Global Competition and Brexit *

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Abstract

We show that support for the Leave option in the Brexit referendum was systematically higher in regions hit harder by economic globalization. We focus on the shock of surging imports from China over the past three decades as a structural driver of divergence in economic performance across UK regions. An IV approach supports a causal interpretation of our finding. We claim that the effect is driven by the displacement determined by globalization in the absence of effective compensation of its losers. Neither overall stocks nor inflows of immigrants in a region are associated with higher support for the Leave option. A positive association only emerges when focusing on immigrants from EU accession countries. The analysis of individual data suggests that voters respond to the import shock in a sociotropic way, as individuals tend to react to the general economic situation of their region, regardless of their specific condition.

Keywords: Brexit; Globalization; Economic Vote.

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1 Introduction

The success of the Leave option in the Brexit referendum of June 2016 was probably the single most important event in European politics in the past two decades. A number of contributions have provided evidence that support for Leave was stronger in geographical areas of the UK characterized by relatively poor economic performance in recent years. In particular, the Leave vote share was higher in regions witnessing lower employment rates and real wage growth, as well as larger increases in inequality and poverty, and sharper declines in manufacturing employment (Becker et al. 2016; Bell and Machin 2016; Clarke and Whittaker 2016; Darvas 2016; Langella and Manning 2016).

Building on this correlational evidence, in this paper we focus on global competition as a structural driver of divergence in performance across UK regions. We exploit the exogenous shock of the surge of China as a leading manufacturer, and measure the vulnerability of each region to this global-scale economic transformation, which has implied a huge displacement of manufacturing activities across developed countries: a phenomenon known as the "Chinese import shock" in the international economics literature (Autor et al. 2013; Bloom et al. 2016). We show that globalization, by means of the Chinese import shock, is a key structural determinant of the Brexit vote.

Our analysis proceeds in two steps. First we work with official referendum results at the regional level. We find that the Leave share was systematically higher in regions that have been more exposed to the Chinese import shock, due to their historical sectoral specialization. This finding is robust to accounting for the possible endogeneity of the import shock, which we instrument using imports from China to the United States. Our result is also robust to controlling for several immigration measures, and a wide range of additional regional characteristics, which have been identified as significant correlates of referendum returns.

In the second part of the study, we perform an analysis of vote choice for individual voters. Conditional on education and other characteristics, we find that individuals living in regions more affected by the import shock were more likely to vote for Leave. The ef-

fect of imports is not restricted to a specific category of voters, but extends broadly across many segments of the population, suggesting that voters have responded to the shock in a sociotropic rather than simple pocketbook fashion. This is in line with results in the economic vote literature (Duch and Stevenson 2008; Kinder and Kiewiet 1981). Importantly, voters respond not only to the state of the economy at the national level, but also at the local level (Ansolabehere et al. 2014).

In terms of control variables, we find no clear evidence that higher immigration is associated with more support for Leave. If anything, when working at the regional level, there is some evidence of a negative correlation, while a positive association with Leave support is only found when considering the arrival of immigrants from EU accession countries, as in Becker et al. (2016). Individual attitudes towards immigration are systematically worsened by the import shock, while they are not related in a clear way to the actual extent of immigration in a region. Overall, worsened attitudes towards immigration seem to largely reflect economic distress driven by import competition. In this sense, we find evidence of an interplay between the trade shock and immigration in affecting voting.

This paper makes two main contributions. The first one is to provide a rigorous analysis of this specific political event, whose importance is undeniable, uncovering a causal driver of vote choice behind the available correlational evidence. The second contribution is to refocus the literature towards a clearer understanding of the political consequences of globalization. Almost a decade ago, Kayser (2007) polemically noted that "the sheer volume of literature in this area has made it easy to overlook an important fact: very little of it addresses the effect of economic globalization on actual politics, understood more narrowly as electoral politics." The situation has not changed much since the claim was made. Our contribution, then, attempts to reconnect the political science literature on globalization with the well-developed literature on the economic vote broadly understood.

2 The Brexit referendum

On June 23 2016, UK citizens were called to express their stance as to whether the United Kingdom should "Remain a member of the European Union" or "Leave the European Union". The Leave option prevailed by almost 4 percentage points (51.9% vs. 48.1%). A great deal of debate and investigation has followed the referendum, and a number of empirical regularities have been established. Considering individual-level factors, older, less educated, and poorer people were more likely to vote for Leave, while students and women were more in favor of Remain. Beyond individual characteristics, though, there is evidence that social and economic conditions across geographic areas also mattered. For instance, Langella and Manning (2016) report that a declining share of employment in agriculture, manufacturing, mining and construction in the past three decades is associated with higher regional Leave shares. A similar correlation is found with respect to declining employment in services over the same period. Darvas (2016) shows that support for Leave was stronger in regions characterized by higher income inequality and higher poverty rates.

Consistent with this evidence, Bell and Machin (2016) find that support for the UK Independence Party in the 2015 election, and relatedly for the Leave option in the referendum, was higher in areas of Britain witnessing poorer performance in terms of real wage growth over the past two decades. Clarke and Whittaker (2016) also find evidence of higher Leave shares in areas with lower employment rates. Connecting different areas of work, Becker et al. (2016) provide the most comprehensive evidence of correlations between Leave votes and a large number of economic, social, and political factors, most of which are also included in our robustness checks.

Despite its prominence in the public debate, evidence concerning the role of immigration is somewhat mixed. With the exception of Langella and Manning (2016), most of the analysts do not find a positive association between immigration and Leave support. If anything, there is evidence to the contrary: areas characterized by higher shares of foreign-born population were more supportive of Remain. This is consistent with more immigrants settling in areas characterized by younger population and more dynamic economy. Lon-

don is probably the most notable example. Besides that, there is some evidence that recent increases in the proportion of immigrants are associated with higher support for the Leave option (Clarke and Whittaker 2016; Darvas 2016; Langella and Manning 2016). This pattern might be driven by communities that started from very low levels of immigration, and began facing only recently an increasingly diverse environment. Moreover, Becker et al. (2016) find evidence of higher Leave shares in areas that have witnessed larger increases in immigration from EU accession countries. In our analysis we account for the share of immigrants in the population of the region, as well as for their recent influx, and we also employ measures of immigration disaggregated by country of origin.

