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Great or Grim? Disagreement about Brexit, Economic Expectations, and Household Spending[*]

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Abstract

Does political polarization influence economic expectations and behaviour? Utilizing British household surveys and administrative data, we find a strong polarization of economic expectations and behaviour between pro- and anti-Brexit supporters after the once-in-a-lifetime EU Referendum. We show that the Brexit vote led to a large and long-lasting divergence between Leavers and Remainers in their assessment of the general economic situation, personal circumstances, and spending intentions. Furthermore, on average, a 10% difference in the share of leave voters across local authorities is respectively associated with a 5.98% and 0.78% increase in the gap in the per capita housing transaction volume and licensed automobile stock after the referendum.

Keywords: Expectations, Spending, Housing, Auto Purchase
JEL classification: D84, E66, P16, R21

1 Introduction

Expectations play a central role in shaping economic behaviour in dynamic economic models (e.g., Barsky and Sims, 2012; Lorenzoni, 2009; Angeletos and La'O, 2013; Adam, Kuang and Marcet, 2012). In recent decades, there has been a fast-growing body of literature which analyzes survey expectations data and the relationship between expectations and actual economic behaviour. Expectations usually display substantial heterogeneity within and across households, firms, and experts (e.g., Coibion and Gorodnichenko, 2015; Sapienza and Zingales, 2013; Andre et al., 2022; Kuang et al., 2022). The literature has shown that survey expectations data have significant explanatory power for economic decisions both at the individual, regional, and aggregate levels (e.g., Greenwood and Shleifer, 2014; Gennaioli, Ma and Shleifer, 2016; Binder, Kuang and Tang, 2023; Kuang et al., 2023).

Following the recent surge of populism across many countries, there has been renewed interest in studying political polarization as an important source of heterogeneity in expectations among households. On the one hand, partisan bias is found to be pervasive in survey-based measures of economic beliefs (e.g., Mian, Sufi and Khoshkhou, 2021; McGrath, 2016; Gerber and Huber, 2010). As documented in studies on American and Australian elections (e.g., Gerber and Huber, 2009; Gillitzer and Prasad, 2018; Benhabib and Spiegel, 2019; Bartels, 2002; Coibion, Gorodnichenko and Weber, 2020), partisan voters tend to rate the economy more favourably when they support the party in office. On the other hand, however, polarization may not influence economic behaviour if partisan "cheerleading" may lead to voters feeling very happy when their "team" wins the elections but not seriously considering future income growth and/or altering their actual behaviours (Mian, Sufi and Khoshkhou, 2021). Moreover, existing studies on the political polarization of economic beliefs primarily focus on partisanship. But does the polarization of beliefs arise beyond partisanship and in a non-election vote? If the vote is a once-in-a-lifetime political event, will individuals and households be more cautious and less influenced by "cognitive bias" in their assessment of the economy and actual behaviours?

In this paper, we study the political polarization in economic beliefs and behaviour in the context of the "Brexit" referendum, probably the most prominent event in European politics in the past three decades. On 23 June 2016, the United Kingdom (UK) voted to leave the European Union (EU) by 52% vs 48%. The UK subsequently invoked Article 50 of the Treaty on the European Union and began the withdrawal process on 29 March 2017. The UK formally exited the EU on 31 January 2020.

We ask two questions. Did the Brexit vote trigger polarization in economic expectations

and spending intentions between pro- and anti-Brexit voters? If so, is any variation in stated economic expectations and spending intentions mirrored by changes in actual economic behaviour? Using British household surveys and administrative data, we find a strong political polarization in economic expectations and behaviour after the once-in-a-lifetime EU referendum. To the best of our knowledge, this paper is the first study on the impact of the Brexit vote on households' economic beliefs and behaviours.

We exploit the announcement of the Brexit vote outcome as an exogenous shock to identify causal effects on the divergence in economic beliefs and actual behaviours between pro- and anti-Brexit voters. In the week before the referendum, the polls consistently found a lead for a Remain vote outcome.[1] Furthermore, the odds-implied probability of a Remain vote outcome reached close to 90% just before the vote (Broadbent, 2017).[2] Since the leave outcome came out as a large surprise (Born et al., 2019), this shock is arguably orthogonal to contemporaneous macro and individual factors that may affect economic beliefs and behaviour.

A unique feature of our context, compared to other studies on general elections, is that there were no Brexit-related policy changes during the years following the vote. The Brexit vote did not instantly change the relationship between the UK and the EU. The UK continued to be a member state of the EU Customs Union and Single Market until the end of a transition period (31 December 2020). This feature should mitigate any confounding effects induced by changes in policies targeted at particular voters following the vote.

To answer the first question, we utilize two nationally representative household surveys carried out over the period from early 2015 to late 2019. We separately pool nine waves of the British Election Study 2014–2019 (BES) and five waves of the Bank of England/NMG Household Survey (NMG) to examine households' economic expectations about the general economy, feelings towards personal economic circumstances, as well as spending intentions on major items and general goods. The Brexit vote led to a large divergence in economic expectations and spending intentions between pro- and anti-Brexit voters. In the wake of the referendum, anti-Brexit voters systematically became more pessimistic about the current economic situation and general unemployment situation than pro-Brexit voters, while the disagreement was fairly small and insignificant before. After the vote, Anti-Brexit voters also started perceiving a higher risk of getting into poverty and became more pessimistic about their future household financial position. These movements in economic expectations are mirrored by changes in spending intentions. Before the Brexit vote, pro- and anti-Brexit voters were similar in their assessment

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[1] See the Wikipedia page "Opinion polling for the United Kingdom European Union membership referendum".

[2] According to Marr (2017) (p. 605), most British politicians, including those on the Leave side, and journalists did not expect the outcome.

of whether it was a good or bad time to buy major items and in planned general spending. However, pro-Brexit voters showed remarkably stronger spending intentions afterwards.

We apply two forms of event study specifications to examine the changes in the belief divergence. We choose Wave 8 in the BES and Wave 2015 in the NMG as the reference points, both of which were the last waves conducted before the Brexit vote. We find that, on average, after the referendum the gap in the beliefs about the current economic situation between pro- and anti-Brexit voters increased by 0.92 standard deviations, the general unemployment situation by 0.75 standard deviations, the perceived likelihood of getting into poverty by 0.16 standard deviations, and own future household financial position by 0.32 standard deviations, with pro-Brexit voters being more optimistic than anti-Brexit voters. Similarly, after the vote, the gap in spending intention on major items between pro- and anti-Brexit voters increased by 0.30 standard deviations and planned general spending by 0.14 standard deviations, with pro-Brexit voters having a stronger spending intention than anti-Brexit voters.[3] By examining the dynamic effects, we find that the large belief divergence has been persistent during the post-referendum period considered. Importantly, before the referendum, there was no significant difference. Such a test consolidates our underlying identification assumption that, without the vote, there would have not been a change in the belief divergence between pro- and anti-Brexit voters.

On average, pro-Brexit voters tended to have a lower socioeconomic status and lower educational attainments (Alabrese et al., 2019). Does the belief divergence arise due to this distinctive composition? We show that controlling for voters' key socioeconomic characteristics such as educational attainment, household income, and employment status does not influence our main conclusions. Moreover, we find that, within each of the two groups of voters, the gaps in revisions to economic expectations and spending intentions are relatively small across socioeconomic characteristics. By contrast, the gaps in revisions to these expectations and intentions are much larger between Brexit supporters/opponents within each socioeconomic characteristic. Overall, our results suggest that views towards Brexit are more important than socioeconomic characteristics in shaping economic beliefs.

In the second part of the paper, we explore whether the stated divergence in economic expectations and intentions is mirrored by a divergence in revealed behaviours. To do so, we exploit administrative data on actual spending across Local Authorities (LAUs) and link it to referendum results aggregated at the same sub-national geographical level.[4] We focus on

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[3]As Section 3.2 discusses, it is important to note that the stronger spending intentions by pro-Brexit voters were not linked to expectations of an increase in the cost of living. Conversely, after the unexpected referendum outcomes, pro-Brexit voters had lower inflation expectations than anti-Brexit voters.

[4]The structure of local government is not uniform across each of the nations constituting the UK. In England,

the per-capita housing transaction volume and licensed automobile stocks, both of which reflect households' major economic decisions. We use Price Paid Data to access administrative records on housing transactions. From 2015 to 2019, there were over 4.7 million housing transaction records, which we aggregate at the LAU level at a quarterly frequency. In addition, we access quarterly data on the total per-capita number of licensed private vehicles from the Department for Transport (DfT) and Driver and Vehicle Licensing Agency (DVLA). Combining these datasets with other LAU-level characteristics, we construct an LAU-quarter panel dataset covering 313 local authorities in England and Wales from the first quarter of 2015 to the last quarter of 2019. The key advantage of administrative data on revealed behaviours over survey-based measures of spending intentions is that the former allows testing for the existence of any potential "cheerleading bias".

The Brexit vote shock to each local authority is measured using its share of Leave voters. Employing a Difference-in-Differences specification, we find that, across local authorities, the Brexit vote has widened the gap in per-capita housing transaction volumes and licensed automobile stocks. On average, a 10% increase in the share of Leave voters is associated with a 5.98% increase in the gap of housing transaction volume per capita and a 0.78% increase in the gap of licensed automobile stock per capita after the Brexit vote. These conclusions are robust to controlling for gross household disposable income and a set of time trends varying with pre-vote local economic characteristics such as unemployment rates, immigration rates, EU Structural Funds, and post-2008 fiscal cuts.

As a further test, we examine the dynamic effects of the Brexit vote on actual economic behaviour. We estimate an LAU-level version of the two event study specifications and choose Quarter 1 of 2016 (before the referendum) as the reference. We find that, before then, there was virtually no difference in per-capita housing transaction volume and licensed automobile stock. By contrast, after the referendum pro- and anti-Brexit local authorities experienced a divergence in actual economic behaviours. The effects remained stable for housing transaction volume and, interestingly, kept increasing over time for licensed automobile stock. We equally test for alternative specifications where we extend our data to Quarter 1 of 2014. Our results are robust to this extension.

The Brexit vote is a paradigmatic example of the recent rise in populism and Euroscepticism across Europe. The literature highlights a broad set of factors potentially explaining the rise in political discontent (Rodrik, 2021; Rodríguez-Pose, 2018). We test some of these, and find that

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Local Authority Districts (LADs) include metropolitan boroughs, London boroughs, non-metropolitan districts, unitary authorities, the Isle of Scilly, and the City of London. In Wales, LAUs correspond to single-tier principal areas. Overall, LADS and principal areas represent the lowest tier of sub-national government across the two nations.

the positive effect of the Brexit vote on actual economic behaviour was comparatively stronger in local authorities that had been suffering from long-term adverse globalization shocks to local manufacturing industries, and that had more low-skill occupations and residents with lower socioeconomic status.

Do spending intentions matter for actual economic behaviour? We use households' views on whether it is currently a good or bad time to purchase major items to construct a local authority-level measure of spending intention. We find that it has a positive linear relationship with the logs of per-capita housing transaction volume and per-capita licensed automobile stock, indicating that survey-based measures on economic beliefs can well predict actual economic behaviour.[5] This is consistent with Gerber and Huber (2009) who examine taxable sales and Gillitzer and Prasad (2018) who examine automobile purchases.

The paper is structured as follows. Section 1.1 discusses the related literature. Section 2 describes the data sources, measurement, and descriptive statistics. We present our empirical strategies and results on the divergence in economic expectations and spending intentions in Section 3, followed by an investigation into actual economic behaviours in Section 4. Finally, Section 5 concludes.

1.1 Related Literature

Our findings' contribution to the literature is fourfold. First, we aim to contribute to the body of work evaluating the effects of macro shocks and individual characteristics on expectation formation. For example, Binder and Makridis (2022) find that a rise in local gas prices causes consumers to become more pessimistic about national economic conditions. The COVID-19 pandemic also led consumers to form higher inflation expectations and more pessimistic unemployment expectations (Binder, 2020). To the best of our knowledge, our paper is the first to study how the Brexit vote shock affected household economic beliefs. We find that the vote led to a sharp and long-lasting belief divergence between pro- and anti-Brexit voters. Other studies focus on socioeconomic statuses such as own or parental income and education (e.g., Das, Kuhnen and Nagel, 2020; Kuhnen and Miu, 2017; Souleles, 2004). Our results suggest that views towards Brexit dominate over socioeconomic status in shaping economic beliefs. Moreover, our findings on actual economic behaviour are consistent with the research by Carroll, Fuhrer and Wilcox (1994), Malmendier and Nagel (2016), Kamdar and Ray (2022), and Gillitzer and Prasad (2018) who argue that consumer sentiment and inflation expectations matter for household spending and exposure of liabilities.

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[5]Interestingly, we find that given a spending intention level, the mean logs of per-capita housing transaction volume and licensed automobile stock were generally higher after the vote.

Second, we add to the large body of research studying the economic consequences of the Brexit vote. Almost without exception, economists have shared the consensus that as a result of new economic barriers (Sampson, 2017), leaving the EU would exert an adverse influence on the UK's economy with regard to trade (Dhingra et al., 2017; Aichele and Felbermayr, 2015; Steinberg, 2019), foreign direct investment (Bruno et al., 2016; Dhingra et al., 2016b), immigration (Portes and Forte, 2017; Wadsworth et al., 2016), household living standards (Dhingra et al., 2016a; Breinlich et al., 2017), and regional economic performance (Dhingra, Machin and Overman, 2017; Los et al., 2017). Nevertheless, the way in which the Brexit vote may have contributed to influencing micro-level household economic decisions has not yet received much attention. We fill this gap by analyzing the effects of the referendum on housing transactions and automobile purchases.

Third, this paper also closely relates to the growing body of political economy research on political polarization. Recent studies report a stark polarization among the American and British electorates (Abramowitz and Saunders, 2008; Boxell, Gentzkow and Shapiro, 2017; Hobolt, Leeper and Tilley, 2021). In particular, there is well-documented evidence on affective polarization (Iyengar, Sood and Lelkes, 2012; Iyengar et al., 2019). Individuals with similar partisanship increasingly share homogeneous ideology, while holding hostility towards members from the opposing political party. This line of research shows that affective polarization may lead to disagreement in factual beliefs (Druckman et al., 2021). Recent literature further explores whether partisan identity shapes individual expectations and behaviours (Mian, Sufi and Khoshkhou, 2021). Research on the Brexit vote suggests that the referendum cut across established party lines, with pro- or anti-Brexit views being similarly shared by traditional Labour and Conservatives voters (Hobolt, Leeper and Tilley, 2021). As the political views around Brexit were often orthogonal to traditional party lines, did the referendum influence individual economic expectations/behaviours in the same way as the long-term partisan identities explored in the literature on affective polarisation? We contribute to the existing studies by showing how polarisation can be triggered by political identities not strictly confined to party politics.

More broadly, our findings add to the literature on the recent rise of populism and political discontent across many countries (Rodríguez-Pose, 2018; Margalit, 2019; McCann and Ortega-Argilés, 2021; Rodrik, 2021). Several papers try to identify the triggers of political disenchantment (e.g., Guiso et al., 2018; Rodríguez-Pose, 2018; Margalit, 2019; Autor et al., 2020; Rodrik, 2021). We push this vein of literature further to consider the economic consequences of populist movements and study how the Brexit results have influenced households' economic activities at the micro-level.

2 Data

2.1 Household Survey Data

We compare economic expectations and spending intentions between pro- and anti-Brexit voters during the period from 2015, more than one year before the Brexit referendum, until the end of 2019. The analysis draws on the data from two nationally representative household surveys, the *British Election Study 2014–2019* (BES) and the *Bank of England/NMG Household Survey* (NMG). The British Election Study is the longest-running social science survey in the UK. The specific BES data set we use is of high frequency and includes 16 waves in total. It investigates British voters' political and economic attitudes around each of the general elections in the UK. We exploit Waves 6, 7, 8, 9, 10, 11, 14, 15, 16, respectively carried out in the following time periods: May 2015, April to May 2016, May to June 2016 (before the referendum), June to July 2016 (after the referendum), November to December 2016, April to May 2017, May 2018, March 2019, May to June 2019. Each wave involves approximately 30,000 respondents.

The NMG survey is an annual survey administered by the Bank of England, asking respondents questions about their income and spending. A relevant feature of the NMG survey is that, since 2016, it also asks respondents' attitudes towards Brexit, enabling us to measure respondents' feelings towards Brexit. We use the NMG waves conducted each year between 2015 and 2019. Each wave involves around 6,000 respondents. The specific timeline and sample sizes for each wave of both surveys are reported in Appendix Table D.1. In the analysis, we use repeated cross-sectional samples from the surveys and weight observations with the weights provided. We document how we measure respondents' Brexit identities, economic expectations, and spending intentions in what follows. For detailed survey questions, response options, as well as sources underlying these measures, readers can refer to Appendix Table D.2.

2.1.1 Brexit Identity and Demographic Compositions of Voters

We measure respondents' "Brexit identities", i.e., whether they can be classified as pro- or anti-Brexit, based on their actual votes, vote intentions, or attitudes towards Brexit. In the waves prior to the Brexit vote (i.e., Wave 6, 7, 8), the BES asked respondents to express their voting intentions on Britain's membership of the EU. Subsequently, in Wave 9, just after the referendum, the survey asked what respondents had actually voted. Since Wave 10, the BES asked for vote intentions again assuming there was another referendum on the EU membership. Utilizing these questions, we identify respondents as pro- or anti-Brexit voters if they respectively answered "Leave the EU" or "Remain in the EU". Using shares of Leave voters from Wave 9,

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in Appendix Figure D.1 we plot the survey-measured stated vote shares against actual Leave voter shares (obtained from London Datastore) for 380 local authorities. The figure shows that the respondents in the BES are highly representative of Brexit voters, with the correlation coefficient between the two shares, weighted by the number of survey respondents, reaching 0.74.

