Identity, Media and Consumer Behavior

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Abstract

This paper examines how political events that sharpen identity can affect day to day economic behaviour, even in contexts that lack prescriptive social norms about group behavior. We study the impact of the Brexit Referendum on consumer choices in the UK between British and EU grocery products. Using a unique panel dataset from a major retailer in the UK with almost a billion shopping trips for 12 million shoppers, we find that consumers respond to the referendum results by increasing consumption of UK products (by 3%) and reducing demand for EU products (by 12%). We provide further evidence that changes in consumption are driven by national identity being top of mind: the increase in consumption of UK products is 4% higher in days following intense social media discussion on Brexit. Consistent with the identity mechanism, this effect is stronger when there is more media discussion on the politics of regaining sovereignty as opposed to the economic consequences or social issues associated with Brexit. Overall, these findings underscore the importance of political events associated with deep changes to perceived identity in shaping routine economic decisions, and the mediating role that the media can play by keeping identity top of mind.

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1 Introduction

A growing literature in economics focusses on the importance of identity in shaping a variety of economic behaviors and outcomes (Akerlof and Kranton 2000; Shayo 2009; Grossman and Helpman 2018; Atkin et al. 2019; Gennaioli and Tabellini 2019). Recent shifts towards nationalistic identities in Europe and in the US have brought renewed urgency to understanding the full extent to which identity affects economic behavior.

A common thread in the literature to date is that the mechanism linking identity to economic behavior operates by increasing the value that individuals attach to conforming to group-specific behavioral norms or to being able to signal to others one's identity. In fact, most work has followed closely from earlier developments in Social Identity Theory (Tajfel 1981; Tajfel 1982; Tajfel and Turner 1986), which emphasises how individual identity is partially derived from group affiliations (Nosofsky 1986; Tajfel and Turner 1986). This theoretical framework predicts that in periods in which the group experiences some external threat, individual identification with the group may strengthen (Branscombe et al. 1999; Davies et al. 2008), increasing the likelihood that individuals' preferences reveal in-group bias and/or that they adopt prototypical group behaviors. These behaviors could include consuming products that are consistent with their most salient political, ethnic, religious or economic identities (Khan et al. 2013; Bertrand and Kamenica 2018; Atkin et al. 2019; Pandya et al. 2018).

This paper asks a broader question: does identity shape routine economic behavior even in settings in which group belonging lacks a deep-rooted set of prescriptive social norms, and consumption has limited social signalling value? To answer this question, we examine whether a plausibly unexpected political outcome that made British identity salient across the UK - the Brexit Referendum revealing the collective decision for the United Kingdom (UK) to exit the European Union (EU) - changed consumers' behavior towards consuming UK vs. EU products. Google search and twitter data reveal that discussions about Brexit were very limited before the announcement of the Brexit referendum (see Section 3.1) but increased significantly after that.

To study consumer behavior we use scanner data from a major UK retailer, with over 600 stores across the UK and a set of 12 million customers who shop regularly with a loyalty card (out of a

universe of 15 million customers shopping at this chain). Our stores cover 95% of all localities in the UK (administrative units that consist of approximately 1,500 households – LSOAs) for the period between March 2015 and March 2017. The loyalty card allows us to construct a panel of customers and their shopping transactions. Our data span the entire period from three months prior to the rise of prime-minister David Cameron to power in 2015, to his calling of the referendum in February 2016, and up to 9 months following the June 2016 referendum. This allows us to observe and control for any pre-trends or anticipatory movements in consumption bundles that might have been driven by expectations around the timing of the referendum and its outcome. While we always account for prices in our analysis, we also take advantage of the (verified) fact that during our window of analysis following the referendum (9 months), supplier contracts were fixed in pounds, prices did not change and the share of UK and EU products available on shelf was stable. To ensure that no residual price variation is driving our results (e.g. promotions of different lengths across stores), we instrument prices at the local level with the effective level of local competition. This measure is calculated based on the opening and closures of competing grocery store chains in the area, the distance to distribution centres and lagged stockouts of UK or EU products in the area surrounding a given store.

Our empirical analysis proceeds in five steps. First, to examine the effect of the Brexit referendum on consumer behavior we exploit variation in identity preferences across the same shoppers over time. We conduct an event study with shopper, store-week and product category fixed effects to estimate changes in the share of UK vs EU products purchased before and after the Brexit referendum. We find that the market share of UK products increased by 0.3% for up to 9 months following the Brexit Referendum. Switching is more frequent in product categories with lower average prices, but for more expensive goods within each product category driven mostly by decreased price sensitivity to UK products and increased price sensitivity to EU products.

In the aggregate, shifts in consumption represent a 63 million GBP increase in revenue from UK products for our sample of shoppers alone.[1] In a back of the envelope calculation, we estimate the value of identity to be equivalent to an average price reduction of UK products of 4 cents, which

[1] If we expand this calculation to include shoppers that do not have loyalty cards the figure would correspond to approximately 79 million GBP.

represents 1.9% of the average price of UK products, and is comparable to the most recent increase in average VAT rates in the UK in 2011. These shifts represented a 168 million GBP change in aggregate consumer surplus. These effects are stable across different UK countries (Scotland, Northern Ireland, Wales and England).

Second, to provide evidence that the change in consumption patterns is driven by changes in the salience of identity we exploit variation across products for which place of origin is more salient, before and after the referendum took place. Within a difference-in-differences framework, we find that the increase in UK product market share is particularly pronounced for products that are saliently labelled as being British, by having the union jack flag on the package or by directly mentioning the place of origin in the product name (eg. British ribs), which is consistent with the fact that it is product origin that is driving observed changes in consumption patterns. The flag leads to a 3% increase in sales relative to UK products without a flag and a 12% increase relative to EU products in the 9 months after the referendum. This corresponds to an approximate revenue increase from flagged products of over 194 million GBP. Conversely, we do not find evidence consistent with consumers shifting consumption patterns towards "quintessentially" British goods (eg. Scottish Oatcakes or Marmite) suggesting that the observed effects are indicative of in-group bias but not necessarily driven by changes in taste that would suggest conformity to prototypical consumption.

Third, to shed light on the mechanisms behind this change in consumption patterns we take a closer look at consumers' perceived importance of identity in grocery shopping. An online survey of a random sample of 1,085 primary grocery shoppers in the UK revealed that consumers did not view a shift towards purchasing UK products as a way to signal conformity to British identity and 96% of respondents felt limited social pressure to purchase more UK products in the aftermath of the referendum. Consistent with this lack of demand for social conformity, levels of economic deprivation and socioeconomic context at the locality level (LSOA administrative unit) do not appear to drive the attachment to national identity in shopping. Taken together, the evidence suggests that individuals can potentially derive utility (privately) from consuming national goods even in settings that lack strong prescriptive social norms and even when products lack important signalling value.

Given the limited evidence on demand for conformity to social norms or on the structural features of shoppers' socioeconomic environment inducing the observed shift in consumption patterns, we explore the hypothesis that political events and the media help keep identity top of mind. If identity preferences are latent and malleable, individuals may then derive utility from consuming national goods whenever identity is particularly salient to them. To study the role of the media as a shifter of the salience of identity, we rely on a panel of twitter data to proxy for changes in exposure to discussions about Brexit and to the salience of UK vs EU identities. We obtain data on the universe of tweets published on Twitter in the UK during the period between March 2015 and March 2017 that related to the Brexit referendum, and we combine text analysis with machine learning to measure the level and direction of sentiment towards Brexit. To help establish causality, we identify twitter storms, i.e. peaks in twitter activity at the national level, as exogenous shocks to the salience of identity. We then compare sales of UK vs EU products in the same store, the day before and after each twitter storm took place. This empirical strategy rests on the assumption that the timing of tweets at the national level is exogenous to the timing of grocery shopping at the local level. We find that a 10% increase in the number of tweets is associated with a 4% increase in the share of UK products purchased. These findings suggest that identity preferences are latent and that making identity top of mind can change consumption behaviors.

Consistent with an identity channel, the effect of twitter activity is particularly strong when tweets are about the politics of Brexit (eg. being an independent, sovereign British nation) relative to economic or social concerns such as immigration. Note that we interpret these results as suggestive of the role of the broader media in making identity salient to a larger segment of the population, not just twitter users. Days with twitter storms are likely to occur when there is more discussion about Brexit in the traditional media as well. In fact, we find very similar effects when we replace twitter data with the number of articles on Brexit published in a representative subset of newspapers in the UK.[2]

Finally, we investigate whether these effects are specific to major political events with potential

[2]We find a strong positive correlation between twitter and perhaps more representative social media platforms such as facebook usage at the locality level. Our findings are also robust to different ways of identifying twitter storms such as looking at the top 20 or 10% episodes of intense twitter activity or by identifying tweets from the top influencers on Twitter. This corresponds to twitter users who have the highest twitter activity and the largest number of friends and followers.

long-lasting effects in perceptions of identity or if they can also arise when any event or issue is made salient in the media. This could suggest that the main channel of impact is not necessarily identity but attention. To do so, we look at how consumption of UK vs EU products changed whenever England won a EURO 2016 match. While this type of event can still trigger an association with British identity, it is far less likely to result in long-lasting changes to one's perceived identity when compared to the Brexit referendum. Unlike what we find after peaks of discussion about Brexit in the media, the day after an English win in the tournament we find no evidence of changes in consumption patterns of UK products and only a limited reduction in the consumption of EU products (by 0.6%).

Consumption choices are an ideal outcome to measure the economic consequences of changes in identity given the frequency of shopping transactions (Escalas and Bettman 2005; Pandya et al. 2018; Bertrand and Kamenica 2018; Atkin et al. 2019). Since supermarket shopping is a frequent and near universal activity, we can observe real-time temporal shifts in behaviour at scale that are triggered by a well-defined political event. Relative to opinion surveys, purchases are also less subject to social desirability bias (Newman and Bartels 2011). Moreover, everyday grocery shopping is likely to have less social signalling value than purchases of durables such as cars, which has been the focus of most of the literature to date (Hong et al. 2011; Fouka and Voth 2013). Agents in our setting are therefore less likely to be constrained by social signalling concerns when making purchasing decisions, which brings us closer to isolating individual preferences for identity.

The close outcome of the Brexit referendum also renders it an ideal event study. As discussed in Section 2, prior to the referendum there was scant public discussion on Brexit. During the campaign and particularly after the vote, interest in Brexit soared and a potentially latent form of "British identity" was revived in the media and in the public discourse. Discussions around Brexit have dominated the political debate up to three years following the referendum, resulting in the resignation of two prime ministers and in a renewed threat of the disintegration of the United Kingdom.[3] At the same time, while the referendum and its aftermath have triggered extensive debate on the categorization of a "British vs EU political and social identity", there is no evidence

[3]The referendum also pre-dated the rise of nationalist and autarkic rhetoric in some western democracies such as the US, as Donald Trump took power five months after the referendum.

that it was associated with explicit boycotts of EU products or an appeal to buy British.[4] Consistent with this, we directly observe that product availability in store remained constant throughout the period of our analysis with 95% of the products sold in March 2015 still being sold in March 2017. The 5% of new products replaced older, discontinued products, whilst keeping the overall share of UK vs EU products constant on shelf.

Our findings build on, and contribute to, several literatures. First, they add to growing evidence on how identity affects economic behavior. In particular, we build on recent empirical papers documenting the impact of political, religious or ethnic identity on consumer purchases (Pandya et al. 2018; Bertrand and Kamenica 2018, Fouka and Voth 2013; Atkin et al. 2019). But we depart from this work conceptually by showing that identity can matter much more broadly, even in settings in which there are no clear focal, prescriptive social norms about identity and group behavior, and in which products do not hold inherent signalling value. We further propose a specific mechanism: important shocks to identity that the media keeps top of mind can lead individuals to derive utility (privately) from purchasing identity goods. An additional contribution is that we are able to quantify the value shoppers attach to identity following an event that increases the salience of identity, and to quantify associated changes in consumer surplus.

Second, an established literature has examined the role of the media on a variety of important economic outcomes namely voting and political beliefs (Besley and Burgess 2001; Strömberg 2004a; Strömberg 2004b; Gentzkow and Shapiro 2004; Gentzkow 2006; Snyder and Strömberg 2010), fertility (Kearney and Levine 2014; La Ferrara et al. 2012); educational outcomes (Gentzkow and Shapiro 2008; Huang and Lee 2010); conflict (Yanagizawa-Drott 2014) and social capital (Paluck 2009). What is perhaps less understood is whether these effects are driven by the media making identity salient. Our evidence adds to this literature by suggesting that the media can sharpen identity preferences triggered by major political events and keep them top of mind, with important implications for day to day economic behavior.

Our findings also speak to an emerging literature on the psychological foundations of consumer

[4]The Brexit referendum did not produce explicit calls for consumers to change their consumption patterns. Our twitter data reveals that less than 0.02% of all tweets in our dataset refer to an explicit boycott of EU products. Additionally, google trends report no data on searches about boycotting EU products during our period of analysis. These findings are consistent lab experiments finding stronger evidence for ingroup favoritism rather than outgroup detraction (Balliet et al 2014).

behaviour (Bordalo et al. 2020a; Bordalo et al. 2020b). In particular, we provide novel evidence on how "identity" preferences may not be fully stable across time and with relation to price. As a result, our findings can help augment and improve the predictive power of existing models, by documenting how consumers may systematically deviate from workhorse rational models of consumer behavior.

Finally, we contribute methodologically to the study of identity. The existing literature relies mostly on lab experiments, surveys and ethnographic studies to measure shifts in identity. In line with recent papers (Bertrand and Kamenica 2018; Atkin et al. 2019), we rely on a revealed preference approach to elicit meaningful shifts in identity through consumption data. We advance on this literature by suggesting the use of the media as an important shifter of the salience of group identity.

The rest of the paper is organized as follows: Section 2 describes our retail setting and the timeline for the Brexit referendum. Section 3 describes the data used in our analysis including the scanner data, the twitter data; the census and voting data, and the online survey data. Section 4 discusses our identification strategy and presents the main results. Section 5 conducts a back of the envelope calculation of the value of identity in shopping. Section 6 discusses the main mechanisms behind our findings and Section 7 discusses several key alternative interpretations. Section 8 concludes.