3 The import shock

3.1 The role of China

Over the last three decades the world has been witnessing a sharp increase in trade between industrialized countries and emerging low-income economies. China has been the major player in this respect. Figure 1 shows the variation in the Chinese share of total manufacturing imports in the United Kingdom, from the end of the 1980s until 2007. This share displays a sizable increase, from about 1% to around 8.6%, which is even more remarkable if one considers that total import flows were almost doubling in real terms at the same time. Imports from other low-income countries have also increased substantially in absolute terms, although their share has remained pretty much constant over time.[1] The growth in import pressure from China thus clearly emerges as the most relevant trade pattern over this period, and constitutes the main focus of our analysis.

Such a strong and very rapid growth in Chinese import competition is not peculiar to the United Kingdom: a very similar tendency has been documented also for other European countries and for the US (Autor et al. 2013; Bloom et al. 2016). This phenomenon is in fact mainly a result of the structural transformation of China, which has become a WTO

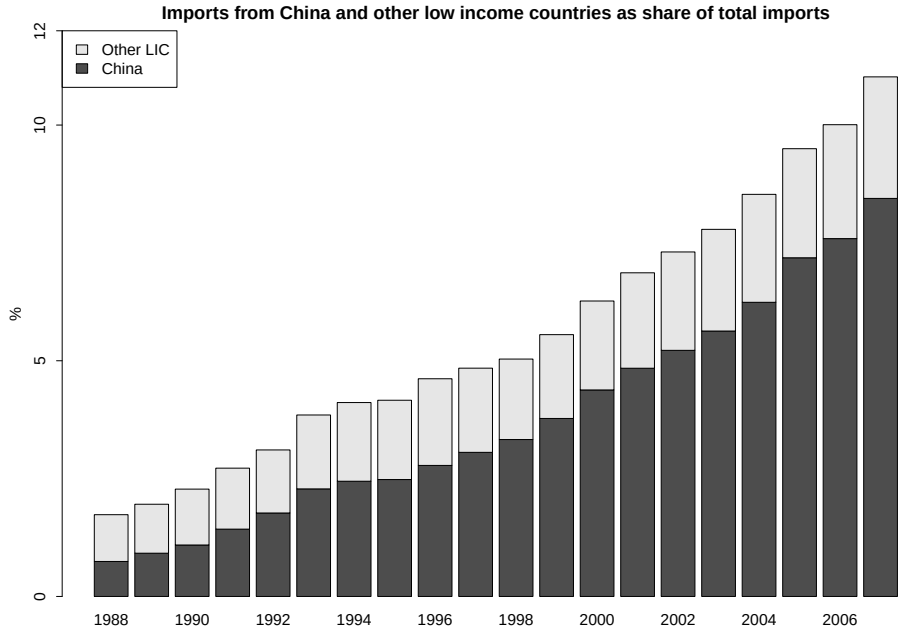
[1] Full list in Section A of the Online Appendix.

member in 2001. In a relatively short time, China has evolved from a closed, agriculture-based economy into an open economy hosting the largest manufacturing sector in the world. This structural change has entailed a dramatic supply shock for developed countries.

In a recent review paper, Autor et al. (2016) notice how "China's rise has provided a rare opportunity for studying the impact of a large trade shock on labor markets in developed economies". Besides the large quantitative impact of a country like China –and the well-known scarcity of natural experiments in international trade– the literature has identified at least three reasons why the surge in Chinese competition constitutes an excellent exogenous source of identification. First, the timing and the extent of China's transformation were essentially driven by domestic idiosyncratic political factors, and were still largely unexpected at the end of the 1980s. Second, the earlier isolation of China under Mao, and the accumulated productivity gap with respect to advanced economies, allowed the government to quickly unlock huge opportunities for rapid structural catch-up. Third, unlike other emerging economies, that tend to specialize in primary commodities, China had a strong comparative advantage in manufacturing. This was concentrated especially in labor-intensive activities, given the abundance of labor associated with the decollectivization of agriculture and the mass migration of farmers to cities. Yet, Autor et al. (2016) show that idiosyncratic prowess also played a role in determining China's specialization, leading to variation in export performance across industries otherwise similar in terms of factor content. This source of heterogeneity is important for identification.

Several studies have exploited the China shock in an attempt to understand the implications for firms and workers in the West. The evidence points to a substantial displacement of manufacturing activities both in the US and in the EU as China's relevance grows, especially in labor-intensive manufacturing activities (Autor et al. 2013; Bernard et al., 2006; Bloom et al., 2016; Khandelwal, 2010). At the individual level, the adjustment costs in terms of unemployment spells and lower earnings fall disproportionately on workers employed in import competing industries, and especially on low-skill workers (Autor et al., 2014).

Figure 1: Evolution of the relative importance of imports from China and other low income countries in the UK.



These findings resonate well with standard predictions of the Heckscher-Ohlin framework and specifically with the Stolper-Samuelson theorem, according to which low-skilled workers in Western countries should be negatively affected by the China shock. Consistently, in his seminal work, Rogowski (1989) already foresaw the possibility of a protectionist backlash from global competition among marginalized low-skilled workers in advanced European countries.

It is undeniable that imports from China have also determined a downward pressure on prices that has benefited consumers (Auer and Fischer 2010; Faijgelbaum and Khandelwal 2016). Yet, while such welfare gains from a demand perspective are diffused among the population –and somewhat difficult to assess for public opinion– the supply-side losses of firms and jobs determine clear and visible losers of globalization. Crucially for the purpose of our analysis, these losers tend to be geographically concentrated in regions that have been historically specialized in manufacturing activities then overtaken by China.