From Wave 2016, carried out after the Brexit referendum, the NMG survey asked respondents about their attitudes on the UK voting to leave the EU in the referendum. We identify respondents as pro-Brexit voters if they held "somewhat positive" or "very positive" attitudes, and anti-Brexit if "somewhat negative" or "very negative". However, the respondents' attitudes are not available in the preceding-vote wave, Wave 2015. To deal with this missing value issue, since some of the NMG survey respondents are traced across different waves, we successively exploit their attitudes revealed in Wave 2016, 2017, 2018, and 2019 to fill in the missing values in Wave 2015. Overall, around 39.9% of the respondents are filled via this approach.[6]

We report the demographic compositions of voters in the BES and NMG samples in Table 1. Confirming the literature identifying the "politically disenchanted median voter", the table shows that anti-Brexit voters were more likely to hold a college degree than pro-Brexit voters (57.0% vs. 38.7% in the BES, 53.0% vs. 37.3% in the NMG). Anti-Brexit voters were also more represented among the high-income group (24.2% vs. 14.1% in the BES, 26.6% vs. 22.7% in the NMG) and, by contrast, less represented in the low-income group (9.6% vs. 12.1% in the BES, 10.8% vs. 13.9% in the NMG).[7] Anti-Brexit voters were also more likely to be employed (61.0% vs. 50.9% in the BES, 61.6% vs. 55.8% in the NMG) and less likely to be inactive (36.2% vs. 46.7% in the BES, 35.4% vs. 42.1% in the NMG). The share of those unemployed is relatively balanced among pro- and anti-Brexit voters (2.9% vs. 2.5% in the BES, 3.0% vs. 2.2% in the NMG). In Column (5), (6), (11), and (12) of Table 1, we test the null hypotheses that anti- and pro-Brexit voters did not have different characteristics by regressing each demographic variable on a dummy indicating if voters are pro-Brexit or not. We find that almost all null hypotheses are rejected at the 1% significance level. Taken together, these descriptive results suggest that anti-Brexit voters had higher educational levels and a higher socioeconomic status. Besides, comparing Columns (13) and (15) in Panel C, we find that the sample with missing attitudes filled does not significantly twist the demographic compositions of the original sample.

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[6]One major concern with this approach is that respondents might alter their attitudes towards Brexit over time, especially after the Brexit vote outcome was declared, especially since the announcement could immediately change interest rates, inflation, and other economic circumstances that might in turn change individual attitudes. Results from Appendix A mitigate this concern, indicating that respondents' attitudes towards Brexit actually remained relatively stable over time during the post-referendum period up to 2019.

[7]The BES and NMG differ in the scales of the classification with respect to gross household income per year. In the BES, we encode "< £10,000" as "low income", "£10,000–£50,000" as "middle income", ">=£50,000" as "high income"; in the NMG, we encode "< £11,500" as "low income", "£11,500–55,000" as "middle income", ">= £55,000" as "high income".

2.1.2 Household Economic Expectations

Our primary measures of economic expectations are voters' beliefs about the general UK economy (macro expectations) and personal economic circumstances (micro expectations). We include two variables to study voters' macro expectations. The first one (from the BES) asks a question about how the current economic situation is changing. There are five response options: "1 = Getting a lot worse", "2 = Getting a little worse", "3 = Staying the same", "4 = Getting a little better", and "5 = Getting a lot better". The second variable (from the NMG survey) measures beliefs on the general unemployment situation, asking how the number of unemployed people in the UK will change over the next 12 months. It also has five response options: "1 = Increase sharply", "2 = Increase slightly", "3 = Remain the same", "4 = Fall slightly", and "5 = Fall sharply". Therefore, a higher value associated with these two variables implies more positive assessments of the economy.

Regarding micro expectations, the first variable (from the BES) is voters' beliefs on the likelihood of not having enough money to cover day-to-day living costs during the subsequent 12 months, with the following five response options: "1 = Very unlikely", "2 = Fairly unlikely", "3 = Neither likely nor unlikely", "4 = Fairly likely", and "5 = Very likely". This measure is used to elicit voters' perceptions of the risks of getting into poverty. Therefore, a higher value implies a higher risk. Next, we study voters' beliefs about how their household financial positions may change over the following 12 months (from the NMG survey). The response options for this variable include: "1 = Get a lot worse", "2 = Get a little worse", "3 = Stay the same", "4 = Get a little better", and "5 = Get a lot better". For ease of interpretation, we standardize all these four expectation variables with a mean equal to zero and a standard deviation of one.

Panel A and B of Figure 1 plot mean standardized macro and micro expectations by Brexit identities across the Brexit referendum. Before the referendum, anti-Brexit voters were more optimistic about the current economic situation and general unemployment situation than pro-Brexit voters, though the disagreement was fairly small. However, following the referendum, anti-Brexit voters had become remarkably more pessimistic relative to pro-Brexit voters, resulting in a large and long-lasting divergence. The trends were similar when examining micro expectations. Anti-Brexit voters perceived fewer poverty risks than pro-Brexit voters before the vote but the pattern reversed in the wake of that. Relatedly, there was no significant divergence in the expectation about the household's financial position between anti- and pro-Brexit voters before the vote but, in stark contrast to Brexiteers, anti-Brexit voters had become significantly more pessimistic after the referendum.

2.1.3 Spending Intentions

We investigate consumers' spending intention with regard to major purchases and household general spending. The variable on major purchases (from the BES) asks respondents whether it is currently a good or bad time to buy major household items (e.g., furniture, kitchen appliances, and televisions). The variable is coded as: "1 = Bad", "2 = Neither good nor bad", and "3 = Good". The second variable comes from the NMG survey and is on household general spending, asking respondents to anticipate what the household's general spending over the next 12 months will be. There are five response options: "1 = Decrease a lot", "2 = Decrease a little", "3 = About the same", "4 = Increase a little", and "5 = Increase a lot". As before, we standardise both variables for ease of interpretation.

Panel C of Figure 1 plots mean standardized spending intentions by Brexit identities across the Brexit referendum. It suggests that before the Brexit referendum, the difference in both spending intentions on major purchases and household general spending was negligible between pro- and anti-Brexit voters. However, the difference widened after the referendum, primarily because Brexit supporters had increased their spending intentions compared to their anti-Brexit counterparts.

2.2 Local Authority Data

To study the effects of the Brexit vote on actual economic behaviour, we utilize aggregate data at the local authority (LAU) level. These are the lowest administrative tier across England and Wales. We assemble a number of data sources to construct an LAU-quarter panel dataset. This includes 313 local authorities and covers the period from the first quarter of 2015 to the last quarter of 2019.

2.2.1 Actual Economic Behavior

We focus on housing transactions and automobile purchases, both of which are household major economic decisions and spending. First, we use *Price Paid Data* from HM Land Registry to access administrative records on housing transactions. This dataset contains detailed information on transaction dates, prices, addresses and characteristics of all property sales across England and Wales since 1995. We know the postcode of each property and are therefore able to map each transaction to a local authority. We then aggregate these transactions at a quarterly frequency. There are overall 4,700,991 transaction records in the period considered (Appendix Table D.4 reports breakdowns by year and quarter). Our final measure is the per-capita total volume of transactions completed in each local authority at the end of each quarter. Population

data are sourced from the 2011 UK census.

Second, we use automobile data from the Department for Transport (DfT) and the Driver and Vehicle Licensing Agency (DVLA). This dataset reports the stock of licensed vehicles at the end of each quarter in each local authority. The licensed vehicles can be stratified by body type (e.g., buses and coaches, cars, heavy goods vehicles etc.), fuel type (diesel, petrol, and other fuels), and ownership (company and private). Our outcome variable measures the quarterly total per-capita number of licensed private vehicles (total body types and total fuel types) in each local authority. To trace household actual spending behaviours, the outcome variable should ideally measure new purchases. Total licensed automobile stock should anyway be a good measure as long as the seasonality pattern of vehicle scrappage is constant and we can use quarter fixed-effects to capture these patterns. We measure licensed automobile stock using private vehicles only (excluding licenses to businesses) to be consistent with Gillitzer and Prasad (2018) who argue that private vehicle purchases map most closely to the survey of consumer sentiment.

2.2.2 Vote Shares and Other Local Authority-Level Control Variables

The analysis at the local authority level requires us to construct a geographic measure of Brexit identities. We do so using the share of Leave voters in the 2016 Brexit referendum from London Datastore, an open data-sharing portal administered by the Greater London Authority. We also use a range of LAU-level control variables as follows.

First, we obtain gross household disposable income in annual frequency from the Office for National Statistics (ONS). Second, we obtain the unemployment rate in 2015, EU Structural Funds per-capita in 2013, and total fiscal cuts over the period 2010—15 from Becker, Fetzer and Novy (2017). EU Structural Funds are EU transfers to local areas of the Member States of the European Union, providing funding to implement place-based policies aimed at reducing inter-regional inequality. Total fiscal cuts are originally compiled by the Financial Times, capturing the financial loss per working adult in pounds sterling per year from 2010 to 2015, that is, during the wave of austerity that followed the 2008 financial crisis.

Lastly, we obtain from the UK Census 2011 the following LAU-level variables: immigration rate, manufacturing employment rate, the share of low-skill jobs, the share of individuals without qualification, and deprivation rate. The immigration rate is measured using the number of residents not born in the UK over the total population. The manufacturing employment rate corresponds to the share of workers in manufacturing according to the UK Standard Industrial Classification 2007 (SIC). We map low-skill jobs with the following occupations in Standard Oc-

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cupational Classification 2010 (SOC): (1) caring, leisure and other service occupations, (2) sales and customer service occupations, (3) process, plant and machine operatives, and (4) elementary occupations. The share of people without qualification measures the share of residents without any formal education. The deprivation rate is a multidimensional measure encompassing the share of households that are deprived in one or more of the following dimensions: (1) employment. Where any member of a household, who is not a full-time student, is either unemployed or long-term sick; (2) education. No person in the household has a secondary education certificate, and no person aged 16 to 18 is a full-time student; (3) health and disability. Any person in the household has general health that is "bad" or "very bad" or has a long-term health problem; (4) housing. The household's accommodation is either overcrowded, with an occupancy rating -1 or less, or is in a shared dwelling, or has no central heating.

2.2.3 Summary Statistics

Table 2 reports some population-weighted summary statistics for the sample of 313 English and Welsh local authorities covered by the analysis. In the table, we compute cross-sectional measures for the three variables that have a time dimension. Housing transaction volume and licensed automobile stock are measured here as the average per capita transaction volume and the average per capita number of licensed private vehicles over the quarters during the period from 2015 to 2019. Gross household disposable income is the annual average from 2015 to 2019. In Columns (1) to (3), we report the mean, median, and standard deviation of the variables for all local authorities. In Columns (4) and (5), we stratify these LAUs into "Leave areas" where the shares of Leave voters are over 50% and "Remain areas" otherwise. Columns (7) and (8) further statistically test the differences between Leave and Remain areas. The results indicate that, on average, Leave areas were more likely to have more housing transactions and licensed automobile stocks, and also tended to have higher: manufacturing employment share, low-skill jobs share, share of people without qualifications, and deprivation rate. Leave areas also tended to have lower immigration rates and gross household disposable income. By contrast, we do not find significant differences in unemployment rates, EU structural fund receipts, and total fiscal cuts.

3 Divergence in Economic Expectations and Spending Intentions

This section investigates the effects of the Brexit vote on British consumers' economic expectations and spending intentions by examining the divergence between pro- and anti-Brexit voters. To this end, we employ two forms of event study specifications. To disentangle the

role of Brexit identities from other socioeconomic characteristics, we also compare revisions to economic expectations and spending intentions across the referendum for various groups of voters classified by Brexit identities and socioeconomic status.

3.1 Econometric Models

Our first event study specification is a parsimonious one,

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it}, \tag{1}$$

where Y_{it}^{j} denotes the particular economic expectation or spending intention j of voter i in wave t. $ProBrexit_{it}$ is the Brexit identity of each respondent i, taking the value of one if they are pro-Brexit and zero otherwise. $Period_t$ indicates whether the survey wave t was conducted before, at the time of the Brexit referendum, or after it. In the BES, we group Wave 6 and 7 as the pre-referendum period, and Waves 9, 10, 11, 14, 15 and 16 as the post-vote period. The reference category in the BES is Wave 8, which was conducted just before the vote. In the NMG survey, we group Waves 2016 to 2019 as the post-vote period. Here the reference category is Wave 2015.[8] ϵ_{it} is the error term. We cluster standard errors at the local authority by wave level in the BES and, because of different scales in the geographical units, at the region by wave level in the NMG survey.[9]

Secondly, we estimate a more flexible event study model,

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}, \tag{2}$$

where Y_{it}^{j}, $ProBrexit_{it}$, and ϵ_{it} are defined as above. $Wave_t$ is now a set of indicator variables for each wave. As before, the reference categories are Wave 8 in the BES and Wave 2015 in the NMG, while standard errors are clustered at the local authority or region by wave level.

In choosing our control variables, we control for key demographics which are found to play an important role in shaping expectations, including gender, age, educational attainment, household gross income per year, and employment status (e.g., Malmendier and Nagel, 2016; Das, Kuhnen and Nagel, 2020). Additionally, one may be concerned that voters' economic expectations and spending intentions could be affected by the changes in economic fundamentals

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[8]We focus the main analysis on the period from the first quarter of 2015 to the end of 2019. Therefore, we merely involve Wave 2015 from the NMG as the pre-treatment period. We do not extend the pre-treatment period longer also because variables on Brexit identity are not available for the NMG in preceding-vote waves, as described in Section 2.1.1.

[9]Regions are statistical, non-administrative units combining many local authorities. The NMG survey records respondents' regions of residence combining Great Britain's 11 NUTS1 regions as follows: North East (including Yorkshire & Humberside), North West, Midlands (East and West), South East, East Anglia, South West, Wales, London, and Scotland.

of the voters' residential areas following the Brexit vote. This concern is mitigated in our context by the fact that the UK-EU relationship remained the same without instant actual policy changes induced by the Brexit vote until the last day of 2020, i.e. after the period covered in our analysis. Nevertheless, we also control for local authority or region by wave fixed-effects to address possible confounding factors.

The explanatory variables of our interest are the interactions between $Period_t$ (or $Wave_t$) and $ProBrexit_{it}$, whose coefficient estimates capture the changes in the divergence of economic expectation or spending intention j between pro- and anti-Brexit voters relative to the references. If the changes were caused by the Brexit vote, we would expect to see insignificant effects on the interactions with the pre-vote periods or waves, but to find significant coefficients for the interactions with the post-vote periods or waves. We test this hypothesis and present the coefficient estimates in the next subsection.

3.2 Empirical Results

Figure 2, 3, and 4 graphically present the coefficient estimates of our interest from Equation (1) and (2). We plot the estimates on the interactions between $Period_t$ and $ProBrexit_{it}$ with horizontal lines and the corresponding 95% confidence intervals with boxes. Additionally, we plot the estimates on the interactions between $Wave_t$ and $ProBrexit_{it}$ with dots and the corresponding 95% confidence intervals with vertical lines. The coefficients plotted can therefore be interpreted as the relative change in belief divergence between pro- and anti-Brexit voters around the Brexit vote. In the baseline models, we do not control for voters' demographics and local authority or region by wave fixed effects. Then, we control for the fixed effects and finally, we control for both the fixed effects and demographics.

Macro Expectations. The results presented in Figure 2, suggest that the Brexit vote widened the divergence in macro expectations between pro- and anti-Brexit voters. Before the vote, the differences in expectation divergence relative to Wave 8 were insignificant. Yet the divergence significantly grew following the vote. As shown by the horizontal lines, pro-Brexit voters on average became 0.917 standard deviations more optimistic about the current economic situation (relative to Wave 8) and 0.747 standard deviations more optimistic about the general unemployment situation (relative to Wave 2015) than anti-Brexit voters. Furthermore, we find that the dynamic effects shown as the dots oscillate slightly around the average effects, suggesting that the enlarged expectation divergence remained stable in the post-referendum period considered. Controlling for voters' demographics and local authority or region by wave fixed effects does not change our conclusions.

Micro Expectations. Consistent with the results on macro expectations, Figure 3 also underscores a divergence in perceived poverty risk and in the assessment of respondents' own household financial position. The divergence is also long-lasting and stable over the period considered. On average, relative to Wave 8, after the referendum pro-Brexit voters perceived a 0.163 standard deviations higher poverty risk and were 0.319 standard deviations more optimistic about their household financial position over the following 12 months. Again, controlling for voters' demographics and the fixed effects does not alter our conclusions.

Spending Intentions. We analyse spending intentions in Figure 4. Resembling the findings regarding expectations, before the referendum, the belief divergence on whether it is currently a good or bad time to purchase major items between pro- and anti-Brexit voters did not significantly differ from that in the reference wave. However, the divergence immediately increased following the referendum, and then fell slightly but anyway remained higher for the whole period analysed. On average, relative to Wave 8, after the referendum pro-Brexit voters showed 0.300 standard deviations stronger intentions to spend on major items than anti-Brexit voters. The divergence associated with household general spending also increased, on average, by 0.142 standard deviations relative to the reference. The increase in the divergence in the post-referendum period is statistically significant at the 5% level, after controlling for region-by-wave fixed effects and demographics.[10]

Additional results. In Appendix Figure D.2 we additionally examine three variables on how voters assessed: (1) the general economic situation (from the NMG), (2) personal risks of losing jobs (from the BES), and (3) the amount of spending on major purchases over the following 12 months (from the NMG).[11] The first and third variables are akin to two of our primary economic expectation and spending intention variables, i.e., the variables on the optimism about the current economic situation and the assessment about whether it is a good or bad time to buy household major items. At the same time, the additional variables come from the NMG rather than the BES, and can hence be used to cross-validate our main results. Consistent with the conclusions above, we find that the divergence between pro- and anti-Brexit voters grew significantly after the vote, as pro-Brexit voters became more optimistic about the overall economy and their personal situation, and more willing to buy major items than anti-Brexit voters (relative to the references).

Changes in household spending can occur because of either quantities change or prices change. Is the divergence in spending intentions between pro- and anti-Brexit voters due to

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[10]We note that the changes in the divergence on household general spending in the first three waves after the vote were not significantly different from zero at the 5% level; they are significantly different from zero for the fourth wave.