2 Identity, Media and Consumer Behavior

A growing literature has focussed on the role of identity in shaping a variety of important economic behaviors such as discrimination in hiring (Akerlof and Kranton 2000); conflict (Depetris-Chauvin and Durante 2017); attitudes towards redistribution (Shayo 2009) and trade policy (Grossman and Helpman 2018), among others.[5] Recent work has begun to link political, ethnic and religious identities to consumer behavior. Pandya et al. 2018) show that during the 2003 U.S. France dispute over the Iraq War, consumer boycotts of French-sounding brands led to significant changes in consumption patterns. Fouka and Voth (2013) focus on the role of collective memory on the purchase of goods with intrinsic social signalling value: they show that in places in Greece where

[5]In this paper we focus on behavioral measures of identity, as reflecting preferences not beliefs (Shayo 2020).

during WWII German troops conducted more massacres, German car sales declined during the 2009 Greek sovereign crisis. Atkin et al. 2019 focusses on a setting in which agents choose between ethno-linguistic and religious identities in a context in which there are strong taboos and norms associated with each identity. To study the effect of identity on day to day economic behavior, this paper builds on this literature to examine how the rise in the salience of the British identity following the close outcome of the Brexit referendum in the UK in 2016, which determined the collective decision for the UK to exit the EU, affected routine grocery shopping and consumers' choice between UK and EU products. We take advantage of this context to explore several key conceptual questions that can advance our understanding of identity and economic behavior.

First, we examine whether consumers prefer identity goods because they value the ability to signal their behavior to themselves or to others. What is common to most of the literature on identity in economics, is that identity preferences often arise because individuals attach value to conforming to prevailing social norms or because they value the ability to signal their behaviour to the group they identify with. We pose a broader question to try to understand whether identity preferences can emerge even in settings that are not characterized by explicit opportunities for social signalling, and in which there are much weaker prescriptive norms associated with particular groups and behaviors. This approach is likely to bring us closer to uncovering whether individuals derive utility (privately) from feeling attached to a particular identity. While we cannot firmly distinguish between the different motivations behind this attachment, possible mechanisms include individuals deriving warm-glow type of utility (Andreoni 1990, Crumpler and Grossman 2008) or valuing the ability to self-signal (Bénabou and Tirole 2004), which are distinct from either the utility associated with social signalling or the utility associated with conforming to the prevailing social norm.

Second, we investigate whether changes in identity preferences are motivated by in-group bias and/or if they are driven by a desire to conform to prototypical group behavior (Shayo 2020). In response to shocks that shape perceptions of identity, individuals may change their preferences in the direction of in-group bias – the affective view – or they may derive their identity from group affiliations via categorization (Tajfel 1981; Tajfel 1982; Tajfel and Turner 1986; Nosofsky 1986) – the cognitive view. In both cases, social identity theory predicts that in periods in which the

group experiences some external threat (relative to the out-group), identification with the group strengthens. The increased utility from identifying with the group during these shocks increases the likelihood that individuals will exhibit in-group favoritism. But identification with a particular group can also lead individuals to want to reduce the perceived distance between themselves and that group's prototypical behavior. In-group bias might explain why Greeks would prefer to buy Italian cars over German cars during the Greek crisis but conformity to prototypical behavior might better explain why Americans would boycott french fries over a dispute with France or why Indian Muslim households would consume less pork and alcohol following episodes of violence against Muslims. While self-categorization may imply in-group bias, it may also lead individuals to change their behavior towards the group stereotype. An in-group bias model would predict that patterns of consumption remain constant but consumers switch to domestic producers while the prototype model would predict that changes in consumption patterns may be more pronounced, with consumers changing their taste across products.

Third, we discuss the role of attention in driving observed changes in consumer behavior. In particular, we explore the role of the media in keeping British identity top of mind (Bordalo et al. 2020b). If the media helps keep issues top of mind, then we should be able to observe an empirical association between intense media exposure to identity and the timing of changes in shopping behavior. But could the observed impact of media focus on identity on consumer behavior be driven exclusively by attention or is it driven by real changes in identity preferences? It is possible that media debates around Brexit keep Britishness top of mind, and that as a result, consumers shop for British products even when they have no concerns about identity. To shed light on these hypotheses, we exploit variations in the intensity of the shock to identity and observe the associated changes in consumer behavior. If attention alone drives consumption, then we should observe similar levels of changes in consumption whenever any event that makes identity salient takes place. If identity preferences also play a role, then we should observe that events that make identity more salient elicit larger responses in consumption.

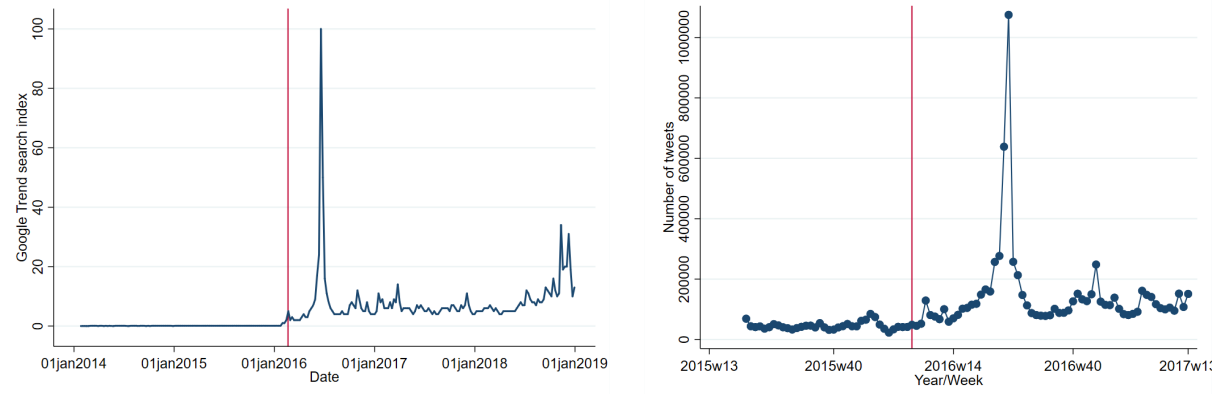
3 Setting and Data

3.1 The Brexit Referendum Timeline

The UK joined the European Union in 1973. Survey evidence suggests that by 2015, over 60% of the UK population believed that participation in the block brought economic benefits to the UK and thus, supported continued membership in the EU (What the UK Thinks: EU 2015; British Social Attitudes Survey 2015). In an unexpected turn of events, David Cameron became prime minister of the UK as the leader of the Conservative party in May of 2015. In fulfilment of his electoral platform, Cameron enacted the EU Referendum Act in December 2015 and the referendum on whether the UK should remain in the EU was announced in February 2016. The vote was held on June 23, 2016. The race was tight, and the option to leave the European Union prevailed by only 4 percentage points (51.9% voted in favor of leaving the EU while 48.1% voted to remain in the block).

Importantly for our identification strategy, actual public interest on Brexit appears to have been extremely limited before the referendum took place. This is evident from the two panels of Figure 1, showing the frequency of google searches of the term "Brexit" (left panel) and tweets mentioning Brexit (right panel) across the UK during this period.[6]

Figure 1: Share of UK and EU products over time



Left panel reports the Google Trend Search Index of the Term "Brexit". Right panel reports the number of Tweets that include the term "Brexit". The red vertical line shows the date of the announcement of the referendum.

[6]Note that the figures represent search interest relative to the highest point on the chart for the given region and time. A value of 100 corresponds to the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means that there was not enough data for this term in a given period.

Searches and tweets about Brexit peaked during the Referendum week and declined shortly after. The referendum, and the campaign that preceded it, may have represented an important coordination device from which consumers could extract a clear signal of the degree of support for a "British identity". In fact, an important part of the discussion that ensued in the media revolved around the UK's search for a new identity outside of the European Union. We exploit this shock to the salience of British identity to understand how identity preferences in the form of attachment to national identity can affect consumer behavior.

3.2 Data

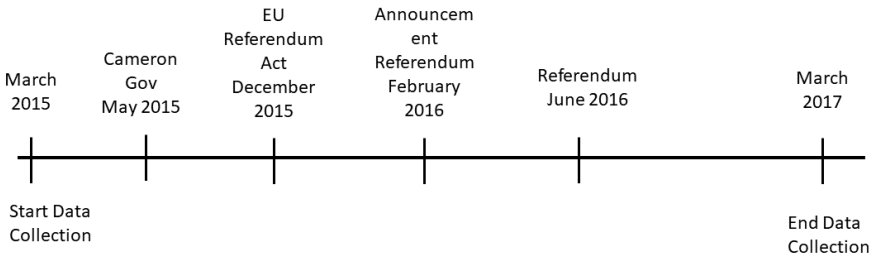
Understanding the nature and implications of identity is challenging since identity preferences are not directly observable and are usually endogenous to particular behaviours. While identity is often studied in lab experiments, real-time collective shocks to identity are hard to reproduce in the lab, and they may lack external validity (Aronczyk 2013;Brewer and Gardner 1996). Alternatively, studies can measure identity based on self-reported surveys but these are often constrained by social desirability bias and demand effects. We build on recent literature and adopt a revealed preference approach by focussing on consumption choices as high frequency, nearly universal economic decisions that can reveal preferences for identities that are clearly identified with specific consumption bundles (Bertrand and Kamenica 2018; Pandya et al. 2018; Atkin et al. 2019). Moreover, we exploit the unexpected outcome of the Brexit Referendum as a positive shock to the salience of British identity to mitigate concerns about endogeneity.

Consumption Data: To measure consumer responses to changes in the salience of identity we analyse weekly sales data for products labelled as originating in the UK or in the EU, in a major retail chain across the UK, before and after the Brexit Referendum took place. Our retail partner has over 600 stores across Wales, England and Scotland, serving a mainstream segment of the grocery market. Our sample of stores covers about 95% of all LSOAs in the UK (administrative units that aggregate approximately 1,500 people).

Our data span a time period between March 2015 and March 2017. This covers the three months before David Cameron's Conservative government came to power (May 2015), the announcement of the Referendum Act (December 2015), the announcement of the referendum (February 2016); the

Brexit referendum (June 2016) and up to nine months after the referendum, as shown in Figure 2.

Figure 2: The timeline of the Brexit Referendum and the Transaction Data



The universe of transactions during this period lists approximately 15 million customers, out of which, 12 million have a loyalty card that they frequently use. To construct a panel of frequent shoppers, we restrict our analysis to the subset of consumers with a loyalty card to be able to observe within shopper variation across time.[7] The 15 million shoppers in the sample engage in a total of almost one billion shopping trips during our period of interest, the vast majority coming from the 12 million shoppers who have a loyalty card.

Table 1 shows the descriptive statistics for our sample. Panel A of the table reports descriptive statistics of shopping trips in the full sample. In Panel B we report shopping trip information and census demographics across loyalty card and non-loyalty card shoppers. Panel C reports shopping statistics at the shopper/week level, which is the unit of analysis in most of our analysis. To identify the share of UK products in a shopper's consumption basket we ascribe an "identity" to each product based on a label displayed on the product package specifying its country of origin (eg: made in the UK). When a product lists more than one origin country, we apply a simple weight to identify the share of the product that is British or European. We use a similar strategy to identify products that are European. As a result, the definition of UK vs EU products represents a score from 0 to 1.[8]

We use machine learning to assign products to product categories based on product descriptions. These consist of distinctive categories such as wine; biscuits and crackers; and breakfast cereals,

[7] Transaction activity of consumers with and without a loyalty card is qualitatively similar as shown in Table 1.

[8] Our results are not sensitive to this classification method. For example, using a lexicographic binary classification capturing whether the product has any link to the UK leaves the results unchanged.

among others, for a total of 20 product categories.[9] The scanner data provides a shopper unique identifier, a product unique identifier (Stock Keeping Unit –SKU– number), information on the price and quantity bought, and the store location. The loyalty card data includes demographic information for approximately 12 million shoppers, including age and gender.

Census Data: To measure how socioeconomic features of shoppers' environments can shape the impact of identity on consumer behavior, we obtain measures of locality-level characteristics from the 2011 UK census that we then match to our stores' location.[10] We rely on the UK census' deprivation index, a rurality index, income levels and share of blue collar workers, as key potential drivers of economic and political identities.

Consumer Surveys: We conduct an online survey of a sample of 1,085 primary grocery shoppers in different grocery chains in the UK. This sample is similar in age, gender and average weekly expenditure to the sample of loyalty card customers we use for the main analysis. These data can shed light on shoppers' beliefs about social norms associated with British identity, whether shoppers have a preference to conform to social norms and whether shoppers felt any social pressure to purchase products made in the UK in the aftermath of the referendum.

Social Media Data: We extract 19.8 million tweets and re-tweets from Twitter's Historic database covering the period between March 2015 and March 2017. Out of these, we are able to geo-tag 11.3 million tweets according to the users' profile or by identifying tweets that are geo-tagged. We rely on a machine learning algorithm to implement sentiment analysis based on hashtags and the content of each tweet. We identify key hashtags and content words related to Brexit following Amador et al (2017) and calculate the TF-IDF (Term Frequency - Inverse Document) frequency for each tweet, which corresponds to a measure of how often each stem word occurred within the tweet, adjusted for frequency over all tweets. This created a vector with all the TF-IDFs per tweet.

[9] Note that the results are robust to using the retailer's definition of product categories, consisting of 385 categories. These include several cross-cutting categories such as "new and trendy". We prefer to use our classification since it is likely to be more representative of how consumers search through their choice sets.

[10] Administrative units in the UK vary between output areas (OA)'s and Lower Layer Super Output Areas (LSOA) built from groups of contiguous OAs. OAs are the smallest census areas in the UK census and were built from clusters of adjacent unit postcodes, and designed to have similar population sizes and be as socially homogeneous as possible based on tenure of household and dwelling types. These would preferably consist of entirely urban or entirely rural postcodes, not a mix. The minimum OA size is 40 resident households and 100 resident people, but the average size is rather larger at 125 households. LSOAs have been automatically generated to be as consistent in population size as possible and typically contain from four to six output areas. The minimum population is 1,000 and the mean is 1,500.

Table 1: Descriptive Statistics

Panel A: Shopping trips (N=831,995,817)				
Variable	Mean	Std. Dev.	Min	Max
Total expenditure	32.44	36.12	0.01	500.00
Share UK products	68.74	23.84	0.00	100.00
Share EU products	19.24	19.93	0.00	100.00
Share National products	20.25	23.24	0.00	100.00

Panel B: split by loyalty card	**With Card (N=775,494,094)**		**Without Card (N=56,501,723)**	
Variable	Mean	Std. dev.	Mean	Std. dev.
Total expenditure	32.62	36.21	29.91	34.66
Share UK products	68.74	23.77	68.72	24.68
Share EU products	19.23	19.87	19.40	20.63
Share National products	20.27	23.19	20.03	23.88
Whites OA (%)	83.97	16.93	81.77	18.42
Unemployment OA (%)	6.63	4.72	6.85	4.84
Blue collar OA (%)	21.91	8.04	21.16	8.23
Rural	3.67	18.80	3.37	18.04

Panel C: Weekly shopping, 1 million shoppers sample (N=56,947,974 T=108)				
Variable	Mean	Std. dev.	Mean	Std. dev.
Number shopping weeks	56.9	28.2	8.0	108.0
Weekly expenditure	50.9	33.9	1.1	1995.9
Share UK products	67.9	8.5	0.0	100.0
Share EU products	19.9	6.8	0.0	100.0
Share National products	20.5	6.8	0.0	100.0

Source: Transaction Data. Notes: *Share National Products* represents the share of UK products that display a union jack flag on the front package.