Understanding the role of labor market frictions –which prevent smooth reallocation

of workers– and uncovering the localized effects of trade shocks, have been key steps forward in the most recent international trade literature. Concerning the China shock, areas that were more exposed to Chinese competition, in virtue of an overlapping industry specialization, have witnessed a decline in employment not only in the affected industries, but also in general, as other industries have not adequately absorbed laid-off workers. The speed of adjustment for local labor markets has been very slow, with observed persistence in regional decline for more than a decade, involving entire communities rather than just low-skilled workers (Autor et al., 2016). The press has referred to these laggard regions as "left behind" areas of globalization. This phenomenon is at the core of our investigation: the Chinese import shock provides an exogenous source of variation in economic performance across UK regions; hence, it may have a causal impact on voting to the extent that citizens voice their discontent with the economic situation of their region by voting Leave. In the theory section, we describe three specific channels that might drive this effect.

3.2 Measurement

Autor et al. (2013) develop a theoretical model that links the Chinese import shock with labor-market outcomes at the regional level. Regions that are more vulnerable to the shock, due to their sectoral specialization, are predicted to face employment losses and lower wages as Chinese imports rise, as a result of productivity gains in China and falling trade costs. This effect depends on the fact that China's demand for foreign goods does not compensate the displacement induced by its exports, a condition which is very realistic given the rising trade surplus run by China over time, especially after entering the WTO.

Based on their theoretical framework, Autor et al. (2013) derive an empirical measure of regional exposure to the Chinese import shock from a supply perspective. They show that a stronger shock leads to higher unemployment, lower labor force participation, and reduced wages across US regions between 1990 and 2007. We employ the same empirical approach. In particular, we measure the trade shock at the regional level as follows:

$$\text{ImportShock}_{it}=\sum_{k}\frac{L_{ik(\text{pre}-\text{sample})}}{L_{i(\text{pre}-\text{sample})}}*\frac{\Delta\text{IMPChina}_{kt}}{L_{k(\text{pre}-\text{sample})}} \quad (1)$$

where i indexes regions, k industries in the manufacturing sector, and t years.

$\Delta\text{IMPChina}_{kt}$ is the change in (real) imports to the UK from China over the past *n* years, in industry *k*. This is normalized by the total number of workers in the same industry in the UK at the beginning of the sample period, $L_{k(\text{pre}-\text{sample})}$. In order to back out the region-specific trade shock, we take the weighted sum of the change in imports per worker across industries, where the weights capture the relative importance of each industry in a given region. Specifically, the weights are defined as the ratio of the number of workers in region *i* and industry *k*, $L_{ik(\text{pre}-\text{sample})}$, over the total number of workers in the region, $L_{i(\text{pre}-\text{sample})}$, both measured at the beginning of the sample period.

This measure has a very intuitive interpretation: for given changes in nation-level imports per worker (i.e. $\Delta\text{IMPChina}_{kt}$ / $L_{k(\text{pre}-\text{sample})}$), the Chinese shock will be stronger in those regions in which a larger share of workers was initially employed in industries witnessing larger subsequent increases in imports from China. Intuitively, cross-regional variation may stem from two sources. In the first place, larger shocks are attributed to regions in which more workers were initially employed in the manufacturing sector. However, for a given overall share of manufacturing workers, the shock is going to be stronger for regions in which more workers were employed in industries for which Chinese imports have increased the most, e.g. textiles or electronic goods.

We measure industry specialization in 1989, before the emergence of China as a global manufacturing player. We then look at import growth between 1990 and 2007, to avoid picking up the complicated ramifications of the 2008 global financial meltdown. This also reassures us that the effects our analysis isolates are manifestations of long-term processes taking place in the British and global economy, rather than simple consequences of one particular shock like the global financial crisis of 2008. Data on the composition of employment at the regional level are from the UK Office for National Statistics (ONS), while data on imports are from Eurostat COMEXT. Both employment and trade data are disag-

gregated at the NACE Rev. 1.1 subsection level.[2]

Our analysis is performed at the NUTS-3 level of regional disaggregation. NUTS (the French acronym for "Nomenclature of Territorial Units for Statistics") is the official classification of territorial units in the European Union. According to this classification, the territory of each EU country is partitioned into administrative regions at three nested levels. The NUTS-3 level is the most disaggregated one and is meant to capture, in Eurostat's words, "small regions for specific diagnoses".[3] We focus on a total of 167 NUTS-3 British regions, with an average population of around 370,000 inhabitants. The NUTS-3 regions of Northern Ireland are excluded due to lack of data on the explanatory variables. The results we report are robust if we perform the analysis at the NUTS-2 level of regional disaggregation.

Given the cross-sectional nature of our empirical analysis, we are going to use a single value on the strength of the import shock for each NUTS-3 region. Specifically, we first compute Import Shock$_{it}$ considering 5-year changes in imports (i.e. n=5), and then take the average between 1990 and 2007. The resulting variable is denoted by Import Shock$_i$. Figure 2 displays the variation in the strength of the shock across regions. The variable we employ has an average value of 0.32, i.e. a growth in imports from China by 320 real euros per worker, with a standard deviation of 0.14. The region with the lowest shock, perhaps not surprisingly, is Camden and City of London (0.06). The region with the largest shock is Leicester (0.75).

In line with earlier findings in the literature, we find that UK regions witnessing larger shocks experience a decline over time in terms of GDP per capita relative to the median region. In particular, for each NUTS-3 region we compute the *Change in Relative Income* (CRI) between 1997 (the earliest year for which we have data) and 2015, using data on gross value added (GVA) from the ONS. We take the ratio between income per capita in each

[2]Subsections are identified by two-character alphabetical codes (from DA to DN for the manufacturing sector) and correspond to 2-digit industries or aggregations of them. See Table A2 in Section B of the Online Appendix for details.