[11]The corresponding survey questions and response options are available in Appendix Table D.2.

the divergence in their inflation expectations? We have two variables to address this question. The first one (from the BES) measures households' views on how the current cost of living is changing. The answers include: "1 = Getting a lot lower", "2 = Getting a little lower", "3 = Staying the same", "4 = Getting a little higher", "5 = Getting a lot higher". A higher value implies more pessimism about inflation. The second variable (from the NMG survey) measures household expectations on how the general shop prices will change over the following 12 months. There are eight scales for the response options: "1 = Go down", "2 = Not change", "3 = Go up by 1% or less", "4 = Go up by 1% but less than 2%", "5 = Go up by 2% but less than 3%", "6 = Go up by 3% but less than 4%", "7 = Go up by 4% but less than 5%", "8 = Go up by 5% or more". A higher value with this variable implies a larger expected increase in prices. As before, we standardize these two variables and use them as our outcome in the two event study specifications. Appendix Figure D.3 present the results, which show how the divergence in inflation expectations between pro- and anti-Brexit voters grew remarkably, with Brexiteers becoming more optimistic about potential inflation. Economic theory would suggest that individuals increase their current spending when they expect a rise in inflation (and vice-versa), as they try to maximise their real-term purchasing power. However, our results show an opposing pattern. After the referendum, pro-Brexit voters had stronger spending intentions despite showing lower inflation expectations than anti-Brexit voters. Thus, the divergence in spending intentions in terms of real spending was in fact even larger than the divergence in nominal spending.

Did the context where respondents live influence the revision in economic expectations and spending intentions? Research in Geography and Psychology highlights how individuals' attitudes/expectations might be influenced by the social environment in which they are immersed (McNeil, Lee and Luca, 2022). We test this by regressing economic expectations and spending intentions on an interaction term among a variable on Leave voter shares of local authorities, a dummy taking the value of one when the survey wave was conducted after the vote, and a dummy indicating pro-Brexit identity, i.e., $LeaveVoteShare_a \times PostBrexit_t \times ProBrexit_{it}$, with controlling for wave fixed effects and Brexit identity. Coefficient estimates on the interaction term suggest how belief divergence between pro- and anti-Brexit voters was moderated by local Leave voter shares after the vote. Regression results are reported in Appendix Table D.3. The results suggest that the belief divergence was larger in local authorities with higher Leave voter shares. One plausible explanation underlying the regression results is that anti-Brexit voters in these areas became more pessimistic about the economy than anti-Brexit voters in other areas, as they saw fewer individuals nearby experienced the alike "stark" times.

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Remark. Overall, the results have shown that, after the Brexit vote, individuals significantly revised their economic expectations and spending intentions. While unpacking the underlying cognitive mechanisms leading to these revisions would require psychological research beyond the scope of the current paper, we can speculate that this occurred because the vote outcome came out as a large surprise (Baker, McElroy and Sheng, 2020), as discussed in Appendix C.[12]

3.3 Brexit Identity vs. Socioeconomic Status

To better understand the relative importance of the Brexit identity in shaping voters' economic expectations and spending intentions after the referendum, we compare belief revisions for voters with the same socioeconomic status across Brexit identities. To this end, we first stratify voters into a variety of groups by their Brexit identities and socioeconomic status (i.e., educational attainment, household gross income per year, and employment status). Then, we compute belief revisions for each group by estimating the following equation:

$$Y_{it}^{j} = \eta \times PostVote_{it} + \epsilon_{it}, \tag{3}$$

where Y_{it}^{j} denotes a particular economic expectation or spending intention variable j for voter i in wave t. $PostVote_{it}$ is a dummy equal to one when voters were interviewed in the post-referendum period. ϵ_{it} is a disturbance term. We also control for LAU or region fixed effects and demographics (excluding the one by which the voters are stratified), and cluster standard errors at the local authority or region by wave level.[13]

Figure 5, 6, and 7 plot the coefficient estimates of η (with 95% confidence intervals), i.e., capturing the belief revisions stratified by various groups of voters. In the left panels, we distinguish between anti-Brexit voters with (or without) a college degree and pro-Brexit voters with (or without) a college degree. In the middle panels, we distinguish between anti- or pro-Brexit voters respectively with low, medium, or high incomes. In the right panels, we stratify respondents as anti- or pro-Brexit voters respectively distinguishing between inactive, employed, or unemployed.

The results suggest that, for each given Brexit identity group (anti- or pro-Brexit), the gaps in belief revisions are relatively small across socioeconomic statuses.[14] But the gaps in belief revisions are much larger across Brexit identities within each socioeconomic status. For example,

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[12] Mian, Sufi and Khoshkhou (2021) find that the relative shift in economic expectations between Republicans and Democrats was larger around the US 2016 presidential election than that around the 2008 election. They argue that the larger belief divergence arose because the Trump victory in 2016 was less expected and represents more of a surprise to individuals.

[13] We do not control for LAU or region by wave fixed effects because this approach would lead to collinearity.

[14] For each Brexit identity (pro- or anti-Brexit), the decline in optimism for voters with higher socioeconomic status (education or income) is on average larger than that for voters with lower socioeconomic status.

in Panel A of Figure 5, the absolute gap in revisions to optimism about the current economic situation between anti-Brexit voters with/without a college degree is 0.132 standard deviations; the corresponding difference for Brexiteers with/without a college degree is 0.062 standard deviations. However, the absolute gap between anti- and pro-Brexit voters increases to 0.925 standard deviations for respondents with a tertiary degree, and to 0.856 standard deviations for individuals without a degree. Overall, the results highlight how the Brexit identity played a more important explanatory role than socioeconomic status in explaining belief revisions. This conclusion broadly holds when examining other economic expectations and spending intentions outcomes, and when stratifying voters by household gross income per year or by employment status.[15]

4   Did the Brexit Vote Affect Actual Economic Behaviour?

The previous section shows that the Brexit vote led to a large divergence in spending intentions between pro- and anti-Brexit voters. Yet, is this divergence mirrored by actual economic behaviours? Mian, Sufi and Khoshkhou (2021) show that partisan bias on survey-based spending intentions among the US electorate does not translate into actual changes in household spending (measured with administrative data). They highlight the potential existence of "partisan cheerleading" effects, with respondents changing their stated expectations but not their concrete economic actions. In this section, we test their hypothesis, using the LAU-quarter panel dataset described in Section 2.2. We exploit variations across local authorities. We trace actual economic behaviours by analysing the volume of quarterly housing transactions and the stock of licensed automobiles, two items involving major household economic decisions.

4.1   Average Effects

We begin the analysis with the following Difference-in-Differences specification,

$$Ln(S_{at}) = \delta_t + \gamma_a + \beta \times PostVote_t \times LeaveVoteShare_a + \epsilon_{at}, \tag{4}$$

where S_{at} denotes either per-capita housing transaction volume or per-capita licensed automobile stock (both expressed in Ln) in each local authority a in quarter t. $PostVote_t$ is a time dummy indicating the post-vote period, after Quarter 1, 2016.[16] $LeaveVoteShare_a$ is the treatment variable, measuring the share of leave voters in the referendum in each LAU. We control

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[15]See Appendix Figure D.4 for the results on the additional outcome variables presented in Appendix D.2.

[16]The Brexit vote took place in June 2016. We hence choose Quarter 1, 2016 as the reference time category because our outcome variables are measured as total numbers at the end of each quarter.

for a set of year-quarter fixed effects, δ_t, to capture all variations in outcomes that are varying in time but common across LAUs, such as seasonality. We also control for a set of local authority fixed effects, γ_a, to capture all LAU-specific, time-invariant characteristics. ϵ_{at} is a disturbance term. Standard errors are clustered at the local authority level. The regression is weighted by local population size. β is the coefficient of interest, capturing the average effects of the Brexit vote on actual economic behavior.

Column (1) – (6) of Table 3 report the coefficient estimates from Equation (4). Panel A and B respectively use the log of per-capita housing transaction volume and the log of per-capita licensed automobile stock as the dependent variable. Column (1) presents the baseline results. We find that the Brexit vote widened the gap in housing transaction volume and licensed automobile stock across local authorities. Hence, the stated divergence in economic expectations and spending intentions uncovered earlier is not merely a "cheerleading effect". On average, after the Brexit referendum, a 10% difference in the share of Leave voters is associated with a 5.98% increase in the gap of per-capita housing transaction volume and a 0.78% increase in the gap of per-capita licensed automobile stock.

In Column (2), we examine if the vote changed actual economic behaviours by influencing households' disposable income. We do this by controlling for the annual local average gross disposable household income. However, the results suggest that income does not remarkably mediate our average effects. This is consistent with the finding that the divergence in the share of households expecting income to increase over the next 12 months did not significantly change after the vote (see Appendix Figure D.5).

While there were no real changes in the relationship between the UK and the EU over the period 2015 – 2019, locality-specific time-varying factors that fail to be captured by our baseline specification could still influence household actual economic behaviour. To address this confounding issue, we control for time trends varying with pre-vote local economic characteristics, on the assumption that in the absence of the Brexit vote, these characteristics would have constant growth rates. Columns (3), (4), (5), and (6) report the results, successively controlling for a time trend variable interacted with the unemployment Rate in 2015, the immigration rate in 2011, the log of EU Structural Funds per capita in 2013, and the log of total fiscal cuts over the period 2010—15. For both Panel A and B, further controlling for these additional time-varying regressors does not significantly change the estimates of β. The only regressor that has a relatively large influence on the outcomes is EU structural funds. In Panel A the estimate of β now reduces to 0.316, i.e., around half of the baseline, but is still significant at the 1% level. In Panel B, the coefficient reduces to 0.027, i.e., around one-third of the baseline. In fact, these reductions

make sense because Brexit means the EU Structural Funds would stop providing funds to the UK, and therefore, like the share of Leave voters, EU Structural Funds per capita 2013 is also a good proxy to capture the Brexit vote shocks. Consequently, a time trend interacting with log of EU Structural Funds per capita 2013 can capture a lot of the effects caused by the Brexit vote.

4.2 Dynamic Effects

We subsequently examine the dynamic effects by estimating a LAU-level version of equations (1) and (2) from Subsection 3.1 above. Specifically, the econometric specifications are as follows,

$$
Ln(S_{at}) = \delta_t + \gamma_a + \beta_1 \times PreVote_t \times LeaveVoteShare_a +
$$
$$
\beta_2 \times PostVote_t \times LeaveVoteShare_a + \epsilon_{at}, \tag{5}
$$

$$
Ln(S_{at}) = \delta_t + \gamma_a + \sum_{t \neq 2016q1} \eta_t \times Quarter_t \times LeaveVoteShare_a + \epsilon_{at}, \tag{6}
$$

where S_{at}, δ_t, γ_a, $LeaveVoteShare_a$, and ϵ_{at} are defined as above. $PreVote_t$ is a dummy indicating the period from Quarter 1, 2015 to Quarter 4, 2015. $PostVote_t$ is another dummy indicating the period from Quarter 2, 2016 to Quarter 4, 2019. $Quarter_t$ is a set of quarter indicators. For both specifications, the reference time is Quarter 1, 2016, the quarter preceding the Brexit vote. We cluster standard errors at the local authority level and weight the regressions by local population size. The coefficients of interest are β_1, β_2, and η_t which capture the changes in the spatial divergence of housing transactions and automobile purchases relative to the reference.

The coefficient estimates of interest are plotted in Figure 8. The estimates of β_1 are indicated as the horizontal lines on the left and β_2 on the right. The estimates of η_t are indicated as dots with their 95% confidence intervals indicated by the grey dashed lines. Panel A shows the results associated with housing transactions. The results suggest that the estimates of η_t are close to null before the Brexit vote, but increased distinctly after. Additionally, the estimates of η_t in the post-vote period remained stable. After estimating Equation (5), we test if $\beta_1 = \beta_2$. The results reject this hypothesis. Taken together, these results are in line with our conclusion above that the Brexit vote had enlarged the spatial gap in housing transactions.

Panel B shows the results for licensed automobile stocks. Nearly all the coefficient estimates of η_t are insignificantly different from prior to Brexit. Interestingly, the effects of the Brexit vote on the spatial gap in terms of licensed automobile stock kept increasing over time during the period considered. Likewise, we test if $\beta_1 = \beta_2$ and the results again significantly reject this hypothesis. Furthermore, consistent with the findings in Section 3, Figure 8 displays that the

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effects of the Brexit vote on the actual economic behaviour are long-lasting. In case the year 2015 may be a special year, we further collect data on housing transaction volume and licensed automobile stock for 2014 and replicate the analysis above.[17] As shown in Appendix Figure D.6, our results are robust to extending the analysis to Quarter 1, 2014.

4.3 Roots of Euroscepticism

In this subsection, we explore if the intensity of the polarising effect of Brexit on actual economic behaviour is linked to a set of pre-referendum factors potentially at the root of Euroscepticism. The literature discusses a broad set of potential factors which may have triggered insecurity and, as a consequence, led to a rise in political disenchantment, support for populist parties, and Euroscepticism (Rodrik, 2021; Guiso et al., 2018; Dijkstra, Poelman and Rodríguez-Pose, 2020). These include different types of economic globalisation shocks linked to trade, "obsolete" industry composition, etc. (e.g., Colantone and Stanig, 2018; Autor et al., 2020), the short-term effects of the government austerity measures that followed the 2008 financial crisis (Fetzer, 2019), and sociocultural change linked to immigration (Margalit, 2019; Albanese, Barone and de Blasio, 2022). Besides, the existing literature highlights that it is not only the "individual losers" of globalisation to support populist movements, but also residents (potentially well-off) of areas experiencing relative economic stagnation and decline (Rodríguez-Pose, 2018).[18]

Drawing on existing studies, we consider a range of variables to measure these potential roots. Specifically, we focus on: the unemployment rate in 2015, the immigration rate in 2011, EU structural funds in 2013, and total fiscal cuts over the period 2010—15. Industry and occupation structure variables include manufacturing employment shares and shares of low-skill jobs. Demographic composition variables include gross household disposable income, shares of residents without qualification, and deprivation rates.

Our empirical strategy is a two-step procedure, exploiting the variation in the share of leave voters uncorrelated with the factors identified as roots of Euroscepticism. Specifically, we first regress separately the share of Leave votes on the factors discussed above and store the residuals, ξ_a. The regression results are reported in Appendix Table D.5. Economic shock variables absorb 51.7% of the variation in the share of leave voters, industry and occupation structure variables absorb 54.3%, and demographic composition variables absorb 69.5%. We also include the full set of variables in Column (4). Overall, all the variables together absorb 78.6%

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[17]To be consistent with our analysis on economic expectations and spending intentions, we confine the main specification on economic behaviour to the period from Q1 2015 to Q4 2019.

[18]Research on place-based policies further suggests that the EU Structural Funds may have contributed to reducing support for populist parties in areas where the policy was effective (Crescenzi, Cataldo and Giua, 2020).

of the variations in the share of leave voters. We then replicate the specification (4) replacing *LeaveVoteShare$_a$* with ξ_a:

$$Ln(S_{at}) = \delta_t + \gamma_a + \beta \times PostVote_t \times \xi_a + \epsilon_{at}. \qquad (7)$$

Since ξ_a is a generated variable, we estimate standard errors using 1,000 bootstrap replications. If the identified factors can generate powerful shocks to drive the actual economic behavior, we should be able to see a relatively large reduction in the coefficient estimates of β compared to the baseline estimates using the specification (4), as the variation in the share of Leave voters associated with these factors has been filtered out.

Regression results are reported in Columns (7), (8), and (9) of Table 3. Panel A and B respectively report the results for per-capita housing transaction volumes and licensed automobile stocks (as before, both expressed in Ln). In Column (7), we include economic shock variables in the first step. For both Panel A and B, the coefficient estimates of β remain quantitatively similar to the baseline results in Column (1). Conversely, the coefficient estimates of β drop significantly for both Panel A and B when controlling for industry and occupation structure variables and demographic composition variables, suggesting that such two sets of variables capture relatively powerful shocks induced by the Brexit vote. Therefore, we conclude that the Brexit vote caused relatively larger shocks on actual economic behaviour for local authorities that had been suffering from long-term adverse impact of globalization on local manufacturing industries, low-skill occupations, and residents with lower socioeconomic status.

4.4 Spending Intentions and Actual Economic Behaviour

Do spending intentions matter for actual economic behaviour? As a first step towards answering this question, we correlate our measures of actual economic behaviour with a measure on spending intention (now aggregated at the LAU-level to reflect the structure of the actual spending data). While such correlations can not be interpreted as causal mechanisms, our goal is merely to explore if the survey-based measures of spending intentions are powerful in predicting actual economic behaviour in the context of the Brexit vote.

To construct the local spending intention measure, we use the variable from the BES on whether it is currently a good or bad time to purchase major items because it has a higher frequency. We calculate the mean for each local authority in each wave. To match such measure with our LAU-quarter panel data set, we generate a variable indicating the year and quarter when each wave was conducted. For each local authority, we then match observations that are closest with respect to the time variable.

Before examining the correlations, we begin by replicating the specification of equation (4) using the LAU-level measure of spending intentions instead of the individual-level one. Appendix Table D.6 reports the results. Column (1) reports the baseline results controlling only for LAU and time fixed effects. Column (2) further controls for annual gross household disposable income (expressed in Ln). Columns (3) — (6) successively control for time trends constructed by interacting time dummies with the pre-vote local unemployment rates, immigration rates, log of EU structural fund transfers, and log of total fiscal cuts over the period from 2010 to 2015. The regression outputs offer a qualitatively similar picture to those from individual-level findings on spending intentions. After the Brexit vote, the divergence in the assessment of whether it is currently a good or bad time to purchase major items grew significantly between local authorities with higher/lower shares of Leave voters.