We then trained support vector machine (SVM) models on a training set obtained from Amador et al (2017) and used the TF-IDF vector as an input. Intuitively, SVM models try to identify a border between two subgroups that separates them as best as possible in a multidimensional space. As a robustness check, we train SVM models with linear, polynomial and RBF kernels and specify the optimal model parameters by cross-validation (sampling the training set into further subsets and comparing the model's performance within those). We identified the RBF kernel as our preferred specification and trained the SVM model again on the complete identified tweet dataset. We repeat these procedures to identify positive/negative sentiment towards Brexit and to identify political, economic or social (immigration) arguments, again following Amador et al (2017). This categorization is important to help us better understand the mechanisms through which social media content can shape identity and consumer behaviour. Table 2 describes the sample of twitter

data used in the analysis and their classification.

Table 2: Descriptive Statistics: Twitter Data

County/week, N=7,547				
	Mean	Std Dev	Min	Max
Total tweets per week per county	1495.7	8924.2	1.0	375025
Share Pro-Brexit	44.4	49.7	0.0	100.0
Share Against-Brexit	55.6	49.7	0.0	100.0
Share Political	35.9	48.0	0.0	100.0
Share Economics	22.8	41.9	0.0	100.0
Share Immigration	10.4	30.6	0.0	100.0

Source: Twitter. Tweets are classified on slant through the use of key hashtags and content words related to Brexit following Amador et al (2017). We train a SVM model with an RBF kernel to identify positive/negative sentiment towards Brexit and to identify political, economic or social (immigration) arguments.

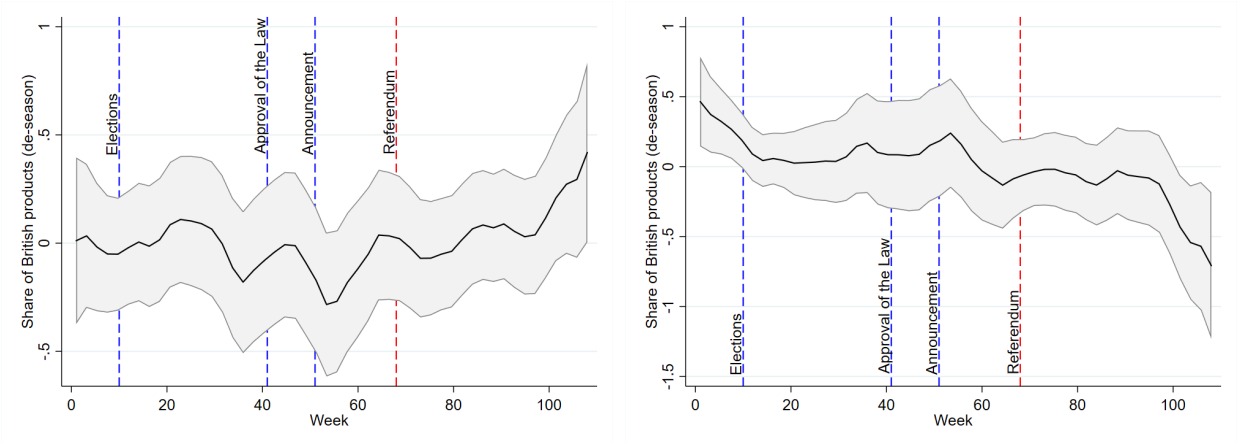
4 Empirical Analysis

To measure the impact of identity preferences on consumer behavior we start by exploiting within shopper variation in consumption, before and after an increased salience of national identity. Our event study relies on the assumption that local level shopping behavior was orthogonal to the outcome of the Brexit referendum.

We begin by examining unconditional aggregate changes in market shares of both EU and UK labelled products before and after the Brexit referendum took place. We compute the market share of UK products and EU products as the number of UK product units sold as a percentage of all units in the product category sold in that store-week. For example, if a product (e.g. rice) had a 50% market share in a given store in a given week, the product accounted for half of all units of rice sold in that store in that week. Measuring market share, as opposed to the total number of units sold, allows us to scale each store's sales of a certain product relative to the overall demand for that product category in that store-week. Changes in market share also capture shifts in demand for products distinct from changes in demand for a particular product category.

The two panels in Figure 3 show the share of expenditures on UK and EU products between March 2015 and March 2017 (de-seasoned with monthly dummies) in the consumption basket of our shoppers.

Figure 3: Share of UK and EU products over time



(a) Share of UK products (de-seasoned)

(b) Share of EU products (de-seasoned)

In the months prior to the referendum, the shares of each product were fairly stable and following a parallel trend. At the time of the referendum, the market share of UK products increased at the expense of the market share of EU products. These changes persisted, and became stronger, up to 9 months after the referendum took place.

This comparison does not however account for baseline heterogeneity in shopper preferences, store characteristics, or prices.

4.1 Event Study: Changes in the Shares of UK vs EU products

We conduct an event study to examine the impact of the Brexit referendum on consumer behaviour. For each store-week in our sample between March 2016 and March 2017, we model the change in the weekly market share of UK and EU products, compared to the same store-week in 2015, which precedes any anticipation of the Brexit referendum. By analysing differences, we hold constant time-invariant store characteristics including the ex-ante demand for UK and EU products, customer demographics, and seasonal fluctuations. In doing so, we assume that the timing of a store's exposure to the Brexit Referendum is orthogonal to consumers' shopping decisions.

We control for seasonal effects by including week and flexible monthly dummies and we account for shopper level heterogeneity in preferences through shopper fixed effects. This allows us to control for omitted variables that generate persistent deviations in consumption patterns across shoppers

or across time. We also hold constant seasonal fluctuations by comparing 2015 and 2017 shares in the same week.

Our baseline specification is:

$$\begin{aligned} Share^{k}_{isct} &= \beta^{UK} ln(price^{UK}_{sct}) + \beta^{EU} ln(price^{EU}_{sct}) + \gamma Post\ Ref_t \\ &+ \beta Expend_{ist} + Week_t + \eta_i + \phi_c + \varepsilon_{isct} \end{aligned} \tag{1}$$

where $Share^{k}_{isct}$ corresponds to the share of $k = UK, EU$ products in the shopper's budget for shopper i in store s, for product category c and week t. $Price_{sct}$ corresponds to the average product category c price, in store s and week t. The $Post\,Ref_t$ indicator equals 1 starting from the week after the referendum and 0 otherwise. We control for total $Expenditure_{ist}$ to isolate compositional changes in shopping patterns distinct from changes in total expenditure, and we include week of the year dummy variables and a trend (flexible month dummy) together with shopper fixed effects. We also include product category fixed effects ϕ_c to absorb heterogeneity in product-level characteristics that could be correlated with changes in consumption patterns. This will allow us to identify how shoppers may trade off UK vs EU close substitutes within each product category (eg. within types of milk; types of biscuits, types of wine, etc.).[11] The fixed effects ensure that we are exploiting within shopper variation, shopping in the same store, in the same time period and between similar categories of products. Standard errors are clustered at the shopper level.

[11] We group product categories into 20 categories based on their product description using machine learning. The results are unchanged when we use a much finer categorization used by the retailer that includes up to 385 categories. These include categories like "new and trendy", which we find harder to conceptualize in our analysis.

Table 3: Event Study: Changes in Shopping Behavior

Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Post Ref	0.221***	-0.264***
	(0.007)	(0.006)
Log(Price UK)	-12.444***	12.166***
	(0.111)	(0.098)
Log(Price EU)	12.070***	-10.867***
	(0.082)	(0.070)
Weekly expenditure	-2.346***	1.580***
	(0.102)	(0.071)
Shopper FEs	YES	YES
Week FEs	YES	YES
Product category FEs	YES	YES
R^2	0.115	0.176
Observations	217,415,406	217,415,406

Source: Transaction Data. Notes: *Share National Products* represents the share of UK products that display a union jack flag on the front package.

Table 3 reveals that UK labelled products gained a market share of 0.221 percentage points, representing a 0.3% overall increase in the share of UK products purchased. Following the referendum, EU products lost a market share of 0.264 percentage points, corresponding to an overall 1.5% decrease relative to the mean share prior to the referendum.[12] In the aggregate, this led to a substantial shift in revenue from the different bundles of products across all stores of the retail chain. Aggregating across 12 million consumers (the sample that we observe with loyalty card data), these changes suggest a yearly increase of 63 million GBP in revenue from sales of British products in the 9 months following the Brexit Referendum alone.[13]

4.1.1 Prices and Product Availability

One possibility is that shifts in market share are driven by shifts in prices that coincided with the Brexit referendum. In our analysis, we take advantage of short-run price rigidity as the retailer we worked with used at least a 6 month lag between pricing decisions. Moreover, it had limited

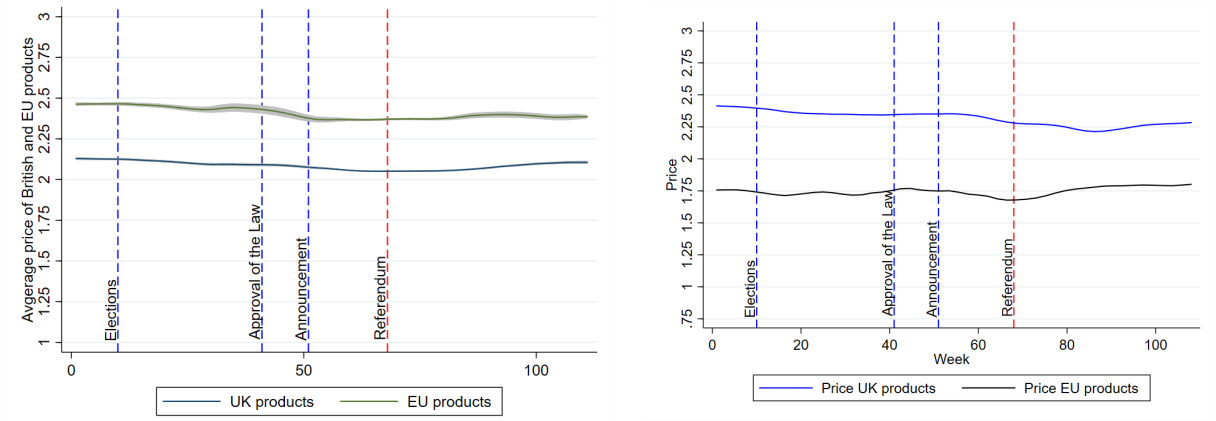
[12]Figure 3 suggested the possibility that the campaign period and the associated polling already provided signals of the level of support for a British vs European identity. We find that this was indeed the case: when we use the announcement of the date of the referendum as the start of our treatment, we can already detect changes to consumer behavior, albeit much smaller in magnitude.

[13]Note that this is likely to be a lower bound since the company had approximately 15 million shoppers. Assuming that the non-loyalty cards responded similarly to the Brexit referendum, these figures would increase to 79 m GBP per annum and even more if we consider the universe of shoppers in the UK.

exposure to currency fluctuations in the short-run by having all contracts in pounds.[14] In fact, Figure 5 (left panel) confirms that the political and economic uncertainty that ensued the Brexit referendum did not move average prices for UK or EU products during our period of analysis.[15]

In Figure 5 (right panel) we zoom into the product categories with the top 20% of treatment effects and find that for these, prices of EU and UK products are also stable across time. Figures 1 and 2 in the Online Appendix show that price dispersion was also constant for both sets of products during our period of analysis, with no changes occurring around the Brexit referendum. At the same time, we confirm in the raw data that 95% of products reported to be on shelf in March 2015 are still on shelf in March 2017. The new products that were introduced between March 2015 and March 2017 were replacing discontinued products, while keeping the overall share of UK and EU products available constant throughout. Figures 1 and 2 in the Online Appendix we show that the standard deviation of prices is also stable across UK and EU products.

Figure 4: Average prices of UK and EU products over time



Left panel reports the average prices of UK and EU products between March 2015 and March 2017 (residualized from monthly dummies and product category fixed effects). Right panel reports average prices for product categories in the top 20% of treatment effects (residualized from monthly dummies and product category fixed effects).

While the retailer adopted a national pricing and promotional strategy, it is still possible that there is some residual price variation at the store level, which could be driven by the timing of promotional endpoints. This could happen if for instance one store, depending on inventory,

[14] Retailers' contracts with suppliers also constrained immediate changes to products' shelf space allocation or product packaging.

[15] The slight price movement that is picked up in a thicker confidence interval around weeks 47 and 99 represent the period in the run-up for Christmas in 2015 and 2016.

decided to keep a promotion running for an extra week. To account for this possibility, we identify supply-side factors or aggregate demand factors that are plausibly exogenous and can serve as shifters of local prices namely competition from other top retailers in the locality, demand shocks in UK or EU product categories taking place in nearby stores that can influence stock availability, and demand shocks interacted with each store's distance to the nearest distribution centre. Using these instruments, our results remain unchanged. These results are discussed in section 8.4.

Given this evidence on short-run price stability, we further examine how demand for "identity" products is affected by prices. First, Table 4 shows that the observed shift towards UK products post referendum is driven mostly by a decrease in price sensitivity towards UK products and an increased price sensitivity towards European products.

Second, we find that the most substantial shifts occur in the cheapest products categories, as

Table 4: Event Study: Changes in Shopping Behavior and Prices

Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Post Ref	0.194***	-0.280***
	(0.021)	(0.019)
Log(Price UK)	-14.050***	12.861***
	(0.116)	(0.101)
Log(Price EU)	12.665***	-11.141***
	(0.082)	(0.071)
Log(Price UK) × Post Ref	2.462***	-1.071***
	(0.041)	(0.036)
Log(Price EU) × Post Ref	-2.360***	1.064***
	(0.031)	(0.026)
Weekly expenditure	-2.341***	1.578***
	(0.102)	(0.071)
Shopper FEs	YES	YES
Week FEs	YES	YES
Product category FEs	YES	YES
R^2	0.115	0.176
Observations	217,415,406	217,415,406

Source: Transaction Data. $Log(Price\ UK)$ corresponds to average product category prices for UK products and $Log(Price\ EU)$ corresponds to average product category prices for EU products. $Weekly\ Expenditure$ corresponds to total weekly expenditure at the shopper level. $PostRef$ represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

shown in Table 5.