[3]Further information is available from `http://ec.europa.eu/eurostat/web/nuts/overview`.

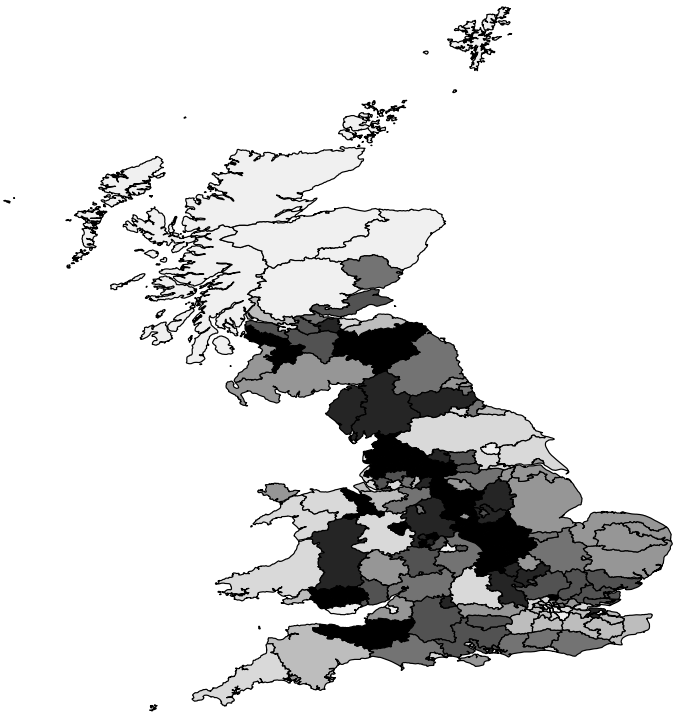
region and income per capita in the median region, in 1997 and in 2015, and we calculate CRI as the percentage difference between these two relative figures. Positive values signal an improvement in the position of a region relative to the median, while negative values reflect a relative worsening over time.

The region with the strongest loss in relative income is Thurrock (UKH32, in Essex), whose GVA per capita was above the median region in 1997, but below it in 2015. Specifically, income per capita declined from 125% to 96% of the median. This is a relatively privileged area "falling behind" sharply in the past two decades. Tellingly, Thurrock happens to be also the NUTS-3 region with the highest Leave share (72.3%). The second strongest loss in relative income took place in Torbay (UKK42, in Devon), whose income per capita declined from 91% to 75% of the median region. This is an initially relatively poor region getting even poorer. The Leave share in Torbay was also high: 63.2%.

The areas with the strongest gains, on the other hand, are Camden and City of London (UKI31) and North Lanarkshire (UKM36, in South Western Scotland). In 1997, the income per capita of Camden and City was 9.7 times the median region. By 2015, this ratio grew to 14. Notably, this region had also the lowest import shock from China, and one of the lowest Leave shares in the referendum: 25%. North Lanarkshire is instead a region showing convergence to the median over time, with a growth in income per capita from 67% to 93% of the median region. Remain prevailed in this region with 62% of the votes.

In the econometric analysis we show that support for Leave is systematically higher in regions that are falling behind in relative terms. In turn, when we regress CRI on the Chinese import shock –instrumented using US imports from China (see *infra*)– we find that a one-standard-deviation increase in the strength of the shock leads to a decrease in CRI by a quarter of a standard deviation. That is, the import shock is an important determinant of divergence across regions. This evidence corroborates our identification strategy.

Figure 2: Strength of the import shock across NUTS-3 regions.



Note: Darker shades correspond to stronger import shock.

3.3 Endogeneity

An issue with our empirical approach is the possible endogeneity of the trade shock. We tackle this issue by instrumenting Import Shock using the growth in imports from China to the United States (sourced from the Center for International Data at UC Davis). Specifically, the instrument is constructed as follows:

$$\text{Instrument for Shock}_{it} = \sum_{k} \frac{L_{ik(\text{pre-sample})}}{L_{i(\text{pre-sample})}} * \frac{\Delta \text{IMPChina}_{\text{USA}kt}}{L_{k(\text{pre-sample})}} \tag{2}$$

With respect to the previous formula for Import Shock, here we substitute $\Delta \text{IMPChina}_{\text{USA}kt}$ for $\Delta \text{IMPChina}_{kt}$. Also in this case we take the average of 5-year changes in imports between 1990 and 2007 to retrieve the instrumental variable Instrument for Shock$_i$. Moti-

vated by earlier literature (e.g. Autor et al. 2013, 2016; Bloom et al. 2016; Colantone et al. 2015), this instrument is meant to capture the variation in Chinese imports which is due to the exogenous changes in supply conditions in China, rather than to domestic factors in the United Kingdom that could be correlated with electoral outcomes.

It is important to spend a few words on the potential sources of endogeneity. In particular, the import shock in a given region might be endogenous to Brexit votes –due to omitted variable bias– if imports to the UK at the industry level were correlated with the political leanings of regions. This might emerge if political leaders protect from foreign competition the industries that are important for their key constituencies, while allowing for more imports in industries that are more concentrated in less relevant constituencies. In this case we would observe lower import shocks in regions where people are already more likely to support Remain, in line with the orientation of the political elites they feel close to. Conversely, stronger shocks would hit regions where people are more likely to support Leave against the incumbent elites, which are generally perceived as distant.

Concerns about this source of endogeneity are mitigated if one considers that our measure of the import shock refers to the period 1990-2007, long before the referendum. Even more importantly, trade policy is an exclusive competence of the European Union. In practice, for our purposes, this means that UK tariffs on Chinese goods are fixed by EU institutions, and are the same across all EU Members. Still, it might be that UK representatives lobby the EU for more protection of industries located in key constituencies. Our instrumental variable strategy is meant to solve this type of issue –and other potential sources of omitted variable bias– as exports from China to the United States are plausibly orthogonal to any NUTS-3 region specific factor in Great Britain.