In Figure 9, we then investigate the correlation between spending intention and actual economic behaviour. The figure presents binned scatter plots of the per-capita housing transaction volume and licensed automobile stock (both expressed in Ln, as before) against our LAU-level spending intention measure (now aggregated at LAU-level). The conditional mean of log of housing transaction volume per capita and log of licensed automobile stock per capita given the spending intentions are positively linear. Using a population-weighted OLS regression with standard errors clustered at the LAU level, we estimate that one standard deviation increase in the spending intention measure is significantly associated with an 18% increase in the mean log of per-capita housing transaction volume and a 45% increase in the mean log of per-capita licensed automobile stock. The magnitude and size of the estimates are broadly similar when we separately consider the periods before and after the Brexit vote, as shown in Appendix Figure D.7.[19]

4.5 Implications of Polarised Beliefs for the UK Economy

This section provides a brief and informal discussion on experts' forecasts of the economic consequences of a Brexit vote and the implications of political polarisation about Brexit for the UK economy. In contrast to the large disagreement among households, economic experts had a nearly unanimous view that Brexit would have negative short- and long-term economic consequences.[20] For instance, on June 7, 2016 (shortly before the referendum), a survey by the Centre for Macroeconomics (CFM) asked a panel of economists about the consequences of a potential Leave vote on the British economy, financial sector and asset prices. None of the experts identi-

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[19]It is also worth highlighting that given the spending intention level, actual behaviours mean per-capita housing transaction volumes and licensed automobile stocks are generally higher after the referendum than before it.

[20]Past literature has documented large disagreements about a wide range of economic and policy issues between ordinary households and economic experts (Cf., for example, Sapienza and Zingales (2013).

fied a potential Leave outcome as beneficial for the UK economy. Private and public economic institutions such as investment banks, the Bank of England and the International Monetary Fund shared a similar view.[21]

In the few years after the EU referendum, there was little discernible impact on macroeconomic variables beyond a fall in the value of the pound. And the economics profession has been criticised for being overly gloomy in its predictions (e.g., Johnson and Mitchell, 2017). The pessimistic view of experts is based on one or several of the following economic channels when the short-term effects of the Brexit vote on the UK economy are analysed. First, an increase in trade barriers with the UK's main trading block would reduce foreign direct investment, productivity and household incomes in the long term. Anticipating this, households would immediately cut spending, and businesses cut jobs.[22] Second, spending decisions would be put off by uncertainty about the UK's relation to the EU. Third, the above two effects would lead to rising financial market volatility, falling asset prices, and increasing borrowing rates for households and businesses. The worsening financial conditions would amplify the first two effects. All three channels would operate via shifting expectations by households and businesses and exert a negative influence on the UK economy.

Our empirical findings highlight that not all households reacted in the same way. Broadly speaking, and consistently with the channels discussed above, we find that the Brexit vote has led to more pessimistic beliefs about the macroeconomy and personal financial situation, and has reduced spending intentions and actual purchases for anti-Brexit voters. The opposite, however, is true for pro-Brexit voters. This channel, along with stimulative macroeconomic policies and strong external demand, may help to explain the relative resilience of the UK economy in the aftermath of the referendum. To conclude, while it's beyond the scope of our analysis to assess the general equilibrium effect of Brexit on the UK economy,[23] our results highlight how the potential macro impacts mask substantial heterogeneity at the micro-level. Future work should explore how the heterogeneous behaviours of households (driven by heterogeneous expectations) will dynamically impact the UK economy in the medium and long term.

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[21]Appendix B provides a detailed discussion of economic experts' views.

[22]Related to this channel, Kuang and Mitra (2016) develops a learning model which suggests an important role for shifting long-run growth expectations in business cycle fluctuations.

[23]Some preliminary assessments using synthetic control methods, for example, point to a significantly negative aggregate effect. See https://www.cer.eu/insights/cost-brexit-june-2022.

5   Conclusion

The Brexit vote was a watershed moment in modern European politics, and the referendum outcome came out as a large surprise. While the UK-EU relation remained the same in the aftermath of the vote and till the end of the Brexit transition period (31 December 2020), the impacts of the vote are far-reaching and have been unfolding. The paper sheds some light on the political polarization in households' economic beliefs and behaviour as a consequence of the Brexit vote. Using two nationally representative household surveys and administrative data, we find a strong political polarization in economic expectations and behaviour in the wake of the once-in-a-lifetime political event.

After the referendum, pro-Brexit voters became systematically more optimistic about the general economy and their personal economic situation, and more likely to spend on major items and general goods. The opposite occurred to anti-Brexit supporters. The vote had thus remarkably enlarged the divergence in economic expectations and spending intentions between pro- and anti-Brexit supporters. While Leavers tended to have a lower socioeconomic status, possess lower education, and be more likely employed in routine jobs compared to Remainers, we show that the divergence is not driven by the distinctive compositions of the two groups of voters. Our results suggest that Brexit identities strongly dominate in shaping economic expectations and spending intentions over socioeconomic characteristics.

We utilize administrative data of housing transactions and licensed automobile stocks at the local authority level to analyze the effects of the Brexit referendum on actual economic behaviour. We find that the vote shock widened the gap in per-capita housing transaction volumes and licensed automobile stocks across local authorities with varying levels of support for leaving the EU. Areas with a higher share of Remain voters experienced a relative decline in housing transactions and automobile stocks. By contrast, Leave areas experienced a relative positive surge, particularly pronounced in local authorities that had been suffering from long-term economic distress under globalization.

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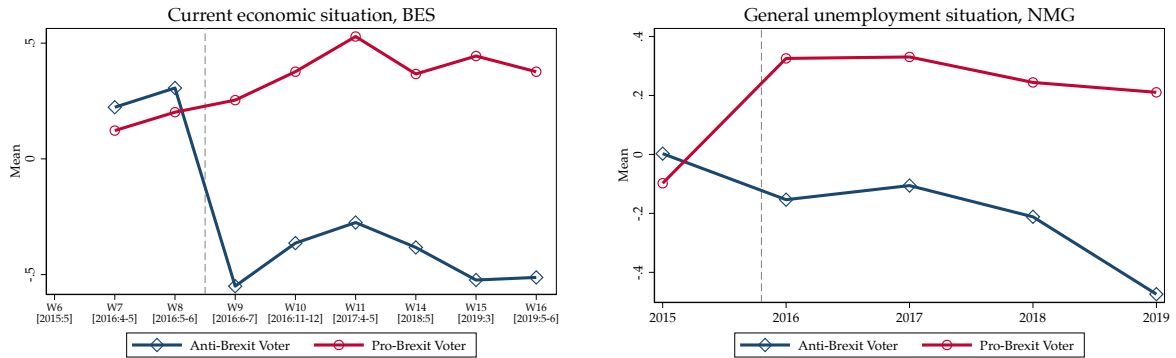
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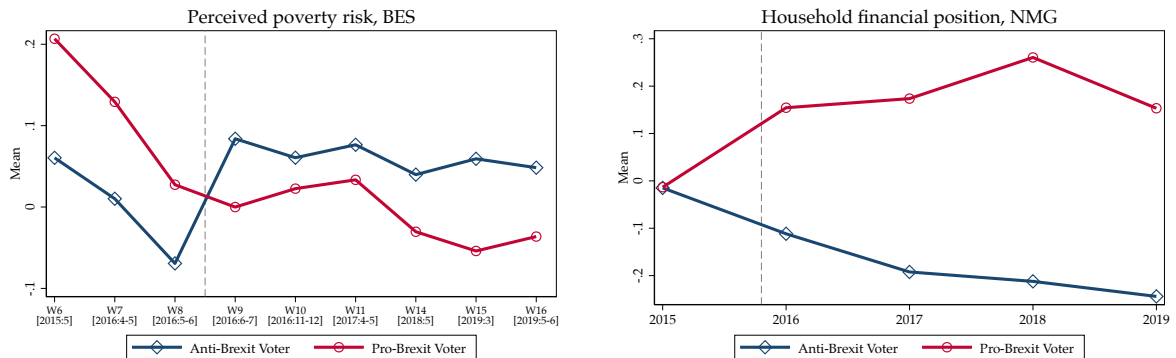
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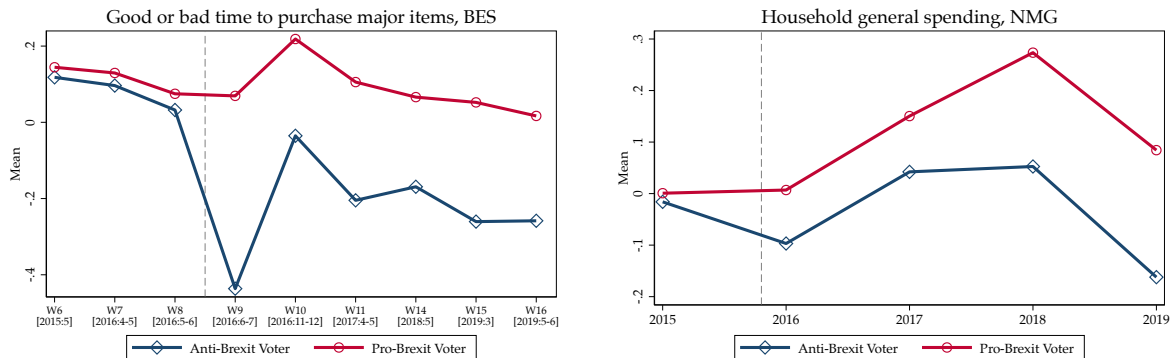
Panel A: Macro Expectations

Current economic situation, BES

General unemployment situation, NMG

Panel B: Micro Expectations

Perceived poverty risk, BES

Household financial position, NMG

Panel C: Spending Intentions

Good or bad time to purchase major items, BES

Household general spending, NMG

FIGURE 1: Economic Expectations and Spending Intentions across the Brexit Referendum

Notes: This figure presents the mean standardized economic expectations and spending intentions by Brexit identities across the Brexit referendum. Gray dashed lines mark the referendum date. Panel A shows macro expectations: beliefs about current economic situation and general unemployment situation; a higher value implies more optimism about the macro economy over the next 12 months. Panel B shows micro expectations: the perceived risk of getting into poverty and beliefs about household financial position; a higher value implies a higher perceived risk or more optimism about the household financial position over the next 12 months. Panel C shows spending intentions: judgement on whether it is currently a good or bad time to buy major items (e.g., furniture, kitchen appliances, and televisions) and intentions on household general spending; a higher value implies a stronger intention to buy major household items or to increase household general spending over the next 12 months.

Panel A: Current Economic Situation, BES
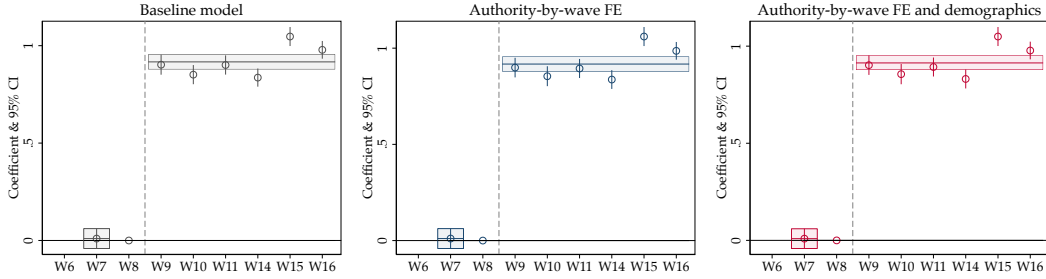
Panel B: General Unemployment Situation, NMG
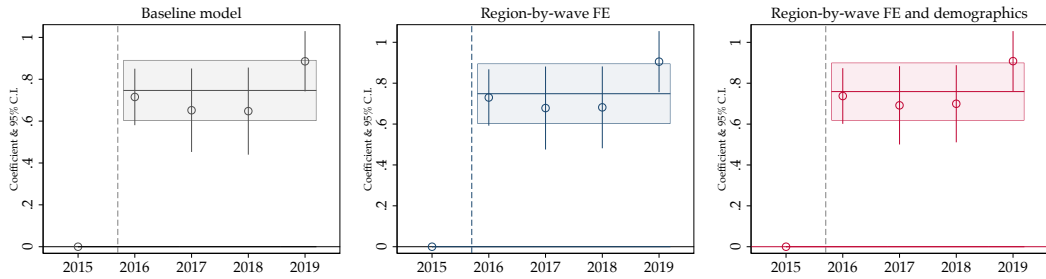
FIGURE 2: Divergence in Macro Economic Expectations across the Brexit Referendum
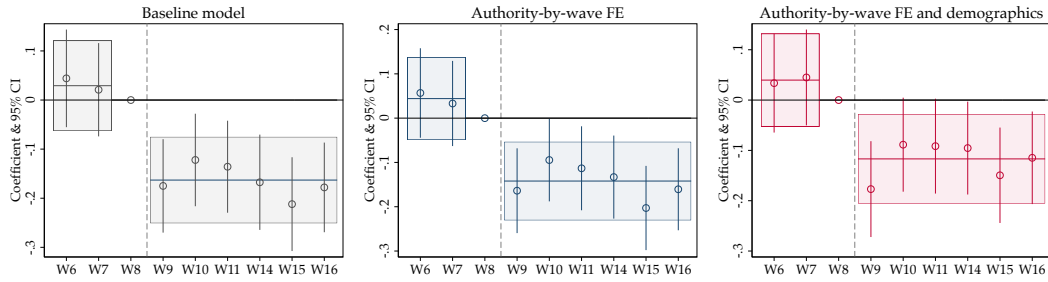
Notes: This figure presents the divergence between pro- and anti-Brexit voters in macro expectations. Panel A presents voters' expectations on whether the economy is getting better, worse, or staying about the same. Panel B presents voters' expectations on how the general unemployment situation will change over the next 12 months. A higher value with these two expectation variables implies more optimism about the economy. To construct the plots, we first estimate the flowing specifications with Wave 8 (in the BES) and Wave 2015 (in the NMG) as the references:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in belief divergence between pro- and anti-Brexit voters around the Brexit vote. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: Perceived Poverty Risk, BES
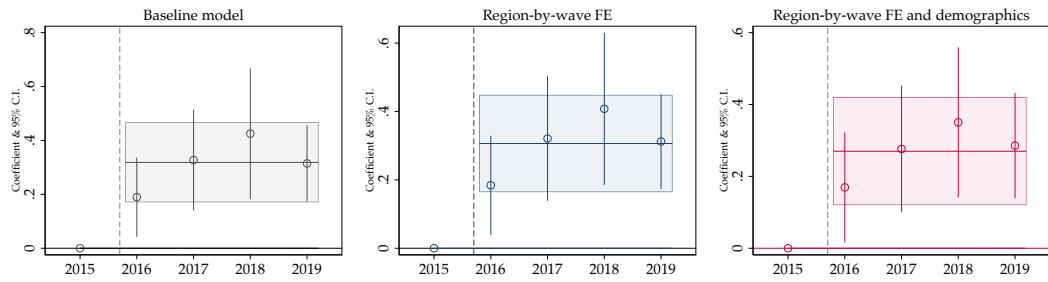
Panel B: Household Financial Position, NMG

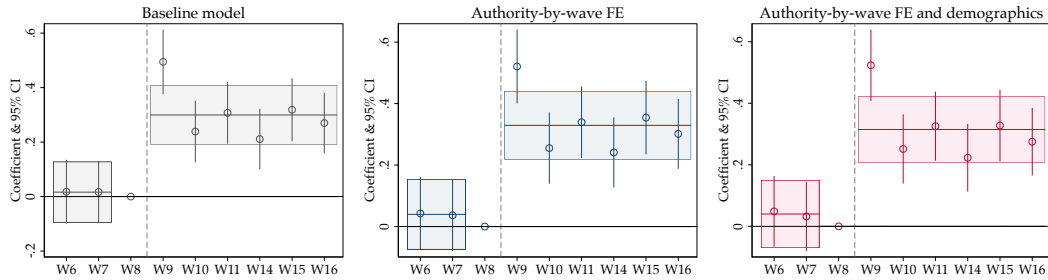**FIGURE 3: Divergence in Micro Economic Expectations across the Brexit Referendum**

Notes: This figure presents the divergence between pro-Brexit and anti-Brexit voters in micro expectations. Panel A presents voters' perceived risk of getting into poverty, i.e., lacking in enough money to cover day to day living costs. A higher value with this variable implies a higher risk. Panel B presents voters' expectations on how the household financial position will change over the next 12 months. A higher value with this variable implies getting better. To construct the plots, we first estimate the flowing specifications with Wave 8 (in the BES) and Wave 2015 (in the NMG) as the references:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in belief divergence between pro-Brexit and anti-Brexit voters around the Brexit referendum. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: Good or Bad Time to Purchase Major Items, BES

Panel B: Household General Spending, NMG
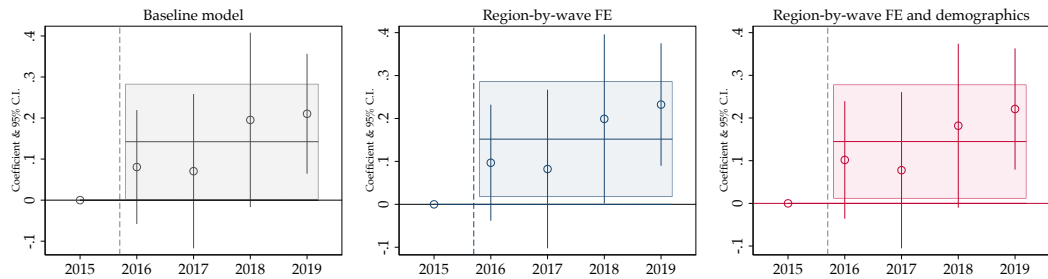
FIGURE 4: Divergence in Spending Intentions across the Brexit Referendum