Table 5: Event Study: Changes in Shopping Behavior and Prices

Dependent variable:	**Share of British products**		**Share of EU products**	
	Cheap	Expensive	Cheap	Expensive
	(1)	(2)	(3)	(4)
Post Ref	0.382***	0.067***	-0.360***	-0.186***
	(0.011)	(0.010)	(0.010)	(0.008)
Log(Price UK)	-14.575***	-11.834***	14.837***	10.454***
	(0.174)	(0.137)	(0.167)	(0.110)
Log(Price EU)	15.404***	9.936***	-14.912***	-8.400***
	(0.138)	(0.094)	(0.132)	(0.075)
Weekly expenditure	-1.759***	-2.807***	1.282***	1.857***
	(0.059)	(0.153)	(0.046)	(0.103)
Shopper FEs	YES	YES	YES	YES
Week FEs	YES	YES	YES	YES
Product category FEs	YES	YES	YES	YES
R^2	0.137	0.141	0.203	0.191
Observations	108345953	109062483	108345953	109062483

Source: Transaction Data. $Log(Price\ UK)$ corresponds to average product category prices for UK products and $Log(Price\ EU)$ corresponds to average product category prices for EU products. $Weekly\ Expenditure$ corresponds to total weekly expenditure at the shopper level. $Post\ Ref$ represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

Finally, we examine how the availability of products of each type (UK vs EU) in the choice set affects substitution patterns.

Table 6 shows that as the share of UK products in a given product category increases, shoppers are more likely to move towards the consumption of UK products. Inversely, the higher the share of EU products in the category, the less likely shoppers are to substitute away towards UK products.

4.2 Difference-in-Differences: Changes in Consumption of Salient UK Products

To confirm that changes in consumption are driven by the salience of identity, we exploit variation across products that differ in their association to national identity. If identity preferences are driving changes in consumption, we should observe that products that are more easily associated with national identity experience larger increases in market share once identity becomes salient.

While all products in our dataset have a label specifying the country of origin, a subset of products also include an image of the union jack displayed on the front of the package, while others include a clear identifier in the product name such as “British ribs” or “Scottish Oatcakes”. If changes in consumption patterns are driven by a preference for identity, then we should observe

Table 6: Event Study: Changes in Shopping Behavior and Prices

Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Post Ref × Avg UK Share in category	1.381***	
	(0.072)	
Post Ref × Avg EU Share in category		2.333***
		(0.064)
Post Ref	-0.711***	-0.863***
	(0.050)	(0.015)
Log(Price UK)	-12.511***	12.559***
	(0.111)	(0.099)
Log(Price EU)	12.053***	-10.882***
	(0.082)	(0.070)
Weekly expenditure	-2.346***	1.580***
	(0.102)	(0.071)
Shopper FEs	YES	YES
Week FEs	YES	YES
Product category FEs	YES	YES
R^2	0.115	0.176
Observations	217,415,406	217,415,406

Source: Transaction Data. *Log(Price UK)* corresponds to average product category prices for UK products and *Log(Price EU)* corresponds to average product category prices for EU products. *Weekly Expenditure* corresponds to total weekly expenditure at the shopper level. *Post Ref* represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *Avg UK Share Category* is the average share of UK products available in the product category and *Avg EU Share Category* is the average share of EU products available in the product category. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

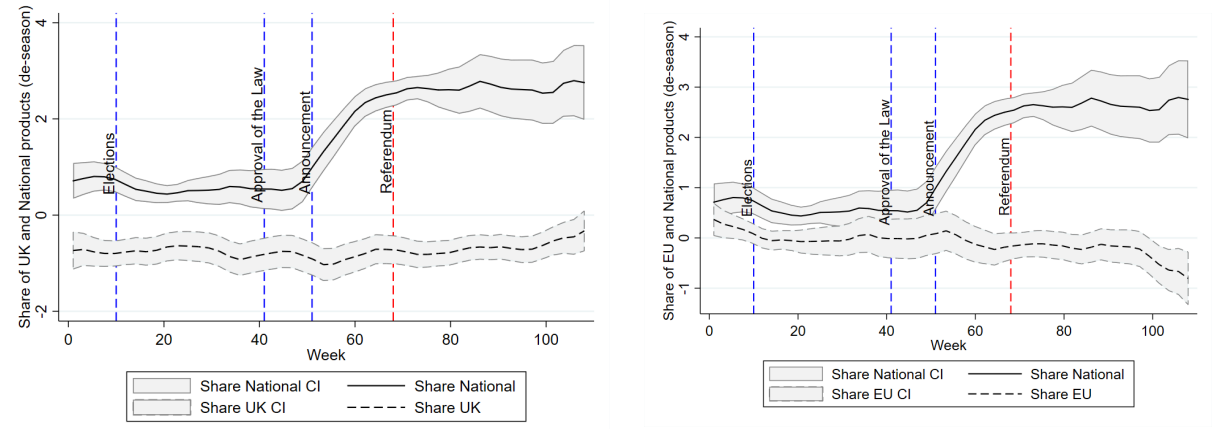
that products with country of origin more saliently displayed on the package experience larger increases in market share.

We focus on products with either a flag or the British name that are not affected by seasonality, but still represent an important share of total average shopper expenditure (approximately 33%). This allows us to rely on a difference-in-differences estimator to identify moves toward products with a salient UK identity, before and after the Brexit referendum.

The two panels of Figure 5 show the trends in purchases of products with the union jack flag or a British identifier, hereafter called national products, against UK products (left panel) and against EU products (right panel), before and after the Brexit Referendum.

Also, Figure 5 reassuringly suggests that market shares of all products were stable and parallel before the announcement of the Brexit referendum, after which the market share of national products increased significantly relative to competitive products within each category.

Figure 5: Share of expenditure on national products against UK and EU products



Left panel reports share of expenditure on national products against UK products. Right panel reports the share of expenditure on national products against EU products.

Our difference-in-differences model is then:

$$\Delta Share_{isct}^{Nat-k} = \beta^{Nat} ln(price_{sct}^{Nat}) + \beta^{k} ln(price_{sct}^{k}) + \gamma Post\ Ref_t + \\ + \beta Expend_{ist} + Week_t + \eta_i + \phi_c + \varepsilon_{isct} \tag{2}$$

where $\Delta Share_{isct}^{Nat-k}$ corresponds to the difference in the market share of products with the UK flag or name saliently displayed relative to the share of $k = UK, EU$ products sold in stores that do not have the flag. As before, $Post\ Ref$ is an indicator that equals 1 for the period following the Brexit referendum (our difference-in-differences estimator). We further include average prices (of national, UK and EU products) at the level of the category and store; a control for total shopper weekly expenditure; week fixed effects; individual shopper and product category fixed effects. We first examine the changes in consumption of national products with respect to the rest of UK products, and then we examine the impact of the referendum on shifts in market share between national and EU products.

Table 7 shows that the union jack flag or the British name significantly increased the impact of identity on shopping behavior. The presence of the flag increases sales of UK products (relative to UK products that do not have a flag) by 0.967 percentage points, representing a 3% increase. EU products decrease their market-share by 12% compared to products that are clearly identified as being British. These findings are consistent with our interpretation that the identity attribute of

Table 7: Difference-in-Differences Estimates: National vs UK and EU products

Dependent variable:	**National-UK**	**National-EU**
	(1)	(2)
Post Ref	0.967***	2.299***
	(0.028)	(0.029)
Log(Price Nat)	-2.219***	-3.271***
	(0.120)	(0.126)
Log(Price UK)	12.011***	
	(0.399)	
Log(Price EU)		20.374***
		(0.322)
Shopper FEs	Y	Y
Week FEs	Y	Y
Product category FEs	Y	Y
Weekly expenditure	Y	Y
R^2	0.178	0.196
Observations	33,148,839	33,146,511

Source: Transaction Data. $Log(Price\ Nat)$ corresponds to average product category prices for national products. $Log(Price\ UK)$ corresponds to average product category prices for UK products and $Log(Price\ EU)$ corresponds to average product category prices for EU products. $Weekly\ Expenditure$ corresponds to the total weekly expenditure of the shopper. $Post\ Ref$ represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

these products became more salient in the post referendum period and that this had a significant impact on patterns of grocery shopping.

5 The Value of Identity

In light of our findings in section 4, we conduct a back of the envelope calculation of the value of identity in grocery shopping. In our data, we observe a shift in consumption (in a context of stable prices) due to a surge in the value of identity, which pushes shoppers to buy more UK products. We then identify the change in prices that would have determined the same shift in consumption. From here, we can have a plausible estimate of the associated welfare change. To do so, we follow Hausman (1996) and we derive the inverse demand function for UK products to identify the changes in average prices that would be consistent with the observed change in quantities in our data.[16] For tractability, we assume that the price elasticity remained constant throughout the period of our analysis.

[16]Figure 3 in the Online Appendix depicts this inverse demand curve.

We estimate the value of identity to be equivalent to a price reduction of 4 cents for UK products, which represents 1.9% of the average price of UK products prior to the referendum. This value corresponds to a change in consumer surplus of 0.27 cents per shopper-week, which aggregates to a yearly change in shopper surplus of approximately 168 million GBP for the entire sample.[17]

The most recent increase in VAT rates in the UK provides a useful benchmark to help gauge the magnitude of the effect of the value of identity and attachment to national identity on consumption. In 2011, the UK's average VAT rate increased by 2.5% of average prices, which is comparable to the 1.9% price movement that would have led to the shift in quantities that we observe for UK products after the referendum.

This estimate suggests that while changes at the individual level might be (plausibly) small, changes in the aggregate are large and economically meaningful.

6 Mechanisms

In this section we examine potential mechanisms driving the observed link between identity and consumer behavior. First, we examine whether consumers reveal an in-group bias alone, or if they also change their taste within and across product categories as a result of the Brexit referendum, moving towards products that are widely recognized as being "quintessentially" British. Second, we explore the role of locality characteristics in potentially heightening the salience of group identity. Third, we conduct consumer surveys to elicit consumers' perceptions about the existence of prescriptive social norms associating British identity and grocery shopping as well as the demand for social signalling through grocery shopping. Finally, we turn to the role of the media as a shifter of the salience of identity on a day-to-day basis.

6.1 Conformity to Prototypical Consumption

So far, our results suggest that following the Brexit referendum, consumers revealed an in-group bias in shopping behavior, switching from EU to UK made products. In this section we examine

[17] If we include the entire universe of 15 million shoppers this value increases to a 211 million GBP change in consumer surplus.

the possibility that the shift in consumption patterns also represents a shift in taste, as shoppers seek out prototypical consumption baskets that they associate with British identity.

An important extension not yet explored empirically in the literature is the distinction between the in-group bias and the prototype model of changes in behavior. While self-categorization may imply in-group bias, it may also lead individuals to change their behavior towards the group stereotype. A pure in-group bias model would predict that patterns of consumption remain constant but consumers switch to domestic producers while the prototype model would predict that changes in consumption patterns may be more pronounced, with consumers changing their tastes across products.

To explore this possibility, we identify "quintessential" British products by obtaining the list of products that are typically sold to UK citizens living abroad, and crossing it with the list of products made in the UK that are sold in the stores in our sample.[18] We then re-run equation 2 but replacing products with the UK Flag with "Quintessential" UK products. Table 8 shows the main results: while significant, the coefficient is close to zero suggesting that most of the observed shift in the consumption of UK goods is more likely to be driven by in-group bias.

6.2 Locality Characteristics

A common narrative in the US and in Europe is that areas that face economic hardship might experience heightened awareness and support for certain political identities and support nationalistic rhetoric and behaviors. The redeeming value of national identity might be more acute when individuals feel connected through a common grievance (eg: deprivation). In fact, a small but growing literature has shown that constituencies with higher unemployment, higher inequality and higher incidence of austerity measures were more likely to vote Leave in the referendum (Becker et al. 2016; Bell and Machin 2016; Clarke and Whittaker 2016; Langella and Manning 2016; Fetzer 2018; Colantone and Stanig 2019).[19]. It is therefore possible that poor economic conditions are

[18]The list of websites used include www.britishcornershop.co.uk; www.britishessentials.com; www.boxfromuk.co.uk; www.britsuperstore.co.uk; www.britishfooddepot.co.uk; and www.ukgoods.co.uk

[19]Langella and Manning (2016) find that a declining share of employment in agriculture, manufacturing, mining and construction in the past three decades was associated with higher regional leave shares and a similar correlation is found with declining employment in services over the same period. Bella and Machin (2016) find that support for leaving the EU was higher in areas of Britain witnessing poorer performance in terms of real wage growth in the last two decades

Table 8: Difference-in-Differences Estimates: Quintessential vs UK

Dependent variable:	**Quintessential-UK**
	(1)
Post Ref	-0.001***
	(0.000)
Log(Price EU)	0.018***
	(0.001)
Log(Price UK)	-0.000***
	(0.000)
Log (Price Quintessential)	
Weekly expenditure	-0.002***
	(0.000)
Shopper FEs	YES
Week FEs	YES
Product category FEs	YES
R^2	0.392
Observations	121,281,295

Source: Transaction Data. *Log*(*Price UK*) corresponds to average product category prices for UK products and *Log*(*Price EU*) corresponds to average product category prices for EU products. *Log*(*Price Quintessential*) corresponds to average product category prices for Quintessential UK products *Weekly Expenditure* corresponds to total weekly expenditure at the shopper level. *Post Ref* represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

fertile ground for nationalistic group identities to rise to the fore. These areas may also attach more value to social signalling. Alternatively, shoppers' preferences may not be affected by the socioeconomic features of their environment, particularly if they lack explicit prescriptive norms and a clear mechanism to signal group belonging. It is also possible that the attachment to national identity is driven by political ideology, as opposed to economic fundamentals. To test these hypotheses, we examine heterogeneity in changes of consumption across areas with high and low levels of socioeconomic deprivation in the UK. We examine whether the impact of identity varies differentially across localities depending on their socioeconomic characteristics.