4 Globalization and politics

The political science literature on globalization and trade openness has initially focused on macro-level policy outcomes. One first strand of literature originates with the concept of “embedded liberalism” introduced by Ruggie (1982, 1994), and draws from the

empirical regularity that sees trade openness being associated with more state spending (Cameron 1978). In this perspective, a bargain involving generous redistribution and insurance against economic shocks in exchange for support for global trade was struck after World War II in Western democracies. The second strand focuses on the constraints that mobile capital puts on the ability of national governments to raise revenues to pay for insurance and redistribution schemes (Burgoon 2001; Garrett 1998). Rodrik (1997) combines the implications of the two perspectives to highlight a fundamental tension: globalization generates higher demand for insurance and redistribution, but also more constraints in terms of taxation; such tension could lead, potentially, to a protectionist backlash.

More recently, the focus in the literature has shifted to the direct effects that globalization might have on individual attitudes and policy preferences. This recent work provides micro-foundations to the previous macro work, suggesting mechanisms that link redistribution and trade policy to political competition, public opinion, and party politics. Some contributions look at how exposure to risk deriving from global competition shapes preferences for redistribution (Rehm 2009; Walter 2010), and how party platforms respond to globalization (Burgoon 2012). Other studies explore how exposure to globalization risks shapes support for protectionism (Margalit 2012; Mayda and Rodrik 2005); whether compensation increases the support of exposed groups for open trade (Hays 2009; Hays et al. 2005); and how support for open trade has been evolving over time (Scheve and Slaughter 2007). When it comes to voting behavior, some have tried to explain how openness might influence accountability, especially by dampening the relationship between performance of the national economy and electoral success of incumbents (Hellwig and Samuels 2007; Kayser and Peress 2012); others have started looking at how globalization affects party and candidate choice (Autor et al. 2016; Che et al. 2016; Dippel et al. 2015; Jensen et al. 2016; Mughan et al. 2003)

Our paper contributes to the literature in two main ways. First, we provide a rigorous analysis of the Brexit vote, a recent political event of the utmost relevance. Second, and most importantly, we improve on earlier work by exploiting a precise identification strat-

egy at the regional level, which allows us to capture the causal impact of trade globalization on voting behavior. Previous studies have relied to a large extent on self-reported perceptions of economic conditions or on country-level measures of globalization, while we employ an objective measure of exposure to globalization, i.e. the import shock from China, which varies across regions of the same country depending on their historical industrial specialization. In addition we tackle the endogeneity issue rigorously, exploiting an instrumental variable approach that is becoming standard in international economics (see Autor et al. 2013 for the seminal contribution). Therefore, our analysis identifies a causal effect of globalization on voting.

We posit that it is possible to understand the success of the Leave option in the Brexit referendum as a consequence of increasing exposure to the global economy: a shock that has created winners and losers within each country. The core of our argument is that Chinese import competition is a structural driver of divergence across social groups and regions in the UK. This globalization-induced shock may have a causal impact on voting to the extent that support for Leave reflects the dissatisfaction of communities that experience a worsening over time in their relative condition compared to richer areas of the country.

There are three main, non-mutually-exclusive mechanisms through which the import shock –with the ensuing decline of traditional manufacturing regions– might lead to higher support for Brexit. These mechanisms relate to three possible interpretations of Leave vote: (1) as a vote against incumbent political elites and the business establishment; (2) as a vote against international integration and in favor of national sovereignty; and (3) as a vote against immigration. We discuss each mechanism in what follows.

First, a vote in support of Brexit may have been to an extent interpreted as an anti-incumbent vote.[4] That is, voters may have used the referendum to "send a signal" to the

[4]There is evidence that anti-incumbent sentiments and economic evaluations affect referendum vote choice, e.g., Brouard and Tiberj (2006) for France and De Vreese and Semetko (2004) for Denmark.

elites. Supporting Leave as a response to the import shock is compatible with a bare-bones economic voting mechanism, or with "blind retrospection" (Achen and Bartels 2016). The import shock led to a crisis of traditional manufacturing and caused persistent economic decline in some areas. This generated pressures to vote against the option preferred by the incumbent Prime Minister and the leadership of mainstream parties. In this sense, choosing the Leave option in the referendum had more to do with punishing the incumbent than leaving the EU. A similar reasoning applies to voting against the business establishment, which was largely in favor of Remain.

Importantly, this mechanism does not require that people are able to identify Chinese imports as the ultimate cause of their problems. In a "blind retrospection" logic, it does not even matter whether the incumbent elites are responsible for the economic distress, or whether they could have possibly ameliorated the conditions of distressed regions. By extension, it does not matter whether Brexit might fix the problems causing the discontent. Very simply, voters were angry because of long-term economic decline and took the opportunity of the referendum to voice their disappointment.

The second mechanism linking import competition and Leave support is consistent with voters being more sophisticated than blind retrospective punishers, and relies on the idea that people do identify globalization –at least generically– as a cause for their malaise. The intuition that marginalized low-skilled workers could drive a protectionist backlash in Europe was already proposed by Rogowski in 1989. Several more recent studies show that support for open trade has been on the decline, especially among workers that are more exposed to risk deriving from global competition (Mayda and Rodrik 2005; Scheve and Slaughter 2007; Margalit 2012). Leave support can be linked to the nationalist and isolationist syndrome documented by these studies. In fact, for many voters in the left-behind regions, the European Union might have become the target of a general antipathy for global impersonal forces that are perceived to determine dim economic dynamics in their communities. Hence the desire to "take back control", as in the rhetoric of Leave campaigners. Surveys carried out right after the referendum are consistent with this interpretation: many

supporters of Brexit indeed mention the desire to regain national sovereignty as an important motive for their choice (Lord Ashcroft 2016).