Notes: This figure presents the divergence between pro- and anti-Brexit voters in spending intentions. Panel A presents voters' judgement on whether it is currently a good or bad time to purchase major items (e.g., furniture, kitchen appliances, and televisions). Panel B presents voters' intentions on household general spending over the next 12 months. A higher value with these two variables implies a stronger intention to buy major household items or to increase household general spending. To construct the plots, we first estimate the following specifications with Wave 8 (in the BES) and Wave 2015 (in the NMG) as the references:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in belief divergence between pro- and anti-Brexit voters around the Brexit vote. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: Current Economic Situation, BES
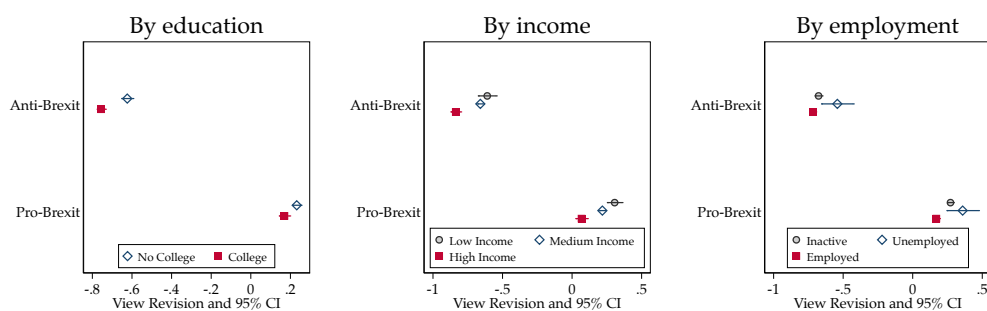
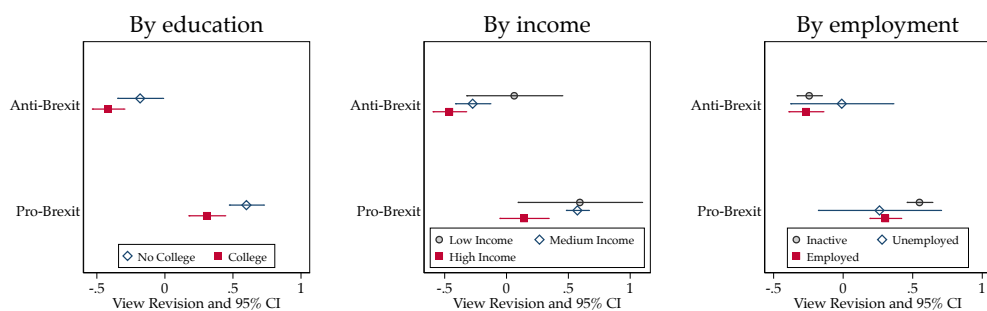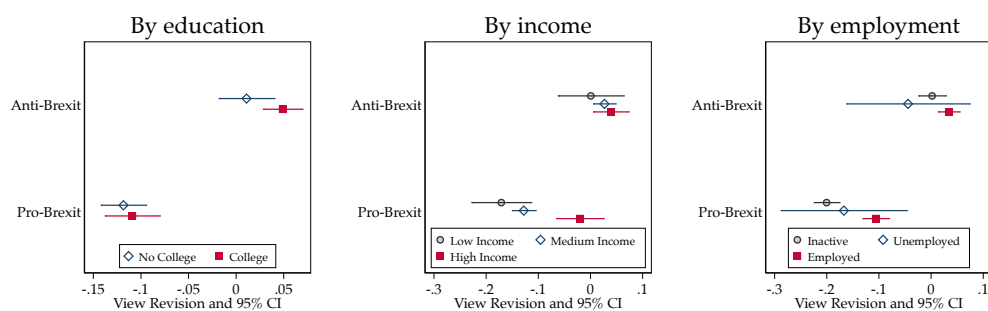Panel B: General Unemployment Situation, NMG

FIGURE 5: Macro Expectations: Brexit Identity vs. Socioeconomic Status

Notes: This figure presents revisions to macro expectations by different groups of voters. To construct this figure, we first stratify voters into various groups based on their Brexit identities and socioeconomic status (i.e., educational attainment, household gross income per year, and employment status). In left panels, 4 groups of voters are identified: (1) anti-Brexit voters without a college degree, (2) anti-Brexit voters with a college degree, (3) pro-Brexit voters without a college degree, (4) pro-Brexit voters with a college degree. In middle panels, 6 groups of voters are identified: (1) anti-Brexit voters in low-income households, (2) anti-Brexit voters in medium-income households, (3) anti-Brexit voters in high-income households, (4) pro-Brexit voters in low-income households, (5) pro-Brexit voters in medium-income households, (6) pro-Brexit voters in high-income households. For the definitions of the income ranges, see the notes in Appendix Table 1. In right panels, 6 groups of voters are identified: (1) anti-Brexit voters inactive in labor markets (e.g., the retired, students), (2) anti-Brexit voters who are unemployed, (3) anti-Brexit voters who are employed, (4) inactive pro-Brexit voters, (5) unemployed pro-Brexit voters, (6) employed pro-Brexit voters. Next, for each group, we estimate the following specification: $Y_{it}^{j} = \eta \times PostVote_{it} + \epsilon_{it}$, and plot the coefficient estimates of η with their 95% confidence intervals.

Panel A: Perceived Poverty Risk, BES

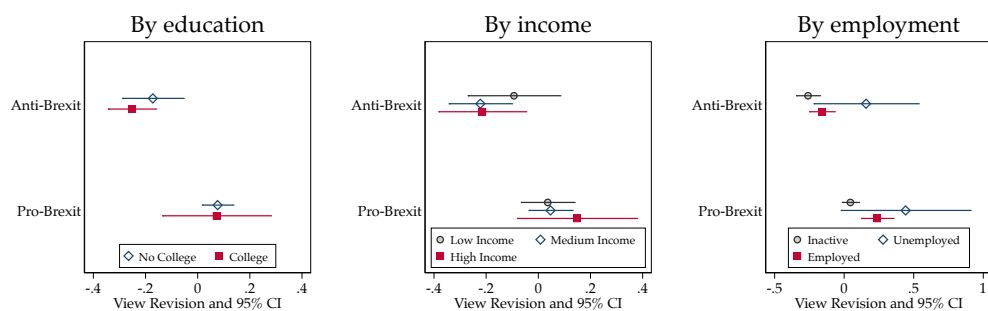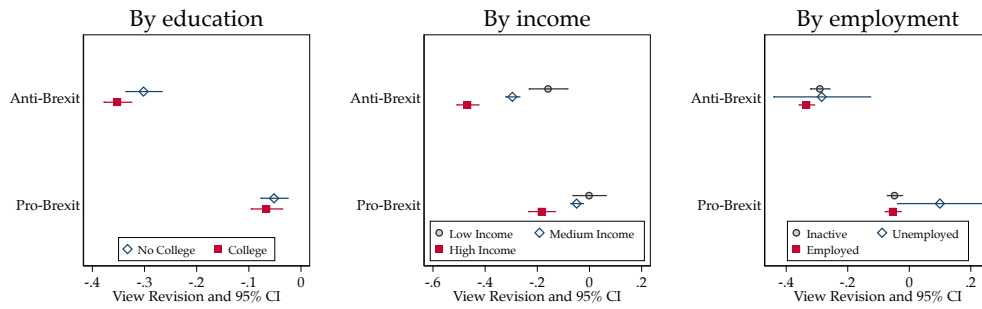Panel B: Household Financial Position, NMG

FIGURE 6: Micro Expectations: Brexit Identity vs. Socioeconomic Status

Notes: This figure presents revisions to micro expectations by different groups of voters. To construct this figure, we first stratify voters into various groups based on their Brexit identities and socioeconomic status (i.e., educational attainment, household gross income per year, and employment status). In left panels, four groups of voters are identified: (1) anti-Brexit voters without a college degree, (2) anti-Brexit voters with a college degree, (3) pro-Brexit voters without a college degree, (4) pro-Brexit voters with a college degree. In middle panels, six groups of voters are identified: (1) anti-Brexit voters in low-income households, (2) anti-Brexit voters in medium-income households, (3) anti-Brexit voters in high-income households, (4) pro-Brexit voters in low-income households, (5) pro-Brexit voters in medium-income households, (6) pro-Brexit voters in high-income households. For the definitions of the income ranges, see the notes in Appendix Table 1. In right panels, six groups of voters are identified: (1) anti-Brexit voters inactive in labor markets (e.g., the retired, students), (2) anti-Brexit voters who are unemployed, (3) anti-Brexit voters who are employed, (4) inactive pro-Brexit voters, (5) unemployed pro-Brexit voters, (6) employed pro-Brexit voters. Next, for each group, we estimate the following specification: $Y_{it}^{j} = \eta \times PostVote_{it} + \epsilon_{it}$, and plot the coefficient estimates of η with their 95% confidence intervals.

Panel A: Good or Bad Time to Purchase Major Items, BES

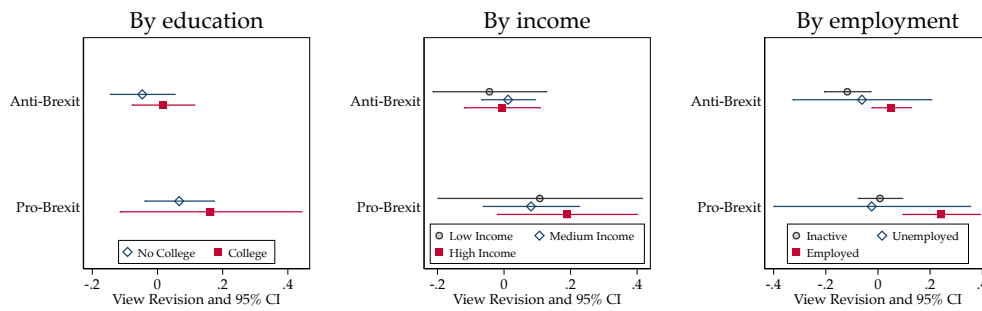## Panel B: Household General Spending, NMG

FIGURE 7: Spending Intentions: Brexit Identity vs. Socioeconomic Status

Notes: This figure presents revisions to spending intentions by different groups of voters. To construct this figure, we first stratify voters into various groups based on their Brexit identities and socioeconomic status (i.e., educational attainment, household gross income per year, and employment status). In left panels, four groups of voters are identified: (1) anti-Brexit voters without a college degree, (2) anti-Brexit voters with a college degree, (3) pro-Brexit voters without a college degree, (4) pro-Brexit voters with a college degree. In middle panels, six groups of voters are identified: (1) anti-Brexit voters in low-income households, (2) anti-Brexit voters in medium-income households, (3) anti-Brexit voters in high-income households, (4) pro-Brexit voters in low-income households, (5) pro-Brexit voters in medium-income households, (6) pro-Brexit voters in high-income households. For the definitions of the income ranges, see the notes in Appendix Table 1. In right panels, six groups of voters are identified: (1) anti-Brexit voters inactive in labor markets (e.g., the retired, students), (2) anti-Brexit voters who are unemployed, (3) anti-Brexit voters who are employed, (4) inactive pro-Brexit voters, (5) unemployed pro-Brexit voters, (6) employed pro-Brexit voters. Next, for each group, we estimate the following specification: $Y_{it}^{j} = \eta \times PostVote_{it} + \epsilon_{it}$, and plot the coefficient estimates of η with their 95% confidence intervals.

Panel A: Housing Transaction Volume
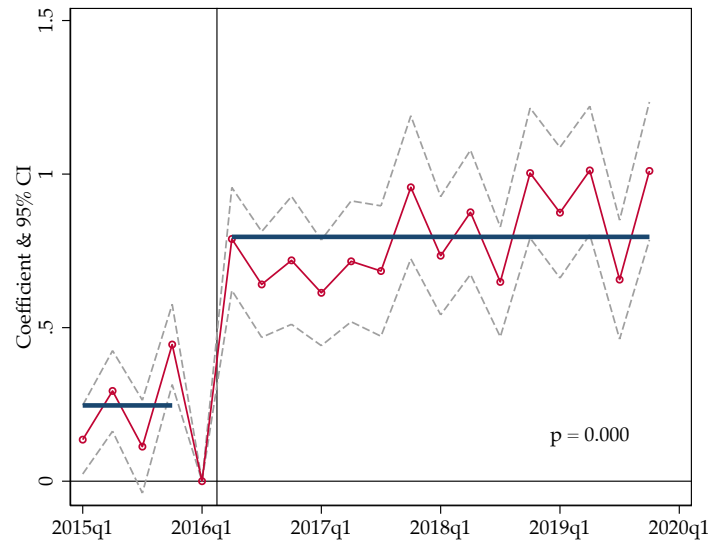
Panel B: Licensed Automobile Stock
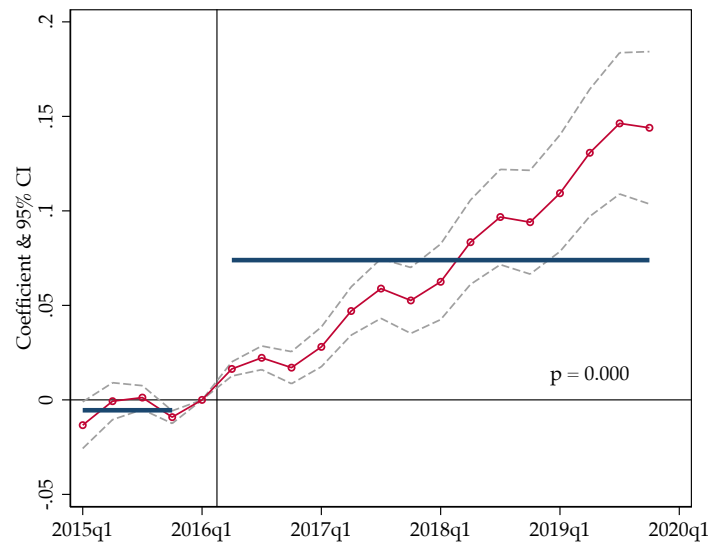
FIGURE 8: Housing Transaction Volume and Licensed Automobile Stock, 2015 – 2019

Notes: This figure presents the effects of the Brexit vote on housing transaction volume per capita (Panel A) and licensed automobile stock per capita (Panel B). The effects are estimated at the local authority level, for 313 local authorities in England and Wales. We plot the coefficient estimates of η_t as dots with their 95% confidence intervals indicated by the dashed lines from the following specification:

$$Ln(S_{at}) = \delta_t + \gamma_a + \sum_{t \neq 2016q1} \eta_t \times Quarter_t \times LeaveVoteShare_a + \epsilon_{at}.$$

To compare the average pre-vote "effects" to post-vote effects, we run the following specification and test the hypothesis that $\beta_1 = \beta_2$. Coefficient estimates of β_1 and β_2 are plotted as the blue horizontal lines. We report the p values underlying the tests.

$$Ln(S_{at}) = \delta_t + \gamma_a + \beta_1 \times PreVote_t \times LeaveVoteShare_a + \beta_2 \times PostVote_t \times LeaveVoteShare_a + \epsilon_{at}.$$

Panel A: Housing Transaction Volume
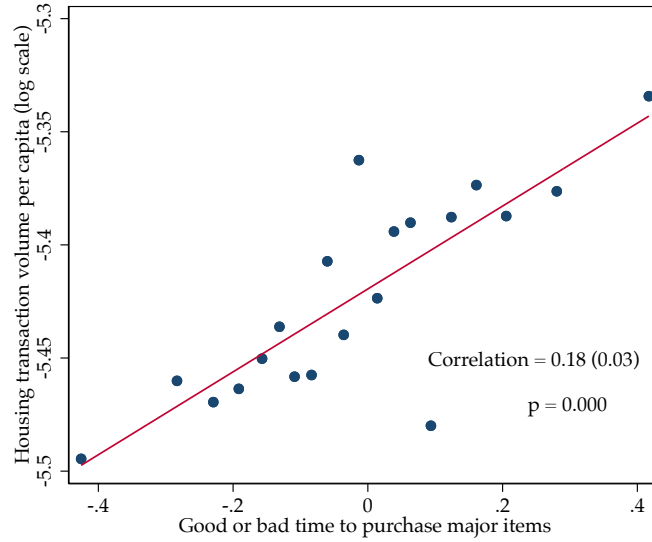
Panel B: Licensed Automobile Stock
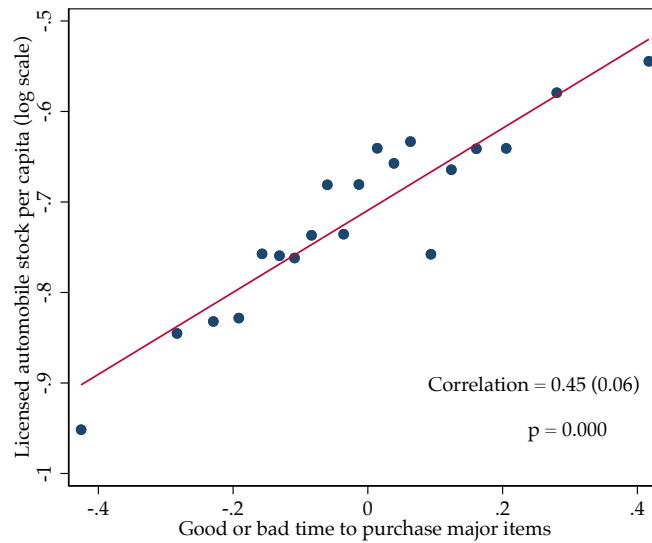
FIGURE 9: Correlation between Spending Intentions and Actual Economic Behavior

Notes: This figure presents binned scatter plots of housing transaction volume per capita and licensed automobile stock per capita (both in log scale) vs. households' judgement on whether it is currently a good or bad time to purchase major items. To construct this figure, we group LAU-quarter observations into twenty equally sized bins based on the spending intention measure. We then plot the mean log of housing transaction volume per capita (or mean log of licensed automobile stock per capita) vs. the mean spending intention within each bin. The correlation coefficients between the variables are estimated using the LAU-quarter data, with standard errors (in the parentheses) clustered at the LAU level. The corresponding p values are also reported.