By matching our store data to census localities, we measure changes in consumption patterns across areas with different levels of economic deprivation in 2015.[20] Table 9 reveals that shopping

[20]The Index of Multiple Deprivation is the official measure of relative deprivation for LSOAs in England. It combines information from seven domain indices (which measure different types or dimensions of deprivation including income, unemployment, education, health, crime, access to housing and living environment) to produce an overall relative measure of deprivation. Deprivation deciles are calculated by ranking the 32,844 small areas in England from most deprived to least deprived and dividing them into 10 equal groups. These range from the most deprived 10 per cent of small areas nationally to the least deprived 10 per cent of small areas nationally. For our analysis, we use the

patterns did not vary with the level of socioeconomic deprivation in each LSOA.[21]

Table 9: Consumption Patterns and Locality Characteristics

Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Post Ref	0.218***	-0.257***
	(0.009)	(0.007)
Post Ref × Most Deprived	0.022	-0.029
	(0.035)	(0.030)
Post Ref × Mid Deprived	0.009	-0.017
	(0.014)	(0.012)
Log(Price UK)	-12.444***	12.166***
	(0.111)	(0.098)
Log(Price EU)	12.070***	-10.867***
	(0.082)	(0.070)
Weekly expenditure	-2.346***	1.580***
	(0.102)	(0.071)
Shopper FEs	YES	YES
Week FEs	YES	YES
Product category FEs	YES	YES
R^2	0.115	0.176
Observations	217415406	217415406

Source: Census and Transaction data. *Log(Price UK)* corresponds to average product category prices for UK products and *Log(Price EU)* corresponds to average product category prices for EU products. *Weekly Expenditure* corresponds to total weekly expenditure at the shopper level. *Post Ref* represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. *Most Deprived* corresponds to the bottom 25% of LSOAs in the deprivation index and *Mid Deprived* to the range 25-70%, with the omitted category representing the over 70%. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

6.3 Social signalling: evidence from consumer surveys

As discussed in section 2, consumers may respond to an increase in the salience of identity because they attach value, privately or socially, to conforming to social norms associated with the group they identify with. Our evidence so far does not, however, appear to support this interpretation. To begin with, our setting is one that lacks explicit prescriptive norms about the typical British behavior when shopping and grocery products have limited social signalling value. Moreover, we found no evidence that general community-level characteristics predicted any changes in consumption, making it less likely that the motivation behind observed shifts in consumption is a desire to signal

bottom 25%, 50-70% and over 70%. https ://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

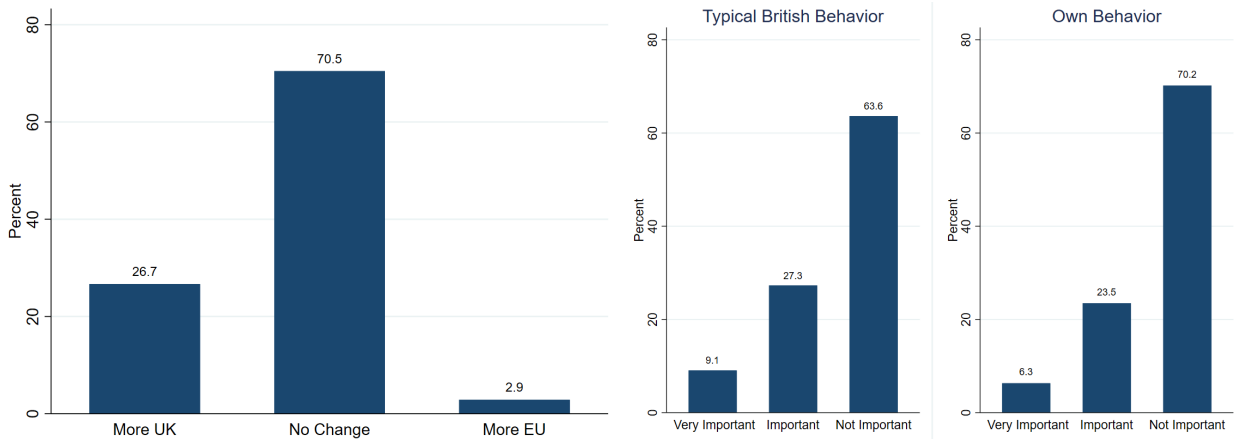
[21] In Table 2 of the Online Appendix, we use different measures of socioeconomic characteristics including income, unemployment share of blue collar workers and level of rurality of an LSOA. The results are very similar. While the coefficients for income and rurality are significant, they are all extremely small suggesting that economic conditions do not play a role in driving consumption changes.

to, or conform to, group identity and behaviors.

To shed more light on this point, we conducted an online survey of 1,085 primary grocery shoppers in the UK and obtained information on perceptions of social norms associated with British identity and grocery shopping. This sample is very similar to the sample of consumers we observe in the transaction data in terms of age, gender and average weekly expenditure.[22] 14% of the online sample shop with our retailer, which allows us to speculate on the potential external validity of our findings, beyond the retailer we worked with. Moreover, while all data are self-reported, the nature of online surveys and the anonymity they allow for make respondents less likely to bias the data towards socially desirable answers.

In the survey, we ask consumers to report on whether they changed consumption patterns following the Brexit referendum. About one-third of respondents (27%) report to have purchased more UK products in the months after the referendum.

Figure 6: Survey on changes in shopping behavior



Left panel reports share of consumers reporting a change in shopping behavior. Right panel reports the share of consumers reporting on the importance of purchasing UK products for the typical British consumer vs for themselves.

To gauge the extent to which consumers associate British identity with a particular social norm about shopping, we ask consumers to report on their perceptions of the importance of shopping for products made in the UK for the typical British consumer in the aftermath of the Brexit referendum. Additionally, we examine how much importance respondents themselves attach to shopping like the typical British shopper.

[22] Our online sample is slightly younger with an average age of 48.3 against 50 in the store sample but with a similar distribution.

The right panel of Figure 6 reveals that only about one third of respondents associate shopping for UK products as being a typical British behaviour. Over 70% of respondents report that they are not trying to conform to the perceived typical British behavior when grocery shopping. Moreover, over 96% of respondents reported feeling no pressure to shop for UK products in the aftermath of the referendum and the remaining 4% reported feeling only slight pressure to do so, and usually out of a desire to support the local economy. These findings are very similar across shoppers shopping at different retailers: Table 1 in the Online Appendix shows the p-values for tests of equality of proportions (chi-square) and of equality of distributions for behaviours and beliefs of shoppers in our retailer relative to those who report shopping at different retailers. Reassuringly, the p-values are all well above 0.4.[23]

This evidence confirms that grocery shopping is a setting that lacks focal, prescriptive social norms associated with British identity. It also suggests that identity preferences are unlikely to be driven by the desire to social signal one's identity.

6.4 Media, attention and the salience of identity

Given the limited evidence on how the observed changes in consumption behavior were driven by social conformity or social signalling, we now advance an alternative hypothesis: i) identity preferences can be latent and malleable, and ii) political events and the media can help place them top of mind and, by doing so, affect day to day economic behavior.

6.4.1 Evidence from Twitter

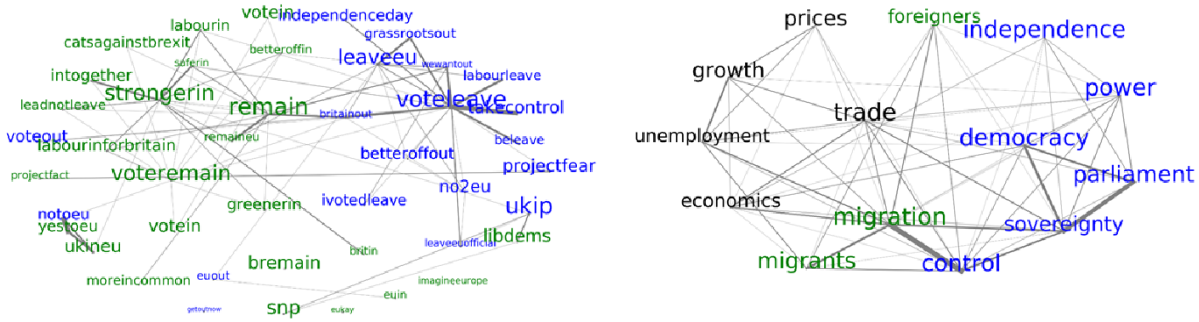
To test this hypothesis, we examine the impact of social media discussing Brexit on the timing of changes to shopping behavior. We obtain the universe of tweets published by twitter in the UK during the period between March 2015 and March 2017, totalling 19.8 million tweets. Out of this sample, we are able to geo-locate 11.3 million tweets either because the user has identified a location in the user profile or because the tweet itself was geo-tagged.[24] We then conduct slant/sentiment analysis to identify tweets that are pro or against Brexit using a supervised vector machine clas-

[23] Figure 3 in the Online Appendix also shows perceptions of consumers who reported shopping at our retailer alone.

[24] Only about 2% of tweets are geo-tagged overall.

sification method. We use the radial basis function kernel (RBF kernel) as a learning algorithm applied to a training sample comprising of 43,221 tweets about Brexit identified in Amador et al (2017). To do this we combine metric multidimensional scaling of co-occurrence and manual tweet inspection.[25] Using the same method, we further classify tweets as being predominantly about politics, about economics or about social issues such as migration, the three key issues that dominated the Brexit debate (Amador et al 2017). The two panels of Figure 7 show examples of the hastags and words used in the classification process.

Figure 7: Classification of Tweets



(a) Tweets pro and against Brexit

(b) Economic, political and trade tweets

Left panel reports the classification of tweets into pro and against Brexit: in green are hashtags and expressions classified as being against Brexit and in blue hastags and expressions classified as being pro Brexit. Right panel reports classification of tweets into economic (black), political (blue) or social (migration in green) issues.

To establish a causal link between exposure to media, identity and consumer behavior, we exploit the timing of the breakout of intense discussions about Brexit in the form of twitter "storms". We identify twitter storms as the days belonging to the top 20% of twitter activity at the national level. For these events, we compute the share of UK and EU products purchased by the shoppers in our sample, in the day before (control) and in the day in which each twitter storm took place (treated).[26] In case of a storm that lasts more than 1 day, we use only the first day and we exclude from the analysis following days, so to keep in the sample only the day before the event and the day when the storm hit. We also exclude from the sample the months of June and July 2016 (i.e. the month of the referendum and the one following it) because of the high intensity of political

[25]Note that the resulting matched dataset is very similar when we use a linear classification as opposed to an RBF kernel.

[26]Note that our results are not sensitive to the choice of this threshold. Tables 3 and 4 in the Online Appendix we show that results remain unchanged when we use a different intensity cut-off such as the top 10%.

Table 10: Twitter Storms and Consumer Behavior

Dependent variable:	**Share UK** (1)	**Share EU** (2)	**Share UK** (3)	**Share EU** (4)	**Share UK** (5)	**Share EU** (6)	**Share UK** (7)	**Share EU** (8)
Treated	0.103***	-0.045***						
	(0.018)	(0.015)						
Log(Tweets)			0.261***	-0.168***				
			(0.028)	(0.024)				
Log(Tweets pro)					0.237***	-0.147***		
					(0.026)	(0.022)		
Log(Tweets against)							0.270***	-0.176***
							(0.029)	(0.025)
Store × Event FEs	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Observations	6874833	6874833	6874833	6874833	6874833	6874833	6874833	6874833

Source: Twitter and Transaction Data. *Treated* is an indicator that equals one for purchases occurring the day of a twitter storm and 0 for the day before a twitter storm. *Log(Tweets)* corresponds to the number of tweets during a twitter storm related to Brexit, aggregated at the LSOA level but excluding the respective LSOA. *Log(Tweets pro)* is the number of tweets that were classified as being pro Brexit and *Log(Tweets against)* is the number of tweets that were classified as being against Brexit. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

discussion occurring in this period. Their inclusion would make all candidate days fall in these two months. Using this method, we identify 36 twitter storms during our period of interest between March 2015 and March 2017. The underlying assumption is that the timing of news about Brexit is not driven by shoppers' decisions of when to shop at the local level.

We then estimate the following model:

$$Share^{k}_{sct} = \delta Treated_{sct} + \beta X_t + \eta_s \times Event_t + \varepsilon_{slt} \tag{3}$$

where $Share_{slct}$ corresponds to the share of $k = UK, EU$ products sold in store s, in county c and in event t relative to the preceding day. The $Treated_{slt}$ indicator equals 1 for each day following a twitter storm (event) and we include store-event across stores and across events fixed effects. Note that in this analysis we use the universe of shoppers in each store as opposed to the panel of loyalty card consumers used in Section 3.

To exploit the intensity of tweets we replace the *Treated* variable with the number of tweets in each event - adding all tweets nationally with the exception of those from the LSOA associated with each store - in logarithmic form.[27] Finally, we examine the relative impact of tweets that are pro vs against Brexit to test whether shopping patterns are differentially affected by slant.

Table 10 shows that an increase in the number of tweets about Brexit (pro or against) at the

[27]There are no zeros in this variable.

national level is associated with a significant increase in the share of UK products and a significant decrease in the share of EU products purchased. A 10% increase in the number of tweets is associated with a 4% increase in the share of UK products purchased. We do not find a significant difference between tweets that are classified as pro or against Brexit, which suggests that it is the discussion around Brexit and keeping identity top of mind that is inducing changes in shopping behavior.[28]

To further investigate how media content mediates the impact of identity on consumer behavior we examine how market shares of UK vs EU products changed with exposure to discussions about the economics, the politics or the social issues associated with Brexit. Our key hypothesis is that, while all three themes can be connected to different dimensions of identity, discussions around the politics of regaining sovereignty are more likely to affect shopping behavior exclusively through the identity channel.

Table 11: Twitter Storms and Consumer Behavior

Dependent variable:	**Share UK** (1)	**Share EU** (2)	**Share UK** (3)	**Share EU** (4)	**Share UK** (5)	**Share EU** (6)	**Share UK** (7)
Log(Tweets immigration)	0.194***	-0.123***					
	(0.027)	(0.023)					
Log(Tweets politics)			0.360***	-0.218***			
			(0.023)	(0.019)			
Log(Tweets economy)					0.230***	-0.182***	
					(0.028)	(0.024)	
Storm							-0.125***
							(0.026)
Identity storm							0.253***
							(0.026)
Store × Event FEs	YES	YES	YES	YES	YES	YES	YES
R^2	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Observations	6,874,833	6,874,833	6,874,833	6,874,833	6,874,833	6,874,833	6,874,833

Source: Twitter and Transaction Data. *Log(Tweets immigration)* is the number of tweets classified as being about immigration during the twitter storms in logarithmic form. *Log(Tweets politics)* is the number of tweets classified as being about politics during the twitter storms and *Log(Tweets economics)* is the number of tweets classified as being about economics during the twitter storms, both in logarithmic form. *Storm* is an indicator that equals one for purchases occurring the day of a twitter storm and if the tweet storm is not classified as an identity storm. *Identity Storm* is an indicator that equals one for purchases occurring the day of a twitter storm if the tweet storm is classified as an identity storm. Store times event fixed effects are included. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

[28] In Table 4 of the Online Appendix we show that these results are very similar when we use the top 10% of twitter activity at the national level, thus increasing the number of twitter storms we use for identification. Table 5 also shows that the results are similar when we use another strategy to identity twitter storms based on tweets by "influencers". We identify "influencers" on twitter by creating an index that equally weights the number of tweets, the weekly frequency of tweets, the number of friends and the number of followers, as a measure of twitter usage and influence. The results are very similar when we use this type of measure.