Voting to leave the EU in response to the Chinese import shock is certainly not fully consistent with a purely instrumental view of voting. Indeed, if anything, exiting the EU might lead to less imports from Germany and other EU partners while increasing imports from China, as the UK is already exploring the feasibility of a free trade deal with China post-Brexit. Yet, our argument does not imply that voters were "fooled". Rather, they chose Leave as the neo-nationalist option that most closely approximated their desire to take back control. Importantly, nothing in this argument requires voters to understand the exact causes of their economic distress, as long as they attribute it –at least partly– to the fact that the UK is influenced by external forces over which it does not exert full control. To an extent, regional exposure to Chinese imports might also be capturing trade vulnerability in more general terms, e.g., related to general imports of low-skill-intensive goods. Also in light of this, we do not read our findings as reflecting necessarily an anti-Chinese sentiment. Yet, the empirical focus on China is important for identification purposes, as looking at other sources of imports would not provide us with a clear exogenous shock comparable to the structural transformation of China.

Finally, the third mechanism linking the Chinese import shock and Leave support is related to immigration. Undoubtedly, support for Brexit was perceived by important parts of the British electorate, and in the political and media discussions, as a vote against immigration. There is ample evidence that negative attitudes and perceptions regarding immigration were strongly and positively associated with support for Leave (Ipsos MORI 2016; Lord Ashcroft, 2016). Using individual-level data, we show that people in areas more affected by Chinese imports tend to be more concerned about and opposed to immigration. In other words, concerns with immigration might have been heightened by trajectories of economic decline as induced by the globalization shock.[5] We discuss in detail below three possible explanations for this finding: "lump-of-labour" fallacy; scapegoating; and welfare

[5]Jeannet (2016) provides similar evidence about the interplay between depressed economic conditions and immigration from new EU members in forming attitudes towards

system congestion. Three factors that gain relevance in depressed economic contexts.

As a concluding remark, our analysis shows that a relevant portion of variation in Leave support across regions is predicted by exposure to the Chinese import shock. We do not try to isolate the role of the three different mechanisms that might drive this effect: blind retrospection; neo-nationalism; and anti-immigration sentiments. Plausibly, not all voters were driven by the same considerations, and, as a matter of fact, the same individual voter might be pushed by more than one drive. Our analysis aims at capturing the overall causal effect of the import shock, which is a key structural determinant of discontent, by means of divergence in economic performance across regions.

5 Data and empirical strategy

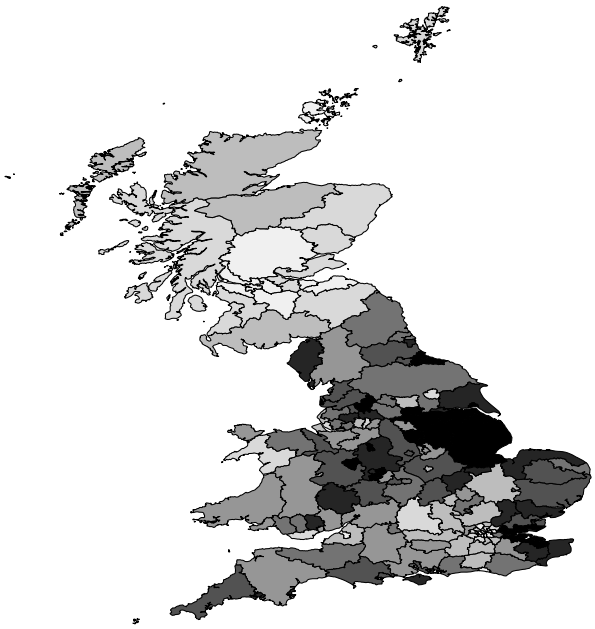
5.1 Disaggregated referendum data

In the first part of our empirical analysis, referendum returns, disaggregated at the regional level, are the outcome variable. Specifically, based on official results, we compute the share of Leave votes in each NUTS-3 region.

Figure 3 shows there is significant spatial heterogeneity in support for the Leave option. The Leave share goes from a minimum of 21.4 in Lambeth (Inner London) to a maximum of 72.3 in Thurrock (Essex), with a standard deviation of 10.6 percentage points. This heterogeneity is key for our identification strategy.

EU institutions.

Figure 3: Vote share of the Leave option across NUTS-3 regions.



Note: Darker shades correspond to stronger support for the Leave option.

In the second part of the analysis we employ individual-level data from Waves 8 and 9 of the British Election Study (BES). Wave 8 was carried out between May 6 and June 22 2016, just before the Brexit referendum of June 23, and has a total of 31,409 respondents. This wave of the survey reports vote intention in the referendum, plus a wealth of data including attitudes towards immigration. Wave 9 covers 30,036 respondents, and was carried out between June 4 and July 4 2016, hence it contains some information about self-reported vote choice rather than vote intention. Using information about the place of residence of the respondent we allocate each individual to a NUTS-3 region, with its corresponding import shock.

5.2 Empirical specification

For the regional level analysis, our baseline specification is:

$$\text{LeaveShare}_i = \alpha_{j(i)} + \beta_1 \text{ImportShock}_i + \beta_2 \text{ImmigrantShare}_i + \beta_3 \text{ImmigrantArrivals}_i + \varepsilon_i. \quad (3)$$

Leave Share$_i$ is the vote share for the Leave option in NUTS-3 region i (as a percentage of valid votes). Import Shock is the strength of the Chinese import shock at the regional level, computed as explained above between 1990 and 2007.

We control for immigration through two variables, based on ONS data. *Immigrant Share* is the share of foreign-born residents out of the total population of the region in 2015. *Immigrant Arrivals* is the inflow of immigrant workers, based on registrations to National Insurance, divided by the total working-age population of the region in 2015. By including these two variables we aim to control both for the stock of immigrants, which reflects immigration dynamics in the region over the past decades, and for the most recent influx, to which voters may be particularly sensitive.