TABLE 1: Demographic Compositions of Voters, BES and NMG

	Panel A: British Election Study Survey						Panel B: Filled and Pooled NMG Household Survey					
	All		Anti-Brexit	Pro-Brexit	Anti-Brexit vs. Pro-Brexit		All		Anti-Brexit	Pro-Brexit	Anti-Brexit vs. Pro-Brexit	
	Mean	Std.Dev.	Mean	Mean	Diff.	p-value	Mean	Std.Dev.	Mean	Mean	Diff.	p-value
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Male	0.498	0.500	0.485	0.511	0.025	0.000	0.516	0.500	0.468	0.568	0.099	0.000
Age	48.6	16.9	44.2	53.3	9.1	0.000	49.1	17.2	46.7	51.8	5.0	0.000
College	0.483	0.500	0.570	0.387	-0.183	0.000	0.454	0.498	0.530	0.373	-0.156	0.000
Low income	0.108	0.310	0.096	0.121	0.024	0.000	0.123	0.328	0.108	0.139	0.032	0.000
Middle income	0.698	0.459	0.661	0.739	0.077	0.000	0.629	0.483	0.626	0.633	0.007	0.298
High income	0.194	0.395	0.242	0.141	-0.102	0.000	0.248	0.432	0.266	0.227	-0.039	0.000
Employed	0.561	0.496	0.610	0.509	-0.101	0.000	0.588	0.492	0.616	0.558	-0.058	0.000
Unemployed	0.027	0.161	0.029	0.025	-0.004	0.000	0.026	0.159	0.030	0.022	-0.008	0.000
Inactive	0.412	0.492	0.362	0.467	0.105	0.000	0.386	0.487	0.354	0.421	0.066	0.000
Pro-Brexit	0.479	0.500	0	1	–	–	0.482	0.500	0	1	–	–

	Panel C: 2015 NMG Household Survey							
	All		Filled Sample					
			All Filled		Anti-Brexit	Pro-Brexit	Anti-Brexit vs. Pro-Brexit	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Mean	Diff.	p-value
Variables	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Male	0.488	0.500	0.605	0.489	0.558	0.648	0.091	0.000
Age	47.4	17.1	52.0	16.4	49.0	54.8	5.8	0.000
College	0.425	0.494	0.421	0.494	0.529	0.321	-0.209	0.000
Low income	0.118	0.322	0.119	0.324	0.108	0.130	0.022	0.291
Middle income	0.671	0.470	0.678	0.468	0.632	0.721	0.089	0.003
High income	0.212	0.408	0.203	0.402	0.260	0.149	-0.111	0.000
Employed	0.594	0.491	0.506	0.500	0.564	0.453	-0.112	0.000
Unemployed	0.022	0.146	0.021	0.144	0.027	0.016	-0.011	0.058
Inactive	0.384	0.486	0.473	0.499	0.409	0.532	0.123	0.000
Pro-Brexit	–	–	0.522	0.500	0	1	–	–

Notes: This table provides an overview of demographic compositions of voters in British Election Study (BES) and NMG Household Survey datasets (NMG). In the BES, we encode "< £10,000" as "low income", "£10,000–£50,000" as "middle income", ">=£50,000" as "high income"; in the NMG, we encode "< £11,500" as "low income", "£11,500–55,000" as "middle income", ">= £55,000" as "high income". Column (6), (12), and (20) present p-values of testing the null hypotheses that anti- and pro-Brexit voters have no different compositions regarding the particular demographics.

TABLE 2: Summary Statistics: Local Authority Level

| Variables | All | | | Remain | Leave | Remain vs. Leave | | Source |
| | Mean | Median | Std.Dev. | Mean | Mean | Diff. | p-value | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Housing transaction volume per capita 2015–19	0.005	0.005	0.001	0.004	0.005	0.001	0.000	Price Paid Data
Licensed automobile stock per capita 2015–19	0.507	0.513	0.128	0.428	0.544	0.116	0.000	DfT and DVLA
Share of Leave voters 2016	0.529	0.540	0.106	0.408	0.585	0.177	0.000	London Datastore
Unemployment rate 2015	0.057	0.054	0.022	0.055	0.057	0.002	0.527	Becker, Fetzer and Novy (2017)
Immigration rate 2011	0.136	0.092	0.120	0.235	0.090	-0.145	0.000	UK Census 2011
EU structural funds per capita 2013	45.1	16.0	80.4	35.9	49.4	13.4	0.262	Becker, Fetzer and Novy (2017)
Total fiscal cuts 2010–15	476.3	472.0	119.1	461.3	483.2	22.0	0.211	Becker, Fetzer and Novy (2017)
Manufacturing employment share 2011	0.090	0.091	0.040	0.055	0.106	0.052	0.000	UK Census 2011
Share of low-skill jobs 2011	0.367	0.368	0.066	0.320	0.389	0.069	0.000	UK Census 2011
Gross household disposable income 2015–19	20386	18978	6127	24359	18557	-5803	0.000	ONS
Share without qualification 2011	0.228	0.229	0.051	0.186	0.247	0.061	0.000	UK Census 2011
Deprivation rate 2011	0.579	0.585	0.064	0.570	0.583	0.014	0.188	UK Census 2011
Number of LAUs		313		79	234	–	–	–

Notes: This table reports summary statistics for the sample of 313 local authorities (LAUs) in England and Wales. Housing transaction volume per capita 2015–19 is the average per capita transaction volume completed each quarter over the period from 2015 to 2019. Licensed automobile stock per capita 2015–19 is the average per capita number of licensed private vehicles over the quarters in the period from 2015 to 2019. "DfT and DVLA" is abbreviation for Department for Transport and Driver and Vehicle Licensing Agency. Immigration rate is measured using the number of population born in non-UK countries divided by that of total population. Total fiscal cuts are originally compiled by Financial Times, capturing the financial loss per working adult in pounds sterling per year during 2010 to 2015. Low-skill jobs include (1) caring, leisure and other service occupations, (2) sales and customer service occupations, (3) process, plant and machine operatives, (4) elementary occupations. Gross household disposable income 2015–19 is annually average gross household disposable income over 2015 to 2019. Deprivation rate is measured by the share of households that meet one or more of the following conditions: (1) Employment: where any member of a household, who is not a full-time student, is either unemployed or long-term sick; (2) Education: no person in the household has at least Level 2 education, and no person aged 16 to 18 is a full-time student; (3) Health and disability: any person in the household has general health that is "bad" or "very bad" or has a long-term health problem; (4) Housing: the household's accommodation is either overcrowded, with an occupancy rating -1 or less, or is in a shared dwelling, or has no central heating. Column (6) presents differences in the regional characteristics between Leave and Remain LAUs, measured by regressing the characteristics on a Leave dummy indicating LAUs' shares of Leave voters are over 50%. Column (7) presents p-values for testing the null hypotheses of no differences between Leave and Remain LAUs.

TABLE 3: The Effects of the Brexit Vote on Per-Capita Housing Transaction Volume and Licensed Automobile Stock

	Baseline	Income	Time Trend				Two-Step Procedure		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Dependent variable: log of housing transaction volume per capita									
$PostVote_t \times LeaveVoteShare_a$	0.598***	0.592***	0.590***	0.316***	0.525***	0.577***			
	(0.064)	(0.064)	(0.065)	(0.070)	(0.061)	(0.069)			
$ln(income)_{at}$		-0.641***							
		(0.210)							
$PostVote_t \times \xi_a$							0.591***	0.139*	0.282***
							(0.069)	(0.078)	(0.083)
Mean of DV	-5.42	-5.42	-5.42	-5.42	-5.43	-5.42	-5.42	-5.42	-5.42
Number of clusters	313	313	313	313	306	313	–	–	–
Observations	6260	6260	6260	6260	6120	6260	6260	6260	6260
Panel B: Dependent variable: log of licensed automobile stock per capita									
$PostVote_t \times LeaveVoteShare_a$	0.078***	0.078***	0.076***	0.027**	0.071***	0.075***			
	(0.013)	(0.013)	(0.013)	(0.012)	(0.014)	(0.013)			
$ln(income)_{at}$		-0.077							
		(0.049)							
$PostVote_t \times \xi_a$							0.076***	0.039***	0.021*
							(0.013)	(0.015)	(0.012)
Mean of DV	-.717	-.717	-.717	-.717	-.72	-.717	-.717	-.717	-.717
Number of clusters	313	313	313	313	306	313	–	–	–
Observations	6260	6260	6260	6260	6120	6260	6260	6260	6260
Control									
LAU FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time trend × Unemployment rate 2015			✓						
Time trend × Immigration rate 2011				✓					
Time trend × ln(EU structural funds per capita 2013)					✓				
Time trend × ln(Total fiscal cuts 2010–15)						✓			
Root of Euroscepticism									
Economic shocks							✓		
Industry and occupation structures								✓	
Demographic compositions									✓

Notes: Column (1) – (6) report coefficient estimates from an OLS regression with controlling for local authority (LAU) fixed effects and time fixed effects. Column (2) further controls for annual gross household disposable income (log). Column (3) – (6) successively control for time trends interacting with pre-vote local unemployment rates, immigration rates, EU structural fund transfers (log), and total fiscal cuts over the period from 2010 to 2015 (log). In Column (7) – (9), we apply a two-step procedure. We first regress the share of Leave voters on a set of variables measuring economic shocks, industry and occupation structures, and demographic compositions. Economic shock variables include unemployment rate 2015, immigration rate 2011, EU structural funds 2013 (log), and total fiscal cuts 2010–15 (log). Industry and occupation structure variables include manufacturing employment shares and shares of low-skill jobs. Demographic composition variables include gross household disposable income (log), shares of residents without qualification, and deprivation rates. See the notes in Table 2 for detailed explanations of the variables. We then store the residuals and regress the outcome variables of interest on the residuals interacting with a dummy indicating post-Brexit period. We report standard errors clustered at the LAU level in Column (1) – (6). Since the two-step procedure hings on generated variables, we report bootstrap standard errors in Column (7) – (9). *: Significant at 10%; **: 5%; ***: 1%.

Online Appendix

A   Attitudes towards Brexit over Time

In this section, we document respondents' attitudes towards Brexit over time. In Appendix Table A.1, we limit respondents to those who participated in the NMG for any two particular years from 2016 to 2019, and present the percentages of respondents who expressed unchanged or changed attitudes towards Brexit. Specifically, we calculate the shares of four types of voters: (1) voters expressing pro-Brexit attitudes in both years, (2) voters expressing anti-Brexit attitudes in both years, (3) voters expressing pro-Brexit attitudes in the former year but changing to anti-Brexit attitudes in the latter year, (4) voters expressing anti-Brexit attitudes in the former year but changing to pro-Brexit attitudes in the latter year. Hence, the voters who changed (or did not change) attitudes are the latter (or the first) two types.

The results suggest that respondents' attitudes remained relatively stable over time during the post-referendum period up to 2019. For instance, the respondents who held pro-Brexit (or anti-Brexit) attitudes both in 2016 and 2017 accounted for 51.7% (or 40.9%) of all the four types of voters, while the respondents who held pro-Brexit attitudes in 2016 but changed to anti-Brexit in 2017 accounted for 3.7%, the same as those who held anti-Brexit attitudes in 2016 but changed to pro-Brexit in 2017. In other words, the percentage of respondents who did not change attitudes between 2016 and 2017 is 92.6%. Although the percentage of respondents with unchanged attitudes slightly decreased over time, it still reached 83.4% between 2016 and 2019. Appendix Table A.2 provides another examination using the BES which makes it possible to compare the waves before the vote and the waves afterwards. It suggests that the percentages of respondents with unchanged attitudes between a wave before the vote and another afterwards all exceeded 80%. Therefore, the concern associated with changing attitudes is mitigated as long as the attitudes of the traced respondents did not change remarkably over time.

TABLE A.1: (Un)Changed Brexit Identities, NMG

		2016		2017		2018	
		Pro-Brexit	Anti-Brexit	Pro-Brexit	Anti-Brexit	Pro-Brexit	Anti-Brexit
2017	Pro-Brexit	51.7%	3.7%				
	Anti-Brexit	3.7%	40.9%				
2018	Pro-Brexit	42.6%	4.4%	42.6%	2.8%		
	Anti-Brexit	9.4%	43.5%	7.5%	47.1%		
2019	Pro-Brexit	39.5%	3.3%	37.2%	2.3%	36.7%	5.1%
	Anti-Brexit	13.3%	43.9%	12.7%	47.8%	7.7%	50.5%

Notes: This table reports the percentages of voters who expressed unchanged/changed attitudes towards Brexit between any two particular years from 2016 to 2019. Percentages of voters who did not change attitudes between two particular years are shaded as color gray. To calculate these percentages, we first limit respondents to those who were traced in two particular waves of the NMG. We then calculate the shares of four types of voters: (1) voters responding pro-Brexit attitudes in both years, (2) voters responding anti-Brexit attitudes in both years, (3) voters responding pro-Brexit attitudes in the former year but changing to anti-Brexit attitudes in the latter year, (4) voters responding anti-Brexit attitudes in the former year but changing to pro-Brexit attitudes in the latter year. Hence, the voters who did not change attitudes are the first two types.

TABLE A.2: Unchanged Brexit Identities, BES

	W6	W7	W8	W9	W10	W11	W14	W15
W7	88.4%							
W8	87.4%	95.3%						
W9	86.7%	92.5%	94.6%					
W10	85.9%	90.8%	92.1%	95.2%				
W11	85.6%	90.6%	92.0%	94.4%	96.9%			
W14	85.1%	89.5%	90.6%	93.0%	95.9%	96.5%		
W15	83.9%	87.9%	88.8%	91.0%	93.9%	94.6%	96.1%	
W16	83.7%	88.4%	89.4%	91.1%	94.0%	94.8%	96.1%	97.5%

Notes: This table reports the percentages of voters who did not change vote intentions towards Brexit between any two particular waves in the BES. Percentages of voters who did not change vote intentions between a wave before the Brexit vote and another after the vote are shaded as color gray. To calculate these percentages, we first limit respondents to those who were traced in two particular waves of the BES. We then calculate the shares of four types of voters: (1) voters responding pro-Brexit attitudes in both years, (2) voters responding anti-Brexit attitudes in both years, (3) voters responding pro-Brexit attitudes in the former year but changing to anti-Brexit attitudes in the latter year, (4) voters responding anti-Brexit attitudes in the former year but changing to pro-Brexit attitudes in the latter year. Hence, the voters who did not change attitudes are the first two types. And the percentages presented are the total shares of the first two types of voters.

B Experts' Views on Economic Consequences of the Brexit Vote

On June 7, 2016, the Centre for Macroeconomics (CFM) survey asked a panel of economists about the consequences of Brexit on the British economy, financial sector and asset prices. For example, in the question, "what do you think will be the overall economic consequences of Brexit for the UK?", 48% of the participants answered "significantly negative", 44% "mildly negative" and 9% "neutral". Nobody thought that the overall consequences of a Leave outcome would be beneficial for the UK economy. Another question asks "what is the probability that the UK experiences such a significant disruption to financial markets and asset prices following a vote for Brexit on 23 June?". The panel members were extremely worried about the consequences of a Brexit vote for financial markets. 26% thought that the chance was higher than 70%, 29% thought this probability was between 31% and 70%, 24% thought it was between 11% and 30%, and 18% thought that it was less than 10%.

TABLE B.1: UK Quarter-on-Quarter GDP Growth (%): Forecast

	16 Q3	16 Q4	17 Q1	17 Q2	17 Q3	17 Q4	18 Q1	18 Q2
Treasury (scenario 1)	-0.1	-0.1	-0.1	-0.1	0.2	0.2	0.2	0.2
Treasury (scenario 2)	-1.0	-0.4	-0.4	-0.4	0.0	0.0	0.1	0.1

Notes: This table reports forecasts of real GDP growth rate for the UK made by HM Treasury conditional on the assumption of a vote to leave the EU published in a government study (HM Treasury, 2016a). Two scenarios are analyzed: a "shock scenario" (scenario 1) and a more pessimistic "severe shock scenario" (scenario 2). The exact explanations of the two scenarios can be seen from HM Treasury (2016a).

Public and private economic institutions shared a similar pessimistic view. Table B.1 displays forecasts of real GDP growth rate for the UK made by HM Treasury conditional on the assumption of a vote to leave the EU published in a government study (HM Treasury, 2016a). Two scenarios are analyzed: a "shock scenario" (scenario 1) and a more pessimistic "severe shock scenario" (scenario 2).[24] Under both scenarios, HM Treasury predicted that a vote to leave would immediately push the UK economy into recession with four quarters of negative growth. In May 2016, Mark Carney, the then-governor of Bank of England, described the Brexit vote as "the most immediate and significant risk" for the UK's economic outlook and warned that a Leave vote "could possibly include a technical recession" (Guardian, 2017). The published minutes of the Monetary Policy Committee meeting in May 2016 warned a leave vote could increase unemployment and prompt households and businesses to delay spending (MPC, 2016). Christine Lagarde, the managing director of the IMF noted that she shares the

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[24]The exact explanations of the two scenarios can be seen from HM Treasury (2016a).

Bank of England's view that a leave vote "could lead to a recession" (IMF, 2016). Table B.2 reports the forecasts of the immediate effect on the level of GDP conditional on the assumption of a Brexit vote made by a number of financial institutions shortly before the Brexit referendum. The forecasts are reproduced from Box 3.D of HM Treasury (2016b) and the sources of the forecasts are provided there.