Table 11 shows results that are consistent with our main hypothesis: discussion around all three themes are associated with an increase in the purchase of UK products and a decrease in the purchase of EU products, but the coefficient for political tweets is relatively larger in magnitude and statistically different from the coefficients for economic or social tweets. This lends further support to the importance of identity, and particularly political national identity, as driving the observed changes in day to day economic decisions.[29]

We conduct a further test of the role of identity. We split the twitter storms into two categories: those that do and do not have a strong identity connotation. To do so, we follow the methods used in social psychology to identify tweets that reflect group identity based on the frequency of first person plural pronouns such as "us", "we", "our"and the use of expressions that refer to British people as a group (Brewer and Gardner 1996, Pennebaker et al. 2003 and Sylwester and Purver 2015). This literature argues that exposure to first-person plural pronouns lead individuals to adopt a collectivist self-view. As shown in column (7), the effect estimated in column (1) of Table 10 is driven mostly by the storms with an identity connotation, while "neutral" storms, probably because the discussion is more about the legal or technical aspects of Brexit, have an opposite and smaller effect on consumption.

We interpret twitter activity and in particular twitter storms as a proxy for more intense general media discussions around Brexit, given that we are unable to match twitter users to consumers and the fact that twitter users will often tweet about news in the traditional media. In Table 6 of the Online Appendix, we show that the results are similar when we use the frequency of newspaper articles from the traditional media in a given day as a shifter of the salience of identity.

All in all, our findings suggest that individuals may derive utility from privately consuming identity products, that identity preferences are malleable and that a determinant of their importance in shaping economic behavior is the ability of the media to keep this product attribute top of mind.

[29]In Table 5 of the Online Appendix we show that the differential impact of tweets about politics relative to economics and social issues is even larger when we consider a narrower definition of twitter storms to include the top 10% of twitter activity days only.

7 Alternative Explanations

7.1 Attention vs Identity

Section 6.4 showed that the media can play an important role in keeping identity top of mind, which can then affect everyday consumer behavior. In this section we explore an alternative hypothesis: can the observed effects be fully explained by changes in attention to a particular attribute of a good, in this case country of origin? If the media makes Britishness top of mind, then will consumers simply think about British products when they enter the store and shop accordingly, without necessarily holding any identity preferences? To address this point, we vary the intensity of the identity signal of different events, and observe the corresponding change in consumer behavior.

We focus on the Euro 2016 football championship and identify the days in which the England team won against a European team during the championship or during the qualifiers. While the EU championship can still make British identity salient, it is less likely to exert a profound and long-lasting shift in perceived identities when compared to an event like the Brexit referendum. We then implement a sharp event study around each of the 15 events and observe shopping behavior for UK and EU products before and after each event.

Table 12 reveals that England's wins have no effect on the share of UK products purchased and are associated with a small reduction (0.6%) in consumption of EU products. These findings suggest that shifts in attention to national identity are more likely to have a significant impact on consumer behavior when they trigger strong and latent identity preferences.

Table 12: England's wins in Euro 2016 and Consumer Behavior

	England win	
Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Treated	-0.006	-0.124***
	(0.030)	(0.025)
Store × Event FEs	YES	YES
R^2	0.010	0.010
Observations	2600263	2600263

Source: EURO 2016 and Transaction Data. *Treated* corresponds to shopping visit that occurred a day of the match, compared to the day prior to the match. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

7.2 Rational expectations and demand-side changes

An alternative interpretation of our findings could be that shoppers anticipate either the worsening of economic conditions following Brexit or future negative supply shocks for European products. If they were hyper-rational and sophisticated, consumers could potentially begin to phase out consumption of EU products in anticipation of these changes. Our evidence is, however, inconsistent with this hypothesis. First, concerns about supply shocks due to a no deal Brexit appeared much later in the public discourse, outside our window of analysis. In Figure 8 we show the frequency of google searches on the term "no deal Brexit".[30]

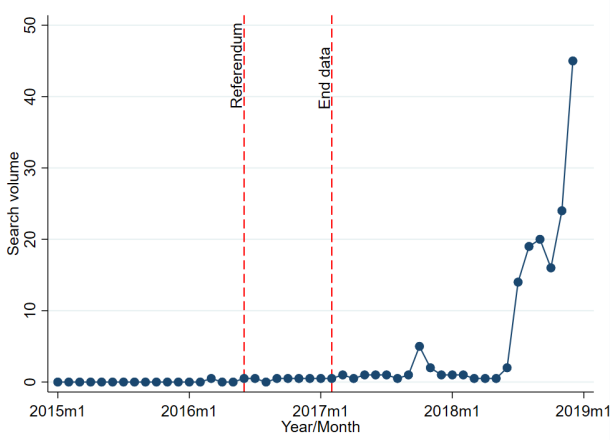


Figure 8: Google Search Index for the Term "No Deal Brexit".

This suggests that disruptions to trade flows and supply shocks only became a public concern significantly later, by the end of 2017. Second, as discussed in Sections 3 and 4, over 95% of products in our sample were continuously traded and on shelf throughout our period of analysis, which is consistent with the fact that there was no short-run disruption to supply chains (and therefore no likely anticipation of such) during our period of analysis. Crucially, we observe that absolute and relative prices were stable for UK and EU products. Nonetheless, in all specifications, we control for total shopper's weekly expenditure, which is likely to be a good proxy of expectations about future economic conditions.

[30]The figure represent search interest relative to the highest point on the chart for the given region and time. A value of 100 corresponds to the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means that there was not enough data for this term.

7.3 Supply-side Changes

Our difference-in-differences and event study identification strategies rely on the (verified) assumption that there were no changes on the supply side including prices, packaging and availability on shelf. The stability of prices was already discussed in Figure 5 and Section 3 discusses the fact that the vast majority of products (95%) remained on shelf in all stores throughout our period of analysis. While we can verify that this was indeed the case by using information directly obtained from the retailer, we also conduct a robustness exercise in which we restrict our analysis in the difference in differences study to the month immediately after the referendum, when any changes would have been extremely unlikely to occur as the retailer was locked into multi-month contracts with suppliers. Changing packaging at scale is extremely challenging for suppliers or for the retailer in the short-run, so restricting the analysis to the first four weeks following the referendum is the most conservative test we can consider.

Table 13: Difference-in-Differences Estimates: Supply-Side

Dependent variable:	**National-UK**	**National- EU**
	(1)	(2)
Post Ref within 4 weeks	0.035**	-0.048***
	(0.015)	(0.013)
Post Ref after 4 weeks	0.257***	-0.305***
	(0.008)	(0.007)
Log(Price UK)	-12.561***	12.291***
	(0.112)	(0.098)
Log(Price EU)	12.099***	-10.881***
	(0.082)	(0.070)
Weekly expenditure	-2.348***	1.583***
	(0.103)	(0.071)
Shopper FEs	YES	YES
Week FEs	YES	YES
Product category FEs	YES	YES
R^2	0.115	0.176
Observations	215,220,529	215,220,529

Source: Transaction Data. $Log(Price\ UK)$ corresponds to average product category prices for UK products and $Log(Price\ EU)$ corresponds to average product category prices for EU products. $Weekly\ Expenditure$ corresponds to total weekly expenditure at the shopper level. $Post\ Ref$ represents an indicator equalling 1 for the period after the Brexit referendum between June 2016 and March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

The evidence in Table 13 suggests that the effect of the treatment –having a flag or a British

identifier in the name– is positive during the first month following the referendum, but it increases seven-fold in the remaining 8 months. Had there been significant changes on the supply side, particularly through changes in packaging to increase the number of products carrying a British flag, the coefficient should be smaller as our control group in the difference-in-differences model would have become "treated". The broader fact that the treatment effect increases with distance from the event is consistent with our previous findings that there was relatively limited discussion in the media prior to the Brexit campaign, followed by several media storms that kept identity increasingly top of mind in the 9 months following the Brexit referendum.

7.4 Price Endogeneity

As shown in Figure 5, average prices were stable throughout our period of analysis. While the retailer adopts a strategy of national pricing, there is still the possibility of some residual price variation at the store level, which may be driven by the timing of promotional endpoints. While promotions are also decided nationally, it is also possible that some stores may, on occasion, keep a promotion going for an extra week. Notice that in our main models (1) and (2), we include shopper and product category FEs, which control for all time-invariant characteristics such as those related to the type of store, its promotional policy and the choice set available to shoppers. Nevertheless, to allay concerns about price endogeneity, in this section we show results when we instrument UK and EU average prices. The instruments we employ are related to supply-side or aggregate demand factors that are plausibly exogenous and can shift prices at the local level: i) competition from the other top retailers in the locality; ii) demand shocks in UK or EU product categories taking place in nearby stores that can influence product availability (and in turn pricing); and iii) demand shocks interacted with each store's distance to the nearest distribution centre.

We identify local competition through the local opening and closures of the 3 main retail competitors to our retailer, which occurred during our window of analysis. This instrument relies on the competitive effect of having more stores operating in the same area.[31] Thus, for every store in our sample, we compute the number of competitors in each week, within several distances. In

[31] On the role of concentration on prices, see for instance Weiss 1989, Bresnahan and Reiss 1991, Goolsbee and Syverson 2008, Schaumans and Verboven 2008 and the vast literature on market concentration and pricing.

particular, we focus on 2 distances. First, the number of competitors within 1 km of each store (close competitors), which we use as a control variable since this variable can capture any further confounder related to the commercial attractiveness of the area where the store is located. Second, we consider the number of competitors within the greater radius of 5 km around each of our stores. We further break down these competitor stores into their potential "identity", based on the approximate share of UK products sold in each retail chain. This leads us to identify competitor chains that are comparable to our retailer (*Comparable*), and stores that carry a significantly larger share of UK products (*Higher UK*).

The second set of instruments are based on (lagged) demand shocks happening to the stores of the same retailer that operate in the same geographical area of each store. The rationale for these instruments is that an unforeseen surge in demand for a certain type of product can generate local stock outs, which in turn can push the nearby stores to refrain from price discounts or even raise prices. We construct the *local demand shock* instrument as follows: i) given a store s in week t in our sample, we consider the set of stores that are located in the same LSOA area, and we examine consumption of UK(EU) product in week $t-1$ (for each product category). We consider that a demand shock takes place if at least 30% of the nearby stores have experienced a demand for the product that belongs to the top 5% in the store's history.[32] We also interact this measure with each store's distance to a distribution centre, called *Distance DC*. The intuition for this interaction is that the effect of stock outs in neighboring stores may be mediated by the distance between the store and its distribution centre, as distance can influence the time needed to replenish the shelves.

We estimate the same model as in (1), but here we instrument the (log) prices. Thus, the estimated coefficients can be directly compared with those reported in Table 3 in Section 4.1. Table 14 reports the results. The estimates show that our earlier findings about the impact of the Brexit referendum on consumption of UK and EU products remain unchanged, even when we

[32] More precisely, we flexibly model the demand of product category c, in store s, in week t using the following model:

$$Sales_{sct} = \phi_c \times \gamma_t + \eta_s + \varepsilon_{sct} \tag{4}$$

where $\phi_c \times \gamma_t$ are a set of product category-week fixed effects (to model seasonality in product category consumption) and η_s is a set of store fixed effects. The residuals that we obtain from the estimation $\hat{\varepsilon}_{sct}$, which capture the deviations from the seasonality captured (conditional on the stores' idiosyncratic characteristics), are then the category/store week deviations that we use to identify abnormal consumption.

Table 14: Instrumenting for UK and EU Average Prices

Dependent Variable:	**Log(Price UK)** IV 1st	**Log(Price EU)** IV 1st	**Share UK** IV 2nd	**Share EU** IV 2nd
Post Ref	-1.82***	-1.48***	0.49***	-0.54***
	(0.00)	(0.00)	(0.06)	(0.05)
Ln(Price UK)			-33.93***	37.69***
			(5.10)	(4.01)
Ln(Price EU)			57.08***	-61.88***
			(5.08)	(4.13)
Num. Comparable stores within 5 km	0.02***	0.01***		
	(0.00)	(0.00)		
Num. Higher UK stores within 5 km	-0.18***	-0.22***		
	(0.00)	(0.00)		
Lag UK local demand shock	0.13***	0.05***		
	(0.01)	(0.01)		
Lag EU local demand shock	0.55***	-0.17***		
	(0.00)	(0.01)		
Lag UK local demand shock × Distance DC	-0.00***	0.00***		
	(0.00)	(0.00)		
Lag EU local demand shock × Distance DC	-0.00***	0.00		
	(0.00)	(0.00)		
Num. Comp within 1 km	-0.96***	-1.02***	0.30***	-0.29***
	(0.00)	(0.00)	(0.04)	(0.03)
Weekly expenditure	0.49***	0.35***	-2.40***	1.64***
	(0.02)	(0.02)	(0.11)	(0.08)
Controls	Yes	Yes	Yes	Yes
F-test			1491.484	1491.484
Observations	205156381	205156381	205156381	205156381

Source: Transaction Data. $Log(Price\,UK)$ corresponds to the average product category prices for UK products and $Log(Price\,EU)$ corresponds to the average product category prices for EU products. *Num. comparable stores within 5km* is the number of competitors selling comparable products within a radius of 5km. *Num. higher UK stores within 5km* is the number of competitors selling a larger share of UK products than our retailer within a radius of 5km. *Lag UK local demand shock* is an indicator variable equalling 1 if other stores of our retailer located in the same LSOA experienced a large positive demand shock for UK products in the previous week. *Lag EU local demand shock* is an indicator variable equalling 1 if other stores of our retailer located in the same LSOA experienced a large positive demand shock for EU products in the previous week.*Distance DC* is the distance between the store and the closest distribution center of the retailer. *Num. Comp within 1 km* is the (total) number of competitors within a radius of 1km around the store. $Weekly\ Expenditure$ corresponds to total weekly expenditure at the shopper level. $Post\,Ref$ represents an indicator equalling 1 for the period after the Brexit referendum between June 2016 and March 2017 and 0 for the period between March 2015 and June 2016. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

account for potential residual variation in prices at the store level. Furthermore, the magnitude of both the effect of the referendum and the estimated price elasticities increase, thus suggesting that our main results might be a conservative measure of the actual impact of the impact of identity on consumption shifts and welfare.

7.5 Sampling Bias

7.5.1 Retailer

Our sample of stores covers 39,775 LSOAs (95.3%) out of 41,729 LSOAs in the UK. As shown in Table 15, the remaining 5% of LSOAs not covered in our sample are almost identical on key socioeconomic characteristics.

Table 15: Descriptive Statistics: LSOAs

	LSOA covered (N=39775)		**LSOA UK (N=41729)**	
Variable	Mean	Std. dev.	Mean	Std. dev.
Share White (%)	86.65	18.51	86.75	18.60
Unemployment (%)	6.47	4.01	6.58	4.13
Blue collar (%)	24.10	7.25	24.22	7.30
Rural	17.47	36.97	17.20	36.75

Source: Census Data. All variables are at the LSOA level (1,500 people on average). *Share White* represents the share of white residents, *Unemployment* represents share of unemployment, *Blue collar* represents the share of blue collar workers, and *Rural* corresponds to a rurality index increasing from 0 to 1.