The number of new arrivals is based on registrations to National Insurance, on which most of the Brexit debate has focused. In fact, Leave campaigners (and, arguably, voters) were not concerned much with illegal immigration. The central issue was the legal right for EU citizens (in particular Eastern Europeans) to settle and work in the United Kingdom. This type of immigration is fully captured by National Insurance registrations, as registering is a prerequisite for signing an employment contract. In a series of robustness checks, we complement these immigration variables with immigration data disaggregated by country of origin and measures of temporary foreign workers.

The specification includes fixed effects $\alpha_{j(i)}$ for the NUTS-1 macro region j to which NUTS-3 region i belongs. The UK is divided into 12 NUTS-1 regions. For instance, Scotland is a NUTS-1 macro-region, and Greater London is another. By including these fixed effects, we can account for any confounder that affects similarly all the NUTS-3 areas in a macro-region. This refers both to stable characteristics of broad geographic areas (e.g., a

different political culture in Scotland), and to recent unobserved shocks that might have affected in a similar way the different NUTS-3 areas within a NUTS-1 macro-region. From the econometric point of view, our coefficients are identified only by variation in vote shares and strength of the import shock (and other covariates) across different NUTS-3 regions located in the same NUTS-1 macro-region.

This very conservative strategy works against finding an effect of the import shock if there is relatively little variation in exposure to Chinese competition across NUTS-3 areas within the same NUTS-1 macro-region.[6] While the NUTS-1 fixed effects should account for many possible remaining confounders –and the IV strategy is also meant to take care of potential omitted variable bias– we perform several robustness checks including additional regional characteristics (mostly at the NUTS-3 level) which have been shown to correlate with Leave support.

The last term in the specification, ε_i, is an error term. There might be unobserved correlation in the errors across NUTS-3 regions in the same area, hence we report standard errors accounting for clustering at the NUTS-2 level, which is the intermediate level of disaggregation between NUTS-3 and NUTS-1. We also estimate models with random intercepts at the NUTS-2 level. These allow for positive correlation between the errors for any two observations (at the NUTS-3 level) within a given NUTS-2 region.

In the second part of the empirical analysis we estimate regressions based on individual-level data. The baseline specification for these estimations is:

$$P(\text{Leave}_\ell) = F(\alpha_{j(\ell)} + \beta_1 \text{ImportShock}_{i(\ell)} + \beta_2 \text{ImmigrantShare}_{i(\ell)} + \beta_3 \text{ImmigrantArrivals}_{i(\ell)} + \mathbf{L}_\ell \gamma' + \varepsilon_\ell), \tag{4}$$

where ℓ indexes individual respondents, and i NUTS-3 regions as before.

This specification is very similar to the one for the regional analysis. The explanatory variables at the NUTS-3 level are exactly the same, and NUTS-1 fixed effects $\alpha_{j(\ell)}$ are always included. We include a vector of individual variables, $\mathbf{L}_\ell$, accounting for education

[6] Our results are qualitatively analogous, in terms of direction and statistical significance, if NUTS-1 fixed effects are not included in the models.

and demographic characteristics. The dependent variable *Leave* is an indicator variable which takes value one if individual ℓ declares to support the Leave option. The baseline model is a probit. Standard errors are clustered by NUTS-3 regions, since we have multiple respondents within each area. We also estimate hierarchical linear probability models with NUTS-3 random intercepts.

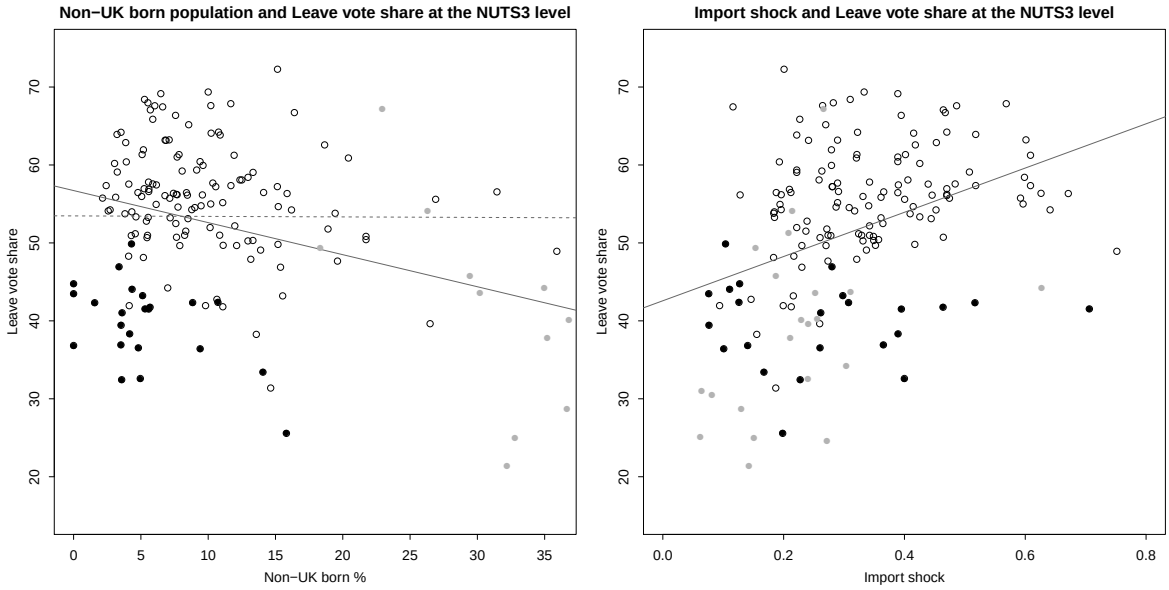
6 Results

6.1 Regional level official referendum results

The right panel of Figure 4 plots the Leave vote share by NUTS-3 region against the import shock. The grey line is the least-squares fit. There is a clear positive association between strength of the import shock and support for the Leave option. The left panel of Figure 4 plots the Leave vote share against the share of immigrants in the population. The solid grey line is the least-squares fit on the whole data, while the dashed grey line is the least-squares fit once Greater London is excluded. There is no clear association between immigration and Leave vote. Once the observations from the London area are excluded, the negative association between immigration and Leave share disappears. A similar picture emerges if one considers the arrival rate of immigrants in 2015 (unreported).