TABLE B.2: Forecasts of the Immediate Effect of a Brexit Vote on Level of GDP (%)
(Relative to Remaining in the EU)

PwC/CBI	-3.1 to -5.5 (over 5 years)
Citi	-4.0 (over 3 years)
Credit Suisse	-1.0 to -2.0 (over 2 years)
Deutsche Bank	-3.0 (over 3 years)
HSBC	-1.0 to -1.5 (over 1 year)
JP Morgan	-1.0 (over 1 year)
Morgan Stanley	-1.5 to -2.5 (over 2 years)
Normura	-4.0 (over 1 year)
Societe Generale	-4.0 to -8.0 (over 5 years)

## C   The Brexit Vote Came Out as A Large Surprise

Voters (in aggregate) revised significantly their economic expectations and spending intentions after the Brexit vote, probably because the vote outcome came out as a large surprise. Here we examine the likelihood that the voters believed the UK would vote to leave the EU. We obtain a variable in Wave 7 and 8 in the BES which asked respondents to express their perceived likelihood of the UK voting to leave. The scale of this variable ranges from 0 to 100. The value of "100" implies completely believing that the UK would leave. Figure C.1 depicts the distribution of the perceived likelihood by Brexit identities and waves. The distributions are broadly normal but higher proportions of anti-Brexit voters on the left side and higher proportions of pro-Brexit voters on the right side. The mean likelihood for anti-Brexit voters is around 40%, and 59% for pro-Brexit voters. There were very few anti-Brexit voters completely believing the UK would leave. A small proportion of pro-Brexit voters, around 6%, completely believed a Leave outcome, while the corresponding number for remain voters is close to 0. Thus, the distributions indicate that a Leave vote outcome was to a large extent a surprise for most voters.
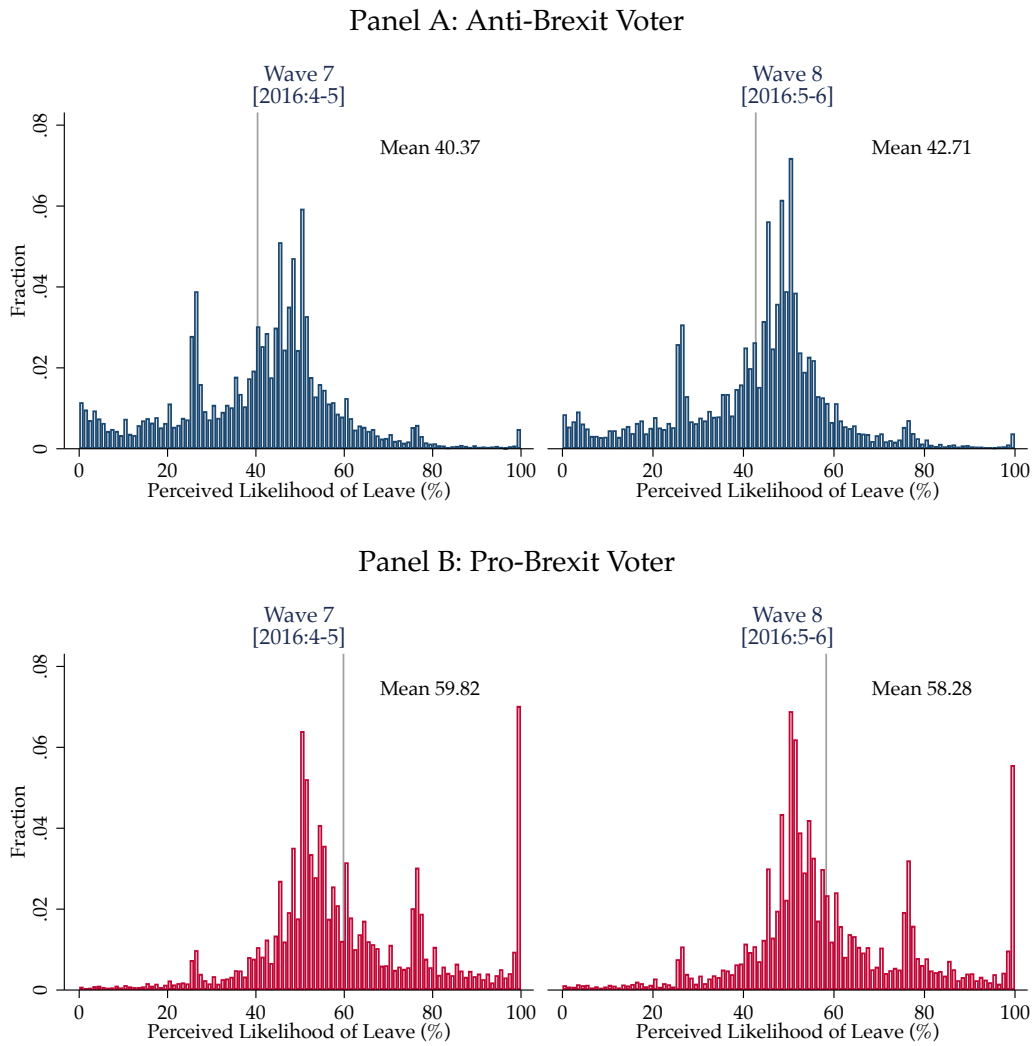
FIGURE C.1: Perceived Likelihood of A "Leave" Outcome

Notes: This figure presents the distributions of perceived likelihood of a "Leave" outcome in the EU referendum for anti-Brexit (Panel A) and pro-Brexit voters (Panel B). To construct this figure, we employ a variable available in Wave 7 and 8 of the BES that asked respondents' perceived likelihood that the UK would finally vote to leave the EU in the referendum. This variable measures the perceived likelihood with a scale ranging from 0 to 100. The value of "100" implies completely believing that the UK would leave.

D Additional Figures and Tables
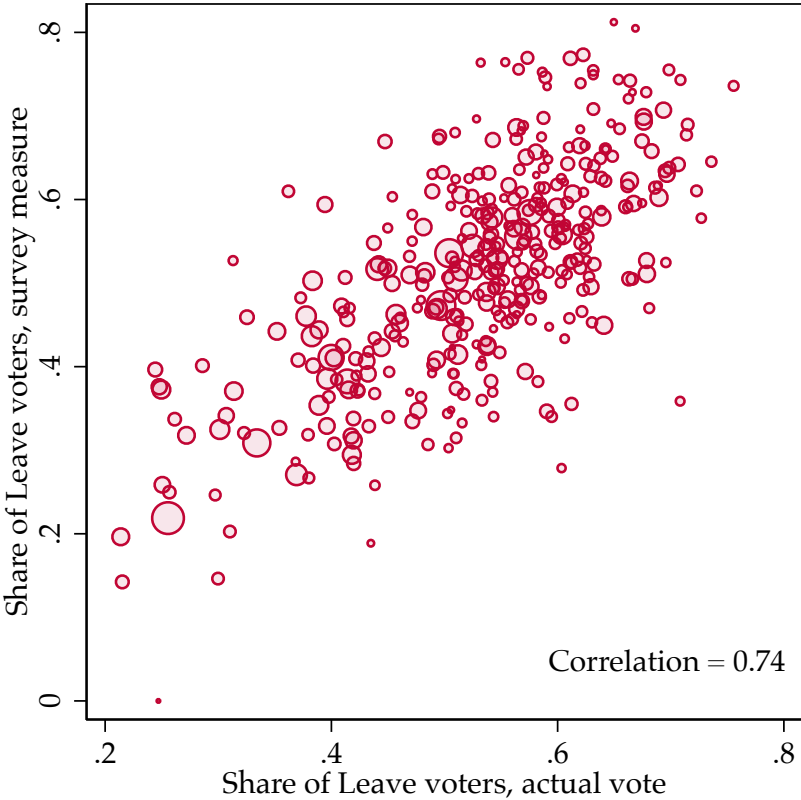
FIGURE D.1: Leave Voter Shares: Survey Measure vs. Actual Vote

Notes: This figure compares survey-based Leave voter shares to the actual ones for 380 local authorities. Each bubble denotes a local authority. The actual Leave voter shares are obtained from London Datastore, an open data-sharing portal administered by Greater London Authority. To measure the survey-based shares, we use Wave 9 of the BES that asked respondents' actual vote choices to calculate the shares of whom voted Leave in the EU referendum. Bubble sizes are proportional to numbers of survey respondents in the corresponding local authority. The correlation coefficient between survey-based and actual shares is weighted by the numbers of survey respondents.

Panel A: General Economic Situation, NMG
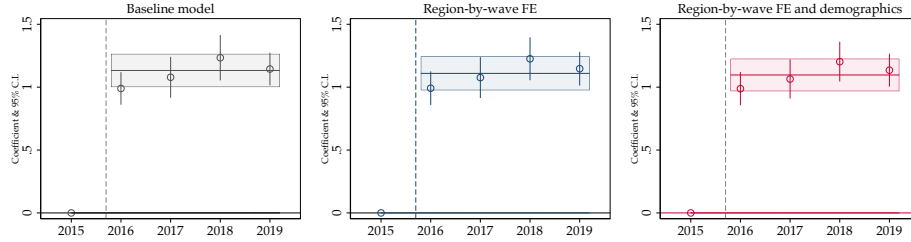
Panel B: Personal Unemployment Risk, BES
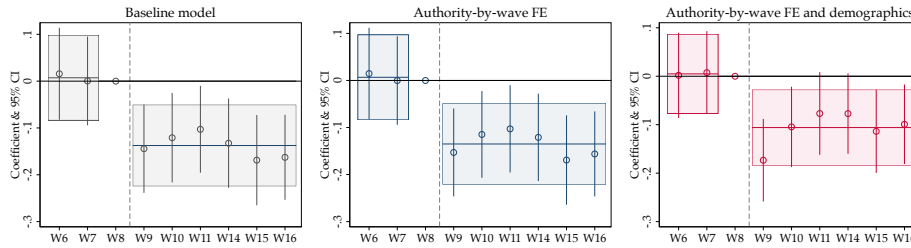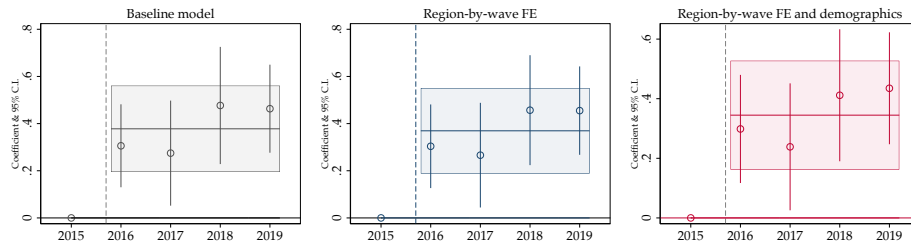

Panel C: Major Purchase Change, NMG

**FIGURE D.2: Additional Examinations on Economic Expectations and Spending Intentions**

Notes: This figure presents the divergence between pro- and anti-Brexit voters in additional variables on macro (Panel A) and micro (Panel B) expectations and spending intentions (Panel C). To construct the plots, we first estimate the following specifications:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in belief divergence between pro- and anti-Brexit voters around the Brexit vote. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: Cost of Living, BES
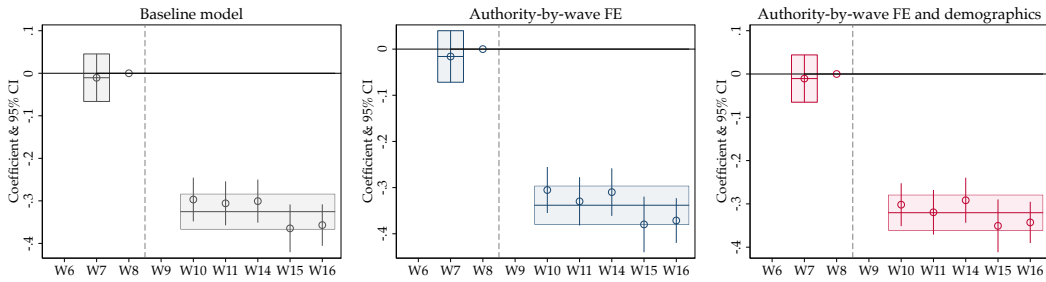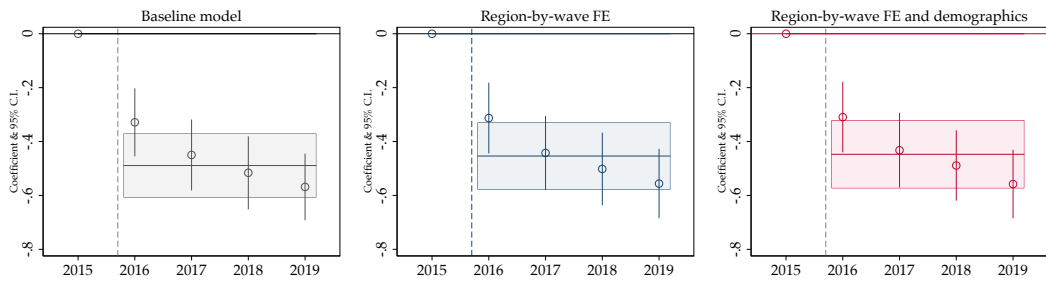
Panel B: General Shop Prices, NMG

**FIGURE D.3: Beliefs on the Cost of Living and General Shop Prices**

Notes: This figure presents the belief divergence between pro- and anti-Brexit voters on the cost of living (Panel A) and general shop prices (Panel B). To construct the plots, we first estimate the following specifications:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$

$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in belief divergence between pro- and anti-Brexit voters around the Brexit referendum. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: General Economic Situation, NMG
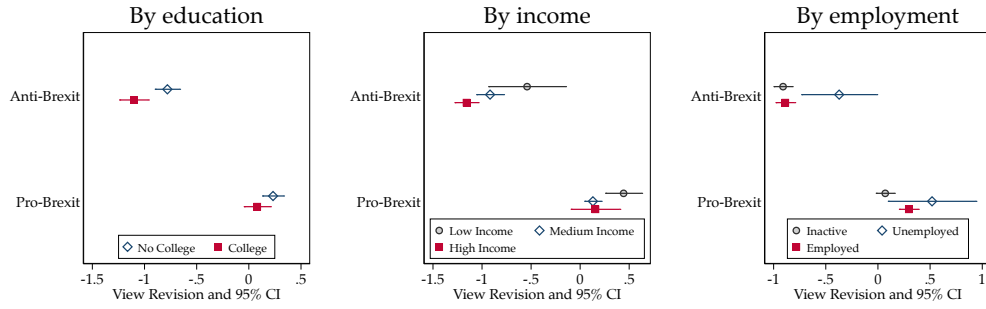
Panel B: Personal Unemployment Risk, BES
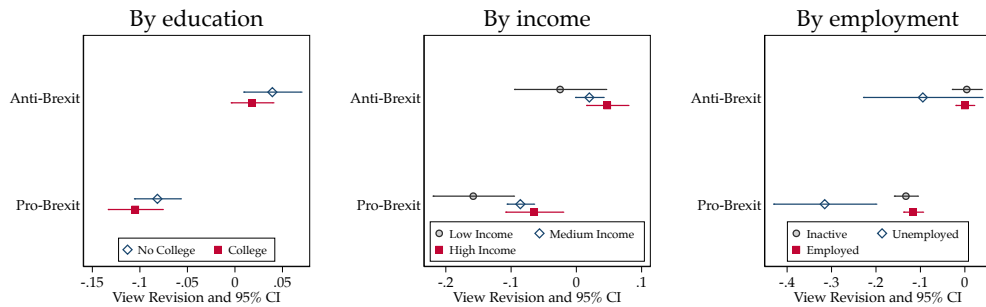
Panel C: Major Purchase Change, NMG
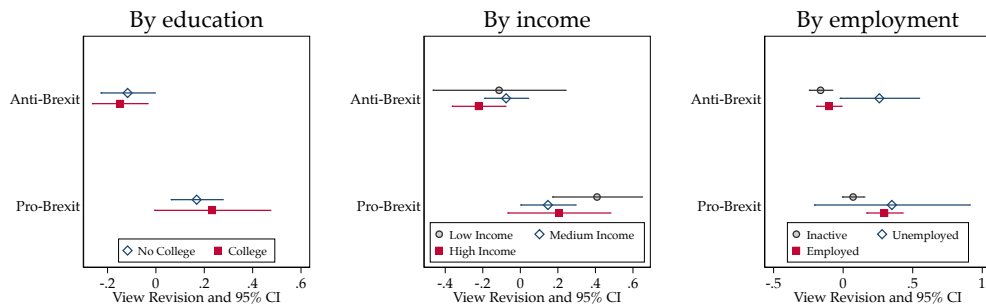
FIGURE D.4: Additional Examinations: Brexit Identity vs. Socioeconomic Status

Notes: This figure presents revisions to voters' views by examining additional variables on economic expectations and spending intentions. Panel A presents the results with expectations on the general economic situation as the dependent variable. Panel B presents the results with the perceived risk of losing jobs as the dependent variable. Panel C presents the results with spending intentions on major purchases as the dependent variable. To construct this figure, we first stratify voters into various groups based on their Brexit identities and socioeconomic status (i.e., educational attainment, household gross income per year, and employment status). In left panels, four groups of voters are identified: (1) anti-Brexit voters without a college degree, (2) anti-Brexit voters with a college degree, (3) pro-Brexit voters without a college degree, (4) pro-Brexit voters with a college degree. In middle panels, six groups of voters are identified: (1) anti-Brexit voters in low-income households, (2) anti-Brexit voters in medium-income households, (3) anti-Brexit voters in high-income households, (4) pro-Brexit voters in low-income households, (5) pro-Brexit voters in medium-income households, (6) pro-Brexit voters in high-income households. For the definitions of the income ranges, see the notes in Table 1. In right panels, six groups of voters are identified: (1) anti-Brexit voters inactive in labor markets (e.g., the retired, students), (2) anti-Brexit voters who are unemployed, (3) anti-Brexit voters who are employed, (4) inactive pro-Brexit voters, (5) unemployed pro-Brexit voters, (6) employed pro-Brexit voters. Next, for each group, we estimate the following specification: $Y_{it}^j = \eta \times PostVote_{it} + \epsilon_{it}$, and plot the coefficient estimates of η with their 95% confidence intervals.