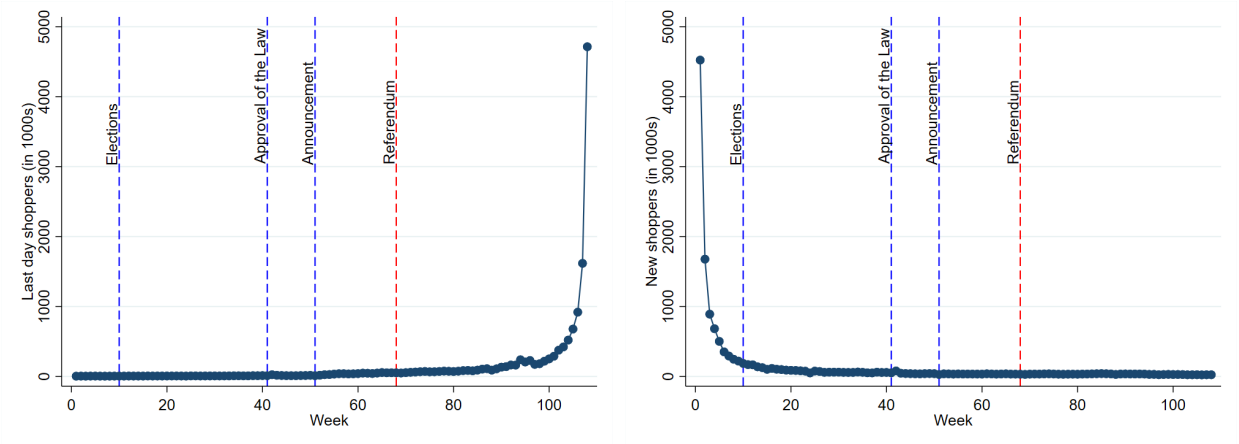
7.5.2 Shoppers

A potential confounding factor in our analysis is that the observed change in consumption patterns could be driven by compositional changes in the type of shoppers who appear in our dataset. Our baseline analysis is based on an unbalanced set of shoppers, as they enter and exit the sample during the period under analysis. We define exit as a shopper appearing regularly in our dataset and then not shopping again until the end of the analysis.[33] Reassuringly, Figure 9 confirms that there is no abnormal exit or entry of shoppers that coincided with the Brexit referendum.

Moreover, shoppers who enter our dataset in the three months after the Brexit referendum do so at the same rate as shoppers who entered the dataset in the three months prior to the referendum. Importantly, these new entrants are similar in average expenditure relative to those in the main sample of shoppers from before the referendum.

[33] When we use an alternative definition of exit one in which a shopper exits when there is a below median persistent drop in shopping frequency following Brexit -, results remain unchanged.

Figure 9: Week of first and last appearance of a shopper in our sample.



(a) Week of first appearance

(b) Week of last appearance

8 Conclusions

This paper provides novel evidence on the impact of political events in shaping identity, and on how identity can affect routine and near-universal economic behaviors. We examine the impactful yet unexpected outcome of the Brexit referendum as a shock to the salience of British identity on consumers' decisions to shop for UK vs EU grocery products. We find that in the aftermath of the referendum: i) shoppers were more likely to consume UK products and to decrease consumption of EU products and that sales increased even more for products that prominently displayed their origin in the front package (by including a flag or a British moniker in the name).

The evidence suggests that changes in consumption patterns were driven by in-group bias, i.e. shoppers swapping similar UK products for EU products. We find no evidence that the identity shock led to a substantive change in taste and a move towards prototypical consumption in the form of purchasing "quintessentially" British products.

On mechanisms, we find no evidence to support the fact that changes in consumption patterns were driven by localities' socioeconomic characteristics. Instead, we find that a move towards UK products is strongly associated with media discussions about the politics of Brexit. Media storms can significantly increase the salience of identity and as a result, lead to significant changes in consumer behavior.

Overall, our findings underscore the fact that identity preferences can matter even in settings that lack focal, prescriptive social norms about group behavior, and that the media can play an important role in keeping it top of mind.

References

Akerlof, G. A. and Kranton, R. E. (2000). Economics and identity. *The quarterly journal of economics*, 115(3):715–753.

Andreoni, J. (1990). Impure altruism and donations to public goods: A theory of warm-glow giving. *The economic journal*, 100(401):464–477.

Aronczyk, M. (2013). *Branding the Nation*. Oxford University Press.

Atkin, D., Colson-Sihra, E., and Shayo, M. (2019). How do we choose our identity? a revealed preference approach using food consumption. *Journal of Political Economy*.

Bénabou, R. and Tirole, J. (2004). Willpower and personal rules. *Journal of Political Economy*, 112(4):848–886.

Bertrand, M. and Kamenica, E. (2018). Coming apart? cultural distances in the united states over time. Technical report, National Bureau of Economic Research.

Besley, T. and Burgess, R. (2001). Political agency, government responsiveness and the role of the media. *European Economic Review*, 45(4-6):629–640.

Bordalo, P., Gennaioli, N., and Shleifer, A. (2020a). Memory, attention, and choice. *The Quarterly Journal of Economics*, 135(3):1399–1442.

Bordalo, P., Nardotto, M., and Sequeira, S. (2020b). Price norms and consumer behavior. Manuscript.

Branscombe, N. R., Ellemers, N., Spears, R., Doosje, B., et al. (1999). The context and content of social identity threat. *Social identity: Context, commitment, content*, pages 35–58.

Bresnahan, T. F. and Reiss, P. C. (1991). Entry and competition in concentrated markets. *Journal of political economy*, 99(5):977–1009.

Brewer, M. B. and Gardner, W. (1996). Who is this "we"? levels of collective identity and self representations. *Journal of Personality and Social Psychology*, 71:83–93.

Crumpler, H. and Grossman, P. J. (2008). An experimental test of warm glow giving. *Journal of public Economics*, 92(5-6):1011–1021.

Davies, P. G., Steele, C. M., and Markus, H. R. (2008). A nation challenged: The impact of foreign threat on america's tolerance for diversity. *Journal of personality and social psychology*, 95(2):308.

Depetris-Chauvin, E. and Durante, R. (2017). One team, one nation: Football, ethnic identity and conflict in africa.

Escalas, J. E. and Bettman, J. R. (2005). Self-construal, reference groups, and brand meaning. *Journal of consumer research*, 32(3):378–389.

Fouka, V. and Voth, H.-J. (2013). Reprisals remembered: German-greek conflict and car sales during the euro crisis. *Manuscript*.

Gennaioli, N. and Tabellini, G. (2019). Identity, beliefs, and political conflict. Manuscript.

Gentzkow, M. (2006). Television and voter turnout. *The Quarterly Journal of Economics*, 121(3):931–972.

Gentzkow, M. and Shapiro, J. M. (2008). Preschool television viewing and adolescent test scores: Historical evidence from the coleman study. *The Quarterly Journal of Economics*, 123(1):279–323.

Gentzkow, M. A. and Shapiro, J. M. (2004). Media, education and anti-americanism in the muslim world. *Journal of Economic perspectives*, 18(3):117–133.

Goolsbee, A. and Syverson, C. (2008). How do incumbents respond to the threat of entry? evidence from the major airlines. *The Quarterly journal of economics*, 123(4):1611–1633.

Grossman, G. M. and Helpman, E. (2018). Identity politics and trade policy. Technical report, National Bureau of Economic Research.

Hong, C., Hu, W.-M., Prieger, J. E., and Zhu, D. (2011). French automobiles and the chinese boycotts of 2008: Politics really does affect commerce. *The BE Journal of Economic Analysis & Policy*, 11(1).

Huang, F. and Lee, M.-J. (2010). Dynamic treatment effect analysis of tv effects on child cognitive development. *Journal of Applied Econometrics*, 25(3):392–419.

Kearney, M. S. and Levine, P. B. (2014). Income inequality and early nonmarital childbearing. *Journal of Human Resources*, 49(1):1–31.

Khan, R., Misra, K., and Singh, V. (2013). Ideology and brand consumption. *Psychological science*, 24(3):326–333.

La Ferrara, E., Chong, A., and Duryea, S. (2012). Soap operas and fertility: Evidence from brazil. *American Economic Journal: Applied Economics*, 4(4):1–31.

Newman, B. J. and Bartels, B. L. (2011). Politics at the checkout line: Explaining political consumerism in the united states. *Political Research Quarterly*, 64(4):803–817.

Nosofsky, R. M. (1986). Attention, similarity, and the identification–categorization relationship. *Journal of experimental psychology: General*, 115(1):39.

Paluck, E. L. (2009). Reducing intergroup prejudice and conflict using the media: a field experiment in rwanda. *Journal of personality and social psychology*, 96(3):574.

Pandya, S., Cian, L., and Venkatesan, R. (2018). Grocery shopping for america: External vs. internal threats to national identity. Manuscript.

Pennebaker, J. W., Mehl, M. R., and Niederhoffer, K. G. (2003). Psychological aspects of natural language use: Our words, our selves. *Annual Review of Psychology*, 54(1):547–577.

Schaumans, C. and Verboven, F. (2008). Entry and regulation: evidence from health care professions. *The Rand journal of economics*, 39(4):949–972.

Shayo, M. (2009). A model of social identity with an application to political economy: Nation, class, and redistribution. *American Political science review*, pages 147–174.

Shayo, M. (2020). Social identity and economic policy. *Annual Review of Economics*.

Snyder, J. M. and Strömberg, D. (2010). Press coverage and political accountability. *Journal of political Economy*, 118(2):355–408.

Strömberg, D. (2004a). Mass media competition, political competition, and public policy. *The Review of Economic Studies*, 71(1):265–284.

Strömberg, D. (2004b). Radio's impact on public spending. *The Quarterly Journal of Economics*, 119(1):189–221.

Sylwester, K. and Purver, M. (2015). Twitter language use reflects psychological differences between democrats and republicans. *PLOS One*, 10(9).

Tajfel, H. (1981). *Human groups and social categories: Studies in social psychology*. Cambridge University Press.

Tajfel, H. (1982). *Instrumentality, identity and social comparisons.* In H. Tajfel (Ed.) Social Identity and intergroup relations (pp. 483-507). Cambridge University Press.

Tajfel, H. and Turner, C. (1986). *The social identity theory of intergroup behaviour.* In S. Worchel and W.G. Austin (Eds.), Psychology of intergroup relations (2nd ed., pp 7-24). Chicago: Nelson-Hall.

Weiss, L. W. (1989). *Concentration and price*. MIT Press.

Yanagizawa-Drott, D. (2014). Propaganda and conflict: Evidence from the rwandan genocide. *The Quarterly Journal of Economics*, 129(4):1947–1994.

Online Appendix for

Identity, Media and Consumer Behavior

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1 Price Analysis

Figures 1 and 2 show a non-parametric fit of the coefficients of variation of UK and EU products. In both cases, price dispersion was fairly stable throughout our period of interest. The dispersion of EU prices is on a very slight upward trend that is not affected by the Referendum. This supports our assumption of price rigidity during our window of analysis.

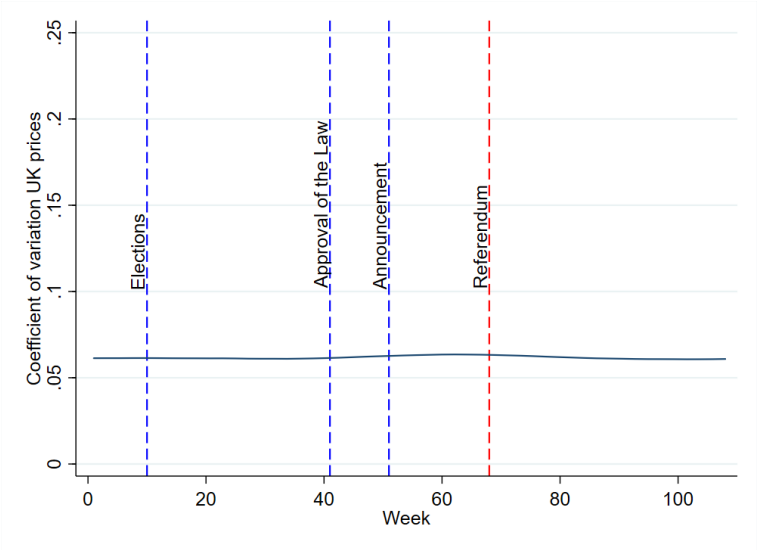

Figure 1: Non-parametric fit of coefficients of variation computed for UK products per product category.

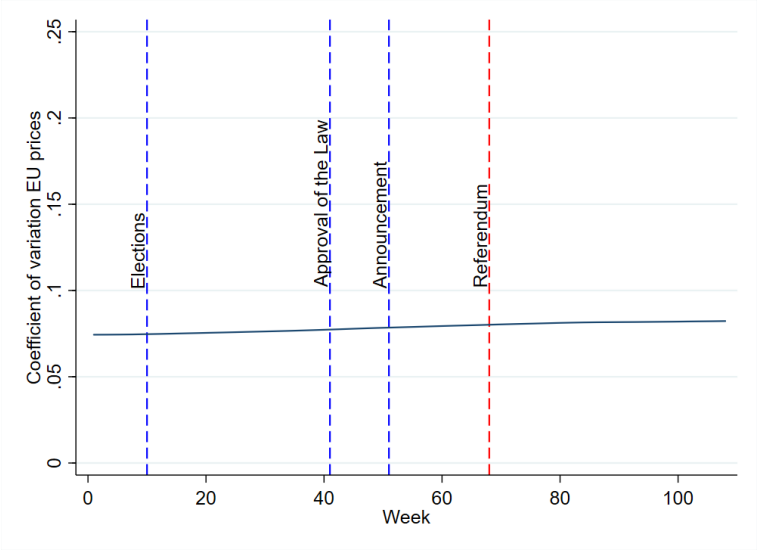

Figure 2: Non-parametric fit of coefficients of variation computed for EU products per product category.

2 The Value of Identity

Figure 3 shows the inverse demand for UK products in our sample.

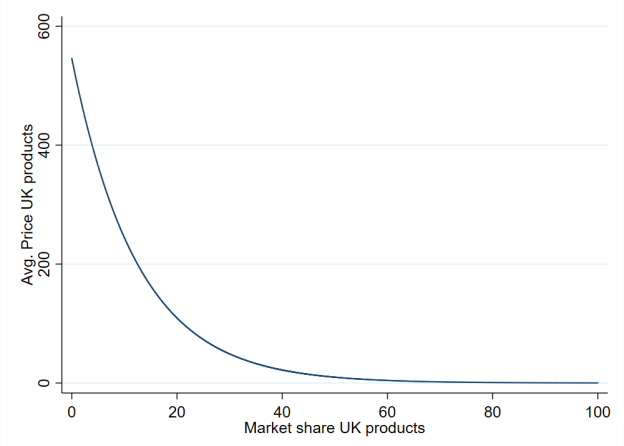

Figure 3: Inverse Demand for UK Products

3 Consumer Surveys

To examine the external validity of our findings, we compare beliefs and reported behaviors of consumers who report shopping at our retailer relative to those who report shopping at alternative retailers. Table 1 shows the p-values for tests of equality of proportions (chi-square) and of equality of distributions for the key reported behaviours and beliefs discussed in the main paper.

