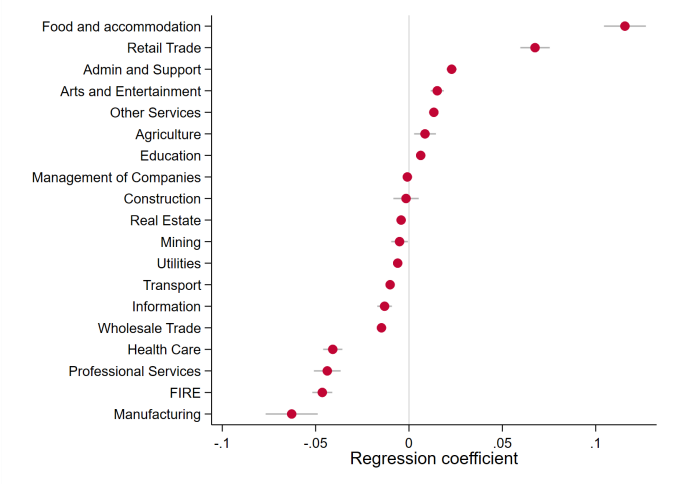


Figure A.2: Employment Sectors of Low-Income Households – U.S. American Community Survey

The figure shows the coefficients of OLS regressions comparing the probability of employment in a particular sector for employed individuals in low-income households (Panel (a), those with a personal income in the bottom 40% of the population), very-low-income households (Panel (b), those with a personal income in the bottom 20% of the population) relative to other employed individuals in the U.S. Census American Community Survey 2010-2014 Personal Files. Each regression regresses an indicator for employment in the particular sector on an indicator for the group of interest (low-income household or very low-income households), as well as Public Use Microdata Areas (PUMAs), year, gender, and age fixed effects. Each dot represents the coefficient on the group indicator.

(a) Low-Income Households



(b) Very Low-Income Households

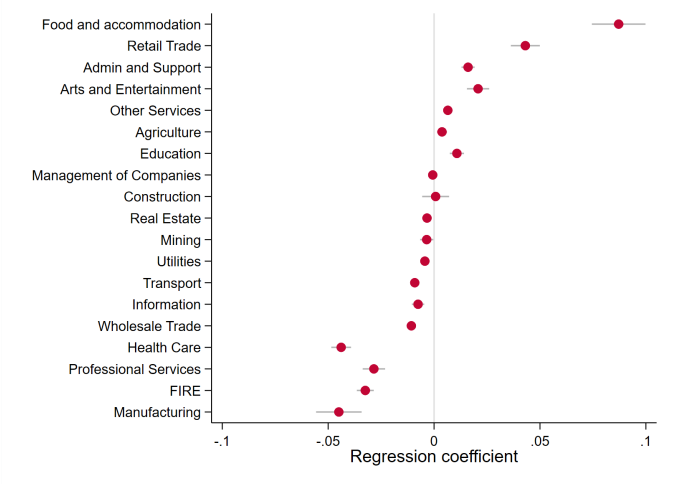
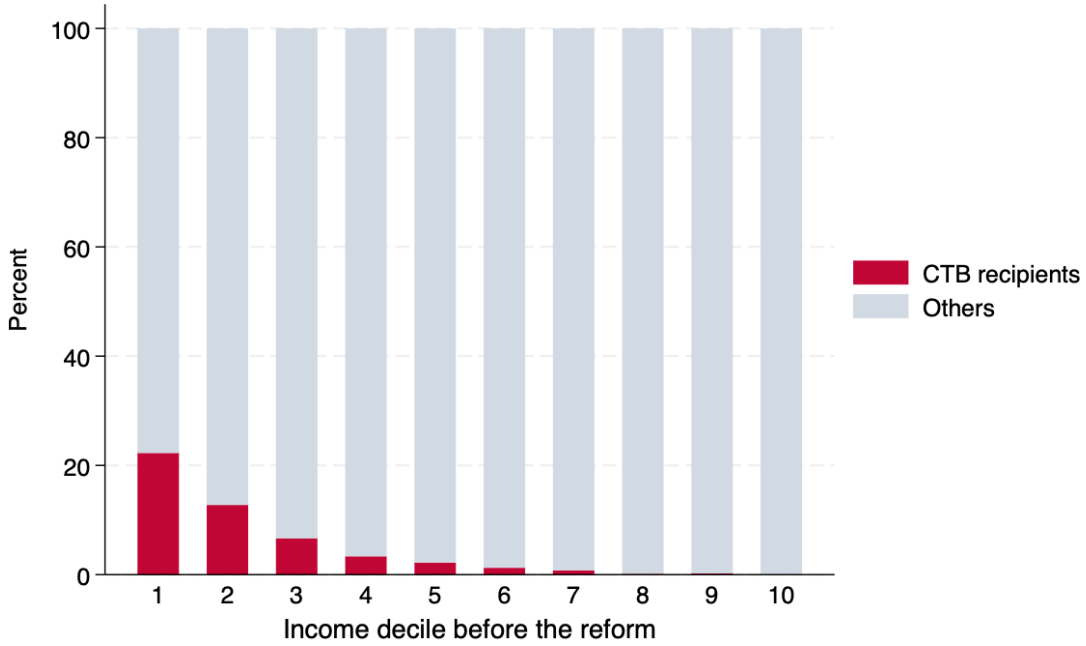


Figure A.3: Council Tax Benefit Recipients by Income Decile

The figure shows the fraction of individuals who are council tax benefit recipients before the reform in each decile of the income distribution. The data is from the UK Household Longitudinal Survey (UKHLS).