FIGURE D.5: Divergence in the Share of Households Expecting Income to Increase

Notes: This figure presents the divergence between pro- and anti-Brexit voters in the share of households expecting income to increase over the next 12 months. To construct the plots, we first estimate the following specifications:

$$Y_{it}^{j} = ProBrexit_{it} + \sum Period_t + \sum \beta_t \times Period_t \times ProBrexit_{it} + \epsilon_{it},$$
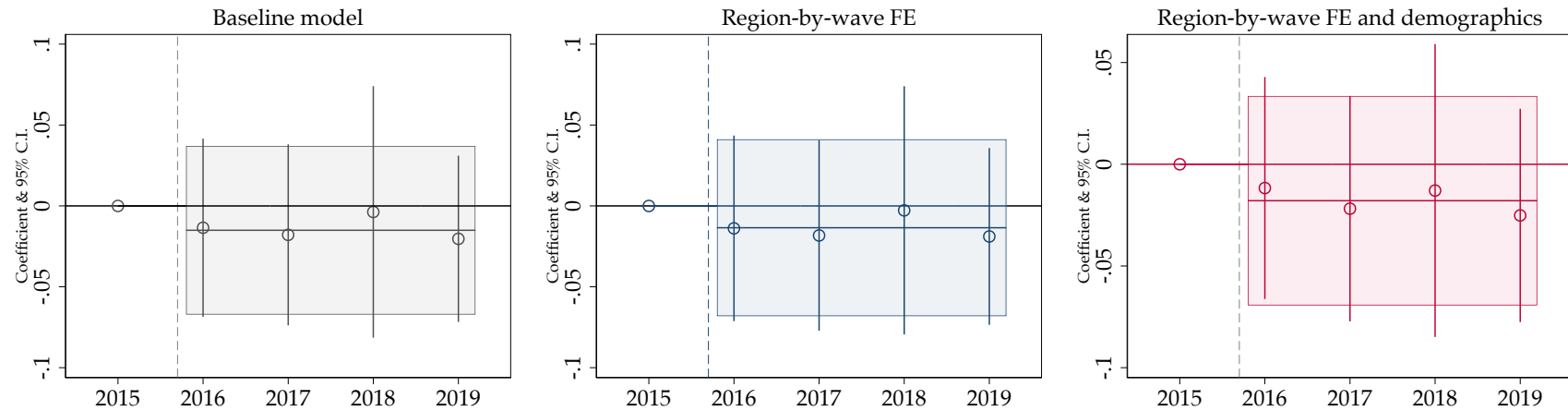
$$Y_{it}^{j} = ProBrexit_{it} + \sum Wave_t + \sum \rho_t \times Wave_t \times ProBrexit_{it} + \epsilon_{it}.$$

The coefficient estimates of β_t are plotted as horizontal lines, and their 95% confidence intervals are indicated as boxes. The coefficient estimates of ρ_t are plotted as dots with their 95% confidence intervals indicated with vertical lines. The coefficients plotted can be interpreted as the relative change in the divergence between pro- and anti-Brexit voters around the Brexit vote. In baseline models, we do not control for voters' demographics and local authority/region by wave fixed effects. Then we successively include them.

Panel A: Housing Transaction Volume

p = 0.000

Panel B: Licensed Automobile Stock

p = 0.000
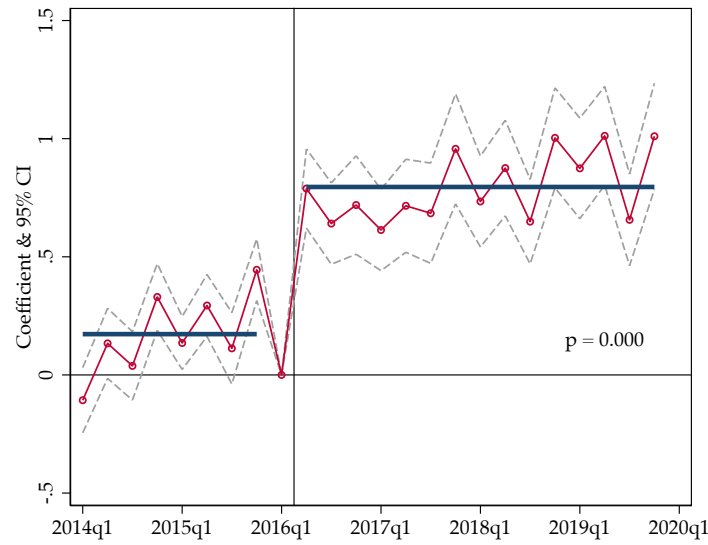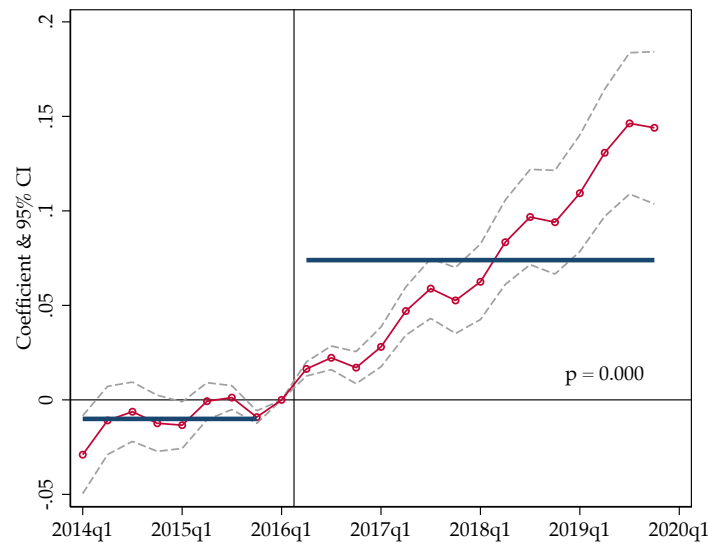
FIGURE D.6: Housing Transaction Volume and Licensed Automobile Stock, 2014 – 2019

Notes: This figure presents the effects of the Brexit vote on housing transaction volume per capita (Panel A) and licensed automobile stock per capita (Panel B). The effects are estimated at the local authority level, for 313 local authorities in England and Wales. We plot the coefficient estimates of η_t as dots with their 95% confidence intervals indicated by the dashed lines from the following specification:

$$Ln(S_{at}) = \delta_t + \gamma_a + \sum_{t \neq 2016q1} \eta_t \times Quarter_t \times LeaveVoteShare_a + \epsilon_{at}.$$

To compare the average pre-vote effects to post-vote effects, we run the following specification and test the hypothesis that $\beta_1 = \beta_2$. Coefficient estimates of β_1 and β_2 are plotted as the blue horizontal lines. We report the p values underlying the tests.

$$Ln(S_{at}) = \delta_t + \gamma_a + \beta_1 \times PreVote_t \times LeaveVoteShare_a + \beta_2 \times PostVote_t \times LeaveVoteShare_a + \epsilon_{at}.$$

A.12

Panel A: Housing Transaction Volume

Panel B: Licensed Automobile Stock

FIGURE D.7: Spending Intentions and Actual Economic Behavior across the Brexit Referendum

Notes: This figure presents binned scatter plots of housing transaction volume per capita and licensed automobiles stock per capita (both in log scale) vs. households' judgement on whether it is currently a good or bad time to purchase major items, stratified by before and after the Brexit vote. To construct this figure, we first divide the observations into pre-vote and post-vote groups. In each of the two groups, we then group LAU-quarter observations into twenty equally sized bins based on the spending intention measure. We subsequently plot the mean log of housing transaction volume per capita (or mean log of licensed automobile stock per capita) vs. the mean spending intention within each bin. The correlation coefficients between the variables are estimated using the LAU-quarter data, with standard errors (in the parentheses) clustered at the LAU level. The corresponding p values are also reported.

TABLE D.1: Conducted Timeline and Sample Sizes of the BES and NMG

Wave	Survey Period	Sample Size
Panel A: The BES		
W6	8th May 2015 – 26th May 2015	30,027
W7	14th April 2016 – 4th May 2016	30,895
W8	6th May 2016 – 22nd June 2016	33,502
W9	24th June 2016 – 4th July 2016	30,036
W10	24th November 2016 – 12th December 2016	30,319
W11	24th April 2017 – 3rd May 2017	31,014
W14	4th May 2018 – 21st May 2018	31,063
W15	11th March 2019 – 29th March 2019	30,842
W16	24th May 2019 – 18th June 2019	37,959
Panel B: The NMG		
W2015	2–22 September 2015	6,007
W2016	31 August–19 September 2016	6,011
W2017	6–26 September 2017	6,018
W2018	5–26 September 2018	6,000
W2019	4-24 September 2019	6,051

Notes: This table reports the conducted timeline and sample sizes of the BES and NMG utilized in the paper. Wave 8 (W8) of the BES was conducted immediately before the Brexit vote taking place on 23rd June 2016, followed by Wave 9 (W9) just afterwards.

Panel A: Brexit Identities

[A.1] Variable: **euRefVote**

Question 1	If there was a referendum on Britain's membership of the European Union, how do you think you would vote? (W6)
Question 2	If you do vote in the referendum on Britain's membership of the European Union, how do you think you will vote? (W7, W8)
Question 3	Which way did you vote in the EU referendum? (W9)
Question 4	If there was another referendum on EU membership, how do you think you would vote? (W10, W11, W14, W15, W16)
Answer	0=Remain in the EU, 1=Leave the EU
Wave	W6, W7, W8, W9, W10, W11, W14, W15, W16
Source	BES

[A.2] Variable: **Brexit**

Question	Taking everything into account, how do you currently view the UK leaving the EU (European Union) – which has become known as 'Brexit'?
Answer	1=Very positive about it, 2=Somewhat positive, 3=No opinion, 4=Somewhat negative, 5=Very negative
Wave	W2016, W2017, W2018, W2019
Source	NMG

Panel B: Economic Expectations

[B.1] Variable: **changeEconomy**

Question	Do you think that the economy is getting better, getting worse or staying about the same?
Answer	1=Getting a lot worse, 2=Getting a little worse, 3=Staying the same, 4=Getting a little better, 5=Getting a lot better
Wave	W6, W7, W8, W9, W10, W11, W14, W15, W16
Source	BES

[B.2] Variable: **changeUnemployment**

Question	How do you expect the number of unemployed people in this country will change over the next 12 months?
Answer	1=Increase sharply, 2=Increase slightly, 3=Remain the same, 4=Fall slightly, 5=Fall sharply
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

Continued on next page

[B.3] Variable: **riskPoverty**

Question	During the next 12 months, how likely or unlikely is it that there will be times when you do not have enough money to cover your day to day living costs?
Answer	1=Very unlikely, 2=Fairly unlikely, 3=Neither likely nor unlikely, 4=Fairly likely, 5=Very likely
Wave	W6, W7, W8, W9, W10, W11, W14, W15, W16
Source	BES

[B.4] Variable: **changeFinancialPosition**

Question	How do you expect the financial position of your household to change over the next 12 months?
Answer	1=Get a lot worse, 2=Get a little worse, 3=Stay the same, 4=Get a little better, 5=Get a lot better
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

Panel C: Spending Intentions

[C.1] Variable: **goodTimePurchase**

Question	Do you think now is a good or a bad time for people to buy major household items (furniture, kitchen appliances, televisions, and things like that)?
Answer	1=Bad, 2=Neither good nor bad, 3=Good
Wave	W6, W7, W8, W9, W10, W11, W14, W15, W16
Source	BES

[C.2] Variable: **changeSpending**

Question	How do you expect your household to change its spending over the next 12 months? Please exclude money put into savings and repayment of bank loans.
Answer	1=Decrease a lot, 2=Decrease a little, 3=About the same, 4=Increase a little, 5=Increase a lot
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

Panel D: Additional Economic Expectations and Spending Intentions

[D.1] Variable: **changeEconomicSituation**

Question	How do you expect the general economic situation in this country to develop over the next 12 months?
Answer	1=Get a lot worse, 2=Get a little worse, 3=Stay the same, 4=Get a little better, 5=Get a lot better
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

[D.2] Variable: **riskUnemployment**

Question	During the next 12 months, how likely or unlikely is it that you will be out of a job and looking for work?
Answer	1=Very unlikely, 2=Fairly unlikely, 3=Neither likely nor unlikely, 4=Fairly likely, 5=Very likely
Wave	W6, W7, W8, W9, W10, W11, W14, W15, W16
Source	BES

[D.3] Variable: **changeMajorPurchase**

Question	Compared to the last 12 months, do you expect to spend more or less money on major purchases (such as a car, furniture or electrical goods) over the next year?
Answer	1=Much less, 2=A little less, 3=About the same, 4=A little more, 5=Much more
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

Panel E: Others

[E.1] Variable: **euRefExpectation**

Question	How likely do you think it is that the UK will vote to leave the EU?
Answer	0 – 100 (Scale)
Wave	W7, W8
Source	BES

[E.2] Variable: **changeCostLive**

Question	Do you think that the cost of living is getting higher, getting lower or staying about the same?
Answer	1=Getting a lot lower, 2=Getting a little lower, 3=Staying the same, 4=Getting a little higher, 5=Getting a lot higher
Wave	W7, W8, W10, W11, W14, W15, W16
Source	BES

Continued from previous page

[E.3] Variable: **changePrice**

Question	How much would you expect prices in the shops generally to change over the next twelve months?
Answer	1=Go down, 2=Not change, 3=Go up by 1% or less, 4=Go up by 1% but less than 2%, 5=Go up by 2% but less than 3%, 6=Go up by 3% but less than 4%, 7=Go up by 4% but less than 5%, 8=Go up by 5% or more
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

[E.4] Variable: **changeHouseholdIncome**

Question	Over the next twelve months, how do you expect your household income (before anything is deducted for tax, National Insurance, pension schemes etc.) to change?
Answer	1=Increase, 0=Decrease or stay the same
Wave	W2015, W2016, W2017, W2018, W2019
Source	NMG

Notes: This table documents survey questions, response options, and waves where the variables are available. These variables measure respondents' Brexit identities, economic expectations, spending intentions, perceptions on the likelihood of a "Leave" outcome in the Brexit vote, and expectations on changes in cost of living, household income, and shop prices. In the analysis, we subsume changeEconomy, changeUnemployment, changeEconomicSituation as macro expectations, and riskPoverty, changeFinancialPosition, riskUnemployment as micro expectations.

TABLE D.3: **Heterogeneity of View Divergence by Exposure to Different Vote Leave Shares**

	Current Economic Situation	Perceived Poverty Risk	Good Time Purchase
	(1)	(2)	(3)
Panel A: No Control			
$LeaveVoteShare_a \times PostBrexit_t \times ProBrexit_{it}$	1.406***	-0.284***	0.438***
	(0.025)	(0.024)	(0.023)
Mean of DV	0.013	-0.026	0.011
Number of clusters	3,025	3,403	3,403
Observations	213,445	212,495	194,461
Panel B: Control for authority by wave fixed effects			
$LeaveVoteShare_a \times PostBrexit_t \times ProBrexit_{it}$	1.521***	-0.332***	0.467***
	(0.026)	(0.025)	(0.025)
Mean of DV	0.013	-0.026	0.011
Number of clusters	3,024	3,401	3,400
Observations	213,444	212,493	194,458
Panel C: Control for authority by wave fixed effects and demographics			
$LeaveVoteShare_a \times PostBrexit_t \times ProBrexit_{it}$	1.487***	-0.281***	0.474***
	(0.029)	(0.027)	(0.029)
Mean of DV	0.028	-0.024	0.025
Number of clusters	3,024	3,398	3,396
Observations	149,082	150,483	138,315

Notes: This table reports coefficient estimates from OLS regressions with expectations (current economic situation and perceived poverty risk) and spending intentions (good or bad time to purchase major items) for the BES as the dependent variables. The baseline econometric specification is $Y_{it}^j = ProBrexit_{it} + \sum Wave_t + \eta \times LeaveVoteShare_a \times PostBrexit_t \times ProBrexit_{it} + \epsilon_{it}$. We do not control for authority by wave fixed effects and voters' demographics in Panel A and successively include them in Panel B and C. We cluster standard errors at the local authority by wave level.

TABLE D.4: Housing Transaction Volume, Q1 of 2015 to Q4 of 2019

	2015	2016	2017	2018	2019
Q1	183346	261746	214044	207007	201942
Q2	222312	195303	238668	228620	222307
Q3	256478	247651	259913	250988	244689
Q4	259845	245399	255394	256007	249332
Total	921981	950099	968019	942622	918270

Notes: This table reports housing transaction volume in 313 local authorities in England and Wales, by year and quarter, from Q1 of 2015 to Q4 of 2019.

TABLE D.5: **Roots of Euroscepticism: Explaining Variations in Shares of Leave Voters**

	Econ. Shocks	Ind. Occ. Str.	Demo. Comp.	All
	(1)	(2)	(3)	(4)
Unemployment rate 2015	0.763***			0.109
	(0.246)			0.109
Immigration rate 2011	-0.678***			-0.235***
	(0.060)			(0.079)
ln(EU structural funds per capita 2013)	-0.017***			-0.012***
	(0.005)			(0.003)
ln(Total fiscal cuts 2010—15)	0.128***			-0.099***
	(0.024)			(0.031)
Manufacturing employment share 2011		1.218***		0.019
		(0.160)		(0.146)
Share of low-skill jobs 2011		0.597***		1.128***
		(0.093)		(0.142)
ln(Gross household disposable income 2015–19)			0.018	0.199***
			(0.028)	(0.030)
Share without qualification 2011			2.343***	1.467***
			(0.182)	(0.240)
Deprivation rate 2011			-0.927***	-0.254
			(0.125)	(0.210)
Mean of DV	.528	.529	.529	.528
Adj. R Squared	.517	.543	.695	.786
Observations	306	313	313	306

Notes: This table reports coefficient estimates from OLS regressions with shares of Leave voters as the dependent variable. The sample is cross-sectional, containing 313 local authorities. In Column (1), we include a set of economic shock variables. In Column (2), we include a set of industry and occupation structure variables. In Column (3), we include a set of demographic composition variables. Column (4) includes all the variables. We report White heteroscedasticity robust standard errors in parentheses. *: Significant at 10%; **: 5%; ***: 1%.

TABLE D.6: The Effects of the Brexit Vote on Spending Intentions: Evidence from Local Authorities

	Baseline	Income	Time Trend			
	(1)	(2)	(3)	(4)	(5)	(6)

Dependent variable: Good or bad time to purchase major items

$PostVote_t \times LeaveVoteShare_a$	0.204**	0.204**	0.186**	0.303***	0.174*	0.168*
	(0.092)	(0.092)	(0.090)	(0.096)	(0.093)	(0.090)
$ln(income)_{at}$		0.048				
		(0.257)				
Mean of DV	-.0166	-.0166	-.0166	-.0166	-.0176	-.0166
Number of clusters	313	313	313	313	306	313
Observations	6260	6260	6260	6260	6120	6260

Controls

LAU FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Time trend × Unemployment rate 2015			✓			
Time trend × Immigration rate 2011				✓		
Time trend × ln(EU structural funds per capita 2013)					✓	
Time trend × ln(Total fiscal cuts 2010–15)						✓

Notes: This table reports coefficient estimates from an OLS regression with controlling for local authority (LAU) fixed effects and time fixed effects. Column (2) further controls for annual gross household disposable income (log). Column (3) – (6) successively control for time trends interacting with pre-vote local unemployment rates, immigration rates, EU structural fund transfers (log), and total fiscal cuts over the period from 2010 to 2015 (log). We report standard errors clustered at the LAU level. *: Significant at 10%; **: 5%; ***: 1%.