Table 1: Shopper Beliefs Across Retailers

	P-values Equality of	
	Proportions	Distributions
Changed Shopping Behavior	0.40	0.85
Typical British Consumer Behavior	0.49	1
Own Behavior	0.76	1

Source: Online Consumer Survey with a sample of 1,085 consumers. The table compares reported beliefs and behaviors for shoppers who shop in our partner retailer to those of shoppers who shop in the remaining retailers in the UK. The table reports the P-values for tests of equality of proportions (chi-square) and for a kolgomorov-smirnov test for equality of distributions for the main variables captured in the survey.

The p-values are all well above 0.4. In Figure 4, we show that the key findings on perceptions about social norms about British behavior in shopping and own behavior are very similar between shoppers who report shopping in our retailer relative to those who report shopping in alternative retailers.

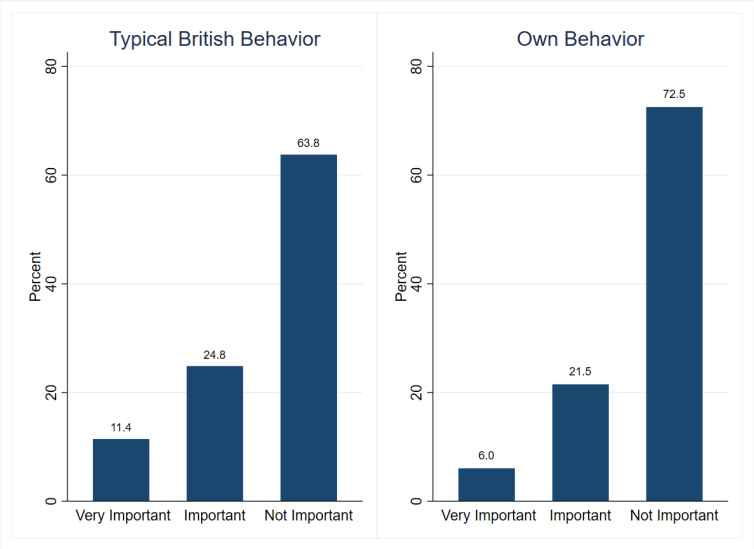

Figure 4: Share of consumers reporting on the importance of purchasing UK products for the typical British consumer vs for themselves, for shoppers in our retailer.

4 Locality Characteristics

In this section we consider alternative measures of socioeconomic development at the LSOA level. Instead of the index of multiple deprivation used in the main paper, we use data on income, share of blue collar workers, unemployment and an index of rurality (between 0 and 1). These indicators are all captured at the LSOA level and were obtained from the UK census.

Table 2: Consumption Patterns and Locality Characteristics

Dependent variable:	**Share UK**		**Share EU**	
	(1)	(2)	(3)	(4)
Post Brexit	0.257***	0.207***	-0.266***	-0.210***
	(0.024)	(0.022)	(0.021)	(0.019)
Log(Price UK)	-12.444***	-12.445***	12.165***	12.166***
	(0.111)	(0.111)	(0.098)	(0.098)
Log(Price EU)	12.070***	12.070***	-10.867***	-10.867***
	(0.082)	(0.082)	(0.070)	(0.070)
Total daily expenditure	-2.346***	-2.346***	1.580***	1.580***
	(0.102)	(0.102)	(0.071)	(0.071)
Post Brexit × I(high income)	-0.038***		0.046***	
	(0.014)		(0.012)	
Post Brexit × Blue collar	-0.001	-0.001	-0.001	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Post Brexit × Unemployment		0.004**		-0.004**
		(0.002)		(0.002)
Post Brexit × Rural	0.041**	0.035**	-0.034**	-0.026*
	(0.017)	(0.017)	(0.015)	(0.015)
Household FEs	YES	YES	YES	YES
Week FEs	YES	YES	YES	YES
Product category FEs	YES	YES	YES	YES
R^2	0.115	0.115	0.176	0.176
Observations	217415406	217415406	217415406	217415406

Source: Census and Transaction data. $LogPriceUK$ corresponds to average product category prices for UK products and $LogPriceEU$ corresponds to average product category prices for EU products. $WeeklyExpenditure$ corresponds to average weekly expenditure at the shopper level. $PostBrexit$ represents an indicator equalling 1 for the period after the Brexit referendum until March 2017 and 0 for the period between March 2015 and June 2016. $I(high\,income)$ corresponds to an indicator for LSOA average income above median value and 0 otherwise. $Rural$ corresponds to a rurality index obtained from the UK census that ranges from 0 to 1. $Blue\,Collar$ corresponds to the share of blue collar workers i the LSOA and $Unemployment$ corresponds to the share of unemployment at the LSOA level. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

Confirming the results in the main paper, we find that while some coefficients are statistically significant –income, unemployment and rurality index – the results are quantitatively extremely

small suggesting that the socioeconomic features of one's environment do not play an important role in how identity preferences affects shopper behavior.

5 Media

5.1 Twitter Data

5.1.1 Identification of Twitter Storms

In this section we test the robustness of our analysis of the intensity of twitter discussions and changes in shopping patterns. In our main analysis, we identify a causal relationship between exposure to the media (via twitter activity) and shopping behavior by exploiting twitter storms that are defined as episodes among the top 20% of twitter activity around Brexit throughout our window of analysis. We now revisit this approach and tighten this classification to include the top 10% of twitter activity at the national level. Tables 3 and 4 show that our results remain stable.

Table 3: Twitter Storms and Consumer Behavior

Dependent variable:	**Share UK**	**Share EU**	**Share UK**	**Share EU**	**Share UK**	**Share EU**	**Share UK**	**Share EU**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated	3.124	-0.835						
	(2.032)	(1.723)						
Log(Tweets)			0.124***	-0.135***				
			(0.028)	(0.023)				
Log(Tweets pro)					0.126***	-0.117***		
					(0.026)	(0.022)		
Log(Tweets against)							0.123***	-0.148***
							(0.029)	(0.024)
Store × Event FEs	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Observations	5572081	5572081	5572081	5572081	5572081	5572081	5572081	5572081

Source: Twitter and Transaction Data. *Treated* is an indicator that equals one for purchases occurring the day after a twitter storm and 0 for the day before a twitter storm. *LogTweets* corresponds to the number of tweets during a twitter storm related to Brexit, aggregated at the LSOA level but excluding the respective LSOA. *LogTweetsPro* corresponds to the number of tweets that were classified as being Pro Brexit and *LogTweetsAgainst* corresponds to the number of tweets that were classified as being Against Brexit. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

The differential impact of tweets about politics relative to economics and social issues is even larger when we consider a narrower definition of twitter storms, which confirms our interpretation

Table 4: Twitter Storms and Consumer Behavior

Dependent variable	**Share UK** (1)	**Share EU** (2)	**Share UK** (3)	**Share EU** (4)	**Share UK** (5)	**Share EU** (6)
Log(Tweets immigration)	0.098***	-0.101***				
	(0.025)	(0.021)				
Log(Tweets politics)			0.329***	-0.249***		
			(0.031)	(0.026)		
Log(Tweets economy)					0.121***	-0.156***
					(0.029)	(0.025)
Store × Event FEs	YES	YES	YES	YES	YES	YES
R^2	0.008	0.008	0.008	0.008	0.008	0.008
Observations	5572081	5572081	5572081	5572081	5572081	5572081

Source: Twitter and Transaction Data. $Log(Tweets\,immigration)$ corresponds to the number of tweets classified as being about immigration during the twitter storms in logarithmic form. $Log(Tweets\,politics)$ corresponds to the number of tweets classified as being about politics during the twitter storms in logarithmic form and $Log(Tweets\,economics)$ corresponds to the number of tweets classified as being about economics during the twitter storms, both in logarithmic form. Store times event fixed effects are included. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

in the paper that arguments about the politics of Brexit are more likely to be affecting shopping behavior through the identity channel.

5.1.2 Influencers

To verify the robustness of our media results, we explore an alternative identification strategy to examine the causal link between exposure to the media and consumer behavior. We identify top "influencers" on twitter by creating an index that equally weights the number of tweets, the weekly frequency of tweets, the number of friends and the number of followers, as a measure of twitter usage and influence. We then identify twitter storms based on the timing of the top 10% influencers' tweets, and again compare shopping activity the day before and after the top 10% of twitter episodes triggered by influencers occur. As shown in table 5, our results remain unchanged.

5.1.3 Sampling Bias

An additional potential concern is that twitter users represent a non-random, non-representative sample of individuals at the locality level. While we cannot fully dismiss this possibility, we find strong evidence that increased twitter activity at the locality level is strongly correlated with

Table 5: Twitter Storms and Consumer Behavior: Influencers

Dependent variable:	**Share UK** (1)	**Share EU** (2)	**Share UK** (3)	**Share EU** (4)	**Share UK** (5)	**Share EU** (6)	**Share UK** (7)	**Share EU** (8)
Treated	0.132***	-0.080***						
	(0.018)	(0.015)						
Log(Tweets)			0.407***	-0.271***				
			(0.029)	(0.024)				
Log(Tweets pro)					0.357***	-0.245***		
					(0.029)	(0.024)		
Log(Tweets against)							0.409***	-0.268***
							(0.029)	(0.024)
Store × Event FEs	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Observations	7420818	7420818	7420818	7420818	7420818	7420818	7420818	7420818

Source: Twitter and Transaction Data. *Treated* is an indicator that equals one for purchases occurring the day of a twitter storm and 0 for the day before a twitter storm. *Log*(*Tweets*) corresponds to the number of tweets during a twitter storm related to Brexit, aggregated at the LSOA level but excluding the respective LSOA. *Log*(*Tweets pro*) is the number of tweets that were classified as being pro Brexit and *Log*(*Tweets against*) is the number of tweets that were classified as being against Brexit. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.

increased usage of other, perhaps more representative, social media platforms such as facebook. As shown in figure 5, there is a strong correlation between twitter and facebook activity at the locality level.[1]

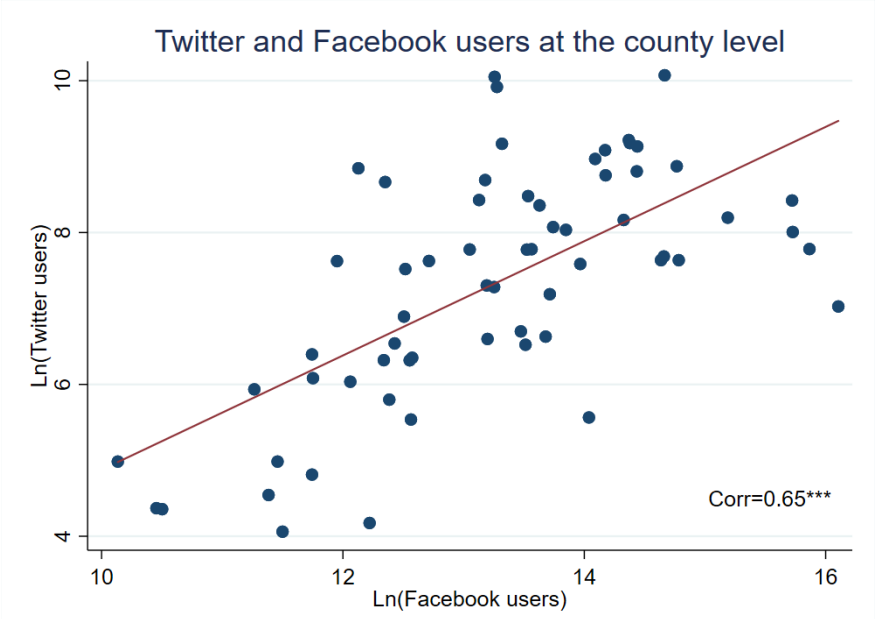

Figure 5: Correlation between Twitter and Facebook usage at the locality level.

This evidence reinforces our interpretation of the twitter data as a proxy for exposure to the

[1]Facebook usage is retrieved by using Google search API to identify users that list a given locality in their user profile.

media more broadly.

A final potential source of sampling bias relates to the sample of tweets used in the twitter analysis. We are able to geo-locate 11.3 million tweets out of a universe of 19.8 million tweets. Figure 6 confirms that we can match twitter data to most LSOAs in the UK. We further find that the share of tweets that are pro and against Brexit is similar in counties with and without stores, as are the shares of tweets about politics, economics and migration. This is reassuring since it suggests that there is limited sampling bias in our analysis of the role of the media on consumption behaviour when we use the twitter data.

Figure 6: Matching Twitter data to LSOAs with store data

5.2 Evidence from Newspapers

To validate our Twitter results, we examine whether news in more traditional media outlets also affect consumption patterns. We collect the content of Brexit-related headlines and first paragraphs of the following newspapers between March 2015 and 2017: Daily Mail, Evening Standard, Express, The Guardian, The Independent, and The Times. This sample was selected based on the availability of digital archives and the need to include both mainstream newspapers and tabloids, but also to include newspapers that adopted different positions on the Brexit debate. We obtain the headlines and the first paragraph of each article to identify Brexit-related news. Examples of keywords used are "brexit","european union", "eu ", "british", "british identity", "british passport", "british culture", "british heritage", "british goods", "british products", "british manufacturing", "made in britain". To identify the days with an intense news activity around Brexit, we use the same methodology that we adopted with Twitter. We focussed on the top 20% of days during our period of interest in which the total number of articles about Brexit were highest. We exclude the months of June and July in 2016 due to the high number of articles about Brexit immediately before and after the referendum, and when several consecutive days fall into the top 20%, we focus on the first day of a series. This leaves us with 41 newspaper "storms", which we use to compare the expenditure share of UK vs EU products purchased in the day before (control) and on the day of each event (treatment). As before, we assume that shoppers' decisions of when to shop at the local level do not drive the timing of news about Brexit. As shown in Table 6, the day when discussions about Brexit in the media take place, sales of UK products increase by 0.9 percent and sales of EU products decrease by 0.2 percent.

Table 6: Newspaper Storms and Consumer Behavior

Dependent variable:	**Share UK**	**Share EU**
	(1)	(2)
Treated	0.614***	-0.035***
	(0.005)	(0.003)
Store x Event FEs	YES	YES
R^2	0.031	0.007
Observations	76,685,604	76,685,604

Source: Newspaper and Transaction Data. *Treated* is an indicator that equals one for purchases occurring the day of a newspaper storm and 0 for the day before a newspaper storm. Store times event fixed effects are included. *, **, *** represent statistical significance at the 10%, 5% and 1% levels respectively.