B Additional Results on District Multipliers (UKHLS Data)

Table B.1: Local Multipliers of Welfare Cuts: Interacted Models

This table presents the results of regressions assessing the effect of austerity cuts on individuals' employment status. Data are from the UKHLS. Cut is the expected total amount of austerity cuts per capita in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. The table presents the results from regressions comparing the effect on individuals in high-, middle-, and low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income households are those with less than £30,000. Low-income CTB are individuals in low-income households and receiving council tax benefit before the reform. In all columns the fixed effects are also interacted with the income category indicators (low, middle, high). Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employed			
	(1)	(2)	(3)	(4)
ln(Cut) x Post	0.017		0.017	
	(0.020)		(0.020)	
ln(Cut) × Post × Mid income	-0.014	-0.012	-0.014	-0.012
	(0.022)	(0.023)	(0.022)	(0.023)
ln(Cut) × Post × Low income	-0.056**	-0.051**		
	(0.022)	(0.023)		
ln(Cut) × Post × Low income Others			-0.051**	-0.045*
			(0.023)	(0.024)
ln(Cut) × Post × Low income CTB			-0.091***	-0.095***
			(0.031)	(0.032)
Individual × Income cat.	Yes	Yes	Yes	Yes
District × Year	-	Yes	-	Yes
Wave × Year × Income cat.	Yes	Yes	Yes	Yes
Region × Year × Income cat.	Yes	Yes	Yes	Yes
Pre-char × Post × Income cat.	Yes	Yes	Yes	Yes
Obs.	166651	166639	166651	166639

Table B.2: Local Multipliers of Welfare Cuts: Terciles of Intensity of Welfare Cut

This table presents the results of regressions assessing the effect of austerity cuts on working-age (18-65) individuals' employment status. The data are from the UKHLS survey. $\text{Cut}_{\text{terc2}}$ and $\text{Cut}_{\text{terc3}}$ denote dummy variables that take the value one when the expected total amount of austerity cuts per capita in the district are above the second or third tercile, respectively. $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Regressions are estimated on individuals in high-, middle-, low-, very low-income households. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low- (very low-) income households are those with less than £30,000 (£20,000). In column (5) (Low CTB sample), the regressions are estimated on individuals in low-income households and receiving council tax benefit before the reform. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employed				
	(1)	(2)	(3)	(4)	(5)
	High	Middle	Low	Very low	Low CTB
$\text{Cut}_{\text{terc3}} \times$ Post	0.007	0.007	-0.021***	-0.021	-0.052**
	(0.011)	(0.005)	(0.007)	(0.013)	(0.024)
$\text{Cut}_{\text{terc2}} \times$ Post	-0.014	0.007	-0.005	0.002	-0.020
	(0.010)	(0.004)	(0.007)	(0.011)	(0.022)
Individual	Yes	Yes	Yes	Yes	Yes
Wave $\times$ Year	Yes	Yes	Yes	Yes	Yes
Region $\times$ Year	Yes	Yes	Yes	Yes	Yes
Pre-char. $\times$ Post	Yes	Yes	Yes	Yes	Yes
Obs.	15831	75555	75270	29411	7798

Table B.3: Local Multipliers of Welfare Cuts: Estimations without Region Fixed Effects and Pre-Reform Characteristics

This table presents the results of regressions assessing the effect of austerity cuts on working-age (18-65) individuals' employment status. The data are from the UKHLS survey. Cut is the expected total amount of austerity cuts per working-age individual in a district (Fetzer (2019)). $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (3)-(4), (5)-(6), and (7)-(10) present the results from regressions estimated on individuals in high-, middle-, and low-income households, respectively. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income households are those with less than £30,000. All regressions control for individuals' job status before the cuts interacted with the post-reform indicator. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employed							
	All		High		Middle		Low	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Cut) × Post	-0.018***	-0.011*	-0.006	0.004	0.003	0.009	-0.042***	-0.028***
	(0.006)	(0.006)	(0.013)	(0.013)	(0.008)	(0.008)	(0.010)	(0.010)
Individual	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave × Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employed × Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pre-char × Post	Yes	-	Yes	-	Yes	-	Yes	-
Region × Year	-	-	-	-	-	-	-	-
Obs.	166721	169145	15826	16013	75555	76467	75270	76595

Table B.4: Local Multipliers of Welfare Cuts: Effect in Districts with High and Low Unemployment Rate

This table presents the results of regressions assessing the effect of austerity cuts on individuals' employment status, in districts with low and high unemployment rate before the reform. Cut is the expected total amount of austerity cuts per capita in a district (Fetzer (2019)). Data on local authority district unemployment rates come from the Office of National Statistics, and is measured as the average unemployment rate in the district between 2010 and 2012. The low and high unemployment subsamples are defined according to the sample median. $Post$ is a dummy variable that takes the value of one after the welfare reform, from 2013 onward. Columns (1)-(2), (3)-(4), (5)-(6), and (7)-(8) present the results from regressions estimated on individuals in high-, middle-, and low-income households, respectively. High-income households are defined as those with more than £60,000 in net income before the reform. Middle-income households are defined as those with between £60,000 and £30,000. Low-income households are those with less than £30,000. Standard errors presented in parentheses are clustered at the region-year level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Employed							
Income category –	All		High		Middle		Low	
District unemployment –	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Cut) × Post	-0.015	-0.020	-0.004	0.041	-0.011	0.004	-0.022	-0.053**
	(0.012)	(0.013)	(0.035)	(0.037)	(0.014)	(0.022)	(0.018)	(0.022)
Individual	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wave × Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pre-char. × Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	82753	81861	9787	5773	40276	34230	32610	41781