Table 1 reports the baseline estimates of eq. (3), where the dependent variable is the Leave vote share at the NUTS-3 level. In columns 1-3 we estimate a parsimonious specification, which includes only the import shock and NUTS-1 fixed effects $\alpha_{j(i)}$. Specifically, the model in column 1 is OLS. The one in column 2 includes random intercepts at the NUTS-2 level, in addition to NUTS-1 fixed effects. Column 3 reports IV estimates of the model in column 1, where Chinese imports to the UK are instrumented through Chinese imports to the US. The coefficient of the import shock is always positive, and clearly bounded away from zero. The results are basically unchanged in magnitude and significance across the three columns. The first-stage coefficient on the instrument used in column 3 is positive (0.128) and significantly different from zero ($t = 25.7$). The F-statistic is also very high, sig-

Figure 4: Import shock, immigration, and Leave vote share.



*N*otes: Black dots are NUTS3 regions of Scotland, grey dots are the NUTS3 of London, and the hollow dots are the remaining NUTS3 of England and Wales. The grey solid lines are least-squares fits on the whole sample, the dashed grey line is the least-squares fit excluding London.

naling the strength of the instrument. The IV coefficient in the second stage is pretty close to the OLS one, pointing to the absence of a clear endogeneity bias.

The effect of the import shock is substantively quite significant: two regions –*within the same NUTS-1 macro-region*– that differ by one standard deviation in strength of the import shock are expected to differ by almost two percentage points in support for Leave. If we compare a region at the 10th percentile of import shock (0.15 - Cardiff and Vale of Glamorgan) with a region at the 90th percentile (0.51 - Gwent Valleys), both located in the same NUTS-1 macro-region (Wales), these are expected to differ by four and a half percentage points. In fact, their actual Leave vote share differed by 16 percentage points.

What amount of variation in Leave share does the import shock explain? The R^2 of model 1 in Table 1 is not directly informative, as the model includes NUTS-1 dummies. Omitting these dummies, the R-square is 0.14: one seventh of the variation in the Leave share at the NUTS-3 level is predictable based on the import shock alone. If one were to look at the aggregates at the NUTS-2 level –i.e., regressing NUTS-2 averages of the Leave

share on NUTS-2 averages of the import shock– the R^2 would be 0.21. The same exercise, at the NUTS-1 level, would yield an R^2 of 0.38.

To further gauge the role of import competition, we can perform some back-of-the-envelope calculations under plausible counterfactuals. In particular, if all the regions had received the shock of a region at the first quartile (0.22 like Wirral, in Merseyside) the national vote share for Leave (omitting Northern Ireland) would have been around 48.5%, reversing the referendum outcome.[7] This conservative calculation assigns to one quarter of the regions a shock stronger than the one they experienced. Notably, among the regions in the first quartile are populous areas in Merseyside and Greater London, not to mention most areas of Scotland. Leaving all the regions below the first quartile untouched, and assigning the first quartile import shock to all the other, the predicted vote share for Leave is around 47.7%. By and large, the Chinese import shock emerges as an important determinant of Brexit.

Table 1: Regional-level results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave Share	Leave Share	Leave Share	Leave Share	Leave Share	Leave Share
Import Shock	12.233**	12.225***	12.965***	12.085***	11.073***	12.299***
	[4.763]	[4.091]	[4.543]	[3.890]	[3.861]	[3.726]
Immigrant Share				-0.490***	-0.513***	-0.491***
				[0.165]	[0.155]	[0.154]
Immigrant Arrivals				-0.066	0.496	-0.058
				[0.741]	[0.801]	[0.691]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
NUTS-2 Random intercepts	N	Y	N	N	Y	N
Observations	167	167	167	167	167	167
R-squared	0.57		0.57	0.65		0.65
Kleibergen-Paap F statistic			662.7			614
Number of groups		39			39	
Model	Linear	Hierarchical	IV	Linear	Hierarchical	IV

Standard errors clustered by NUTS-2 area in all columns except 2 and 5.
*** p<0.01, ** p<0.05, * p<0.1

[7] To obtain this figure, we predict the Leave share in each NUTS-3 region based on the counterfactual value of the import shock. We then multiply this share by the number of votes cast in the region. Next, we sum the predicted votes for Leave across regions and we divide these Leave votes by the total votes cast.

In columns 4-6 of Table 1 we add two variables on immigration: Immigrant Share and Immigrant Arrivals. We report the results for a linear model with NUTS-1 fixed effects (column 4), a NUTS-2 random-intercepts and NUTS-1 fixed effects model (column 5), and an IV model with NUTS-1 fixed effects (column 6). The effect of the import shock remains positive, statistically significant, and stable in size.[8]

In column 4, the share of immigrants is negatively and significantly related to support for the Leave option, consistent with earlier evidence, while the coefficient on new arrivals is negative but not statistically different from zero.[9] A one standard deviation increase in the share of immigrants (11.2%) is associated with lower support for Leave by about 5.5 percentage points. The results are essentially unchanged in the multilevel and IV estimations, both for the import shock and for the immigration variables.

In Section C of the Online Appendix, we augment the specification of column 4 in Table 1 with a large number of additional controls. Tables A3 to A5 report results controlling for: additional immigration measures; political and social factors; and economic factors. The inclusion of these variables is motivated by the correlational evidence presented in other contributions, and most comprehensively in Becker et al. (2016). We do not consider these models as yielding the most accurate estimate of the effect of the import shock, as many of the controls are plausibly post-treatment, and the inclusion of a large number of covariates introduces collinearity issues.[10] Nonetheless, the robustness of our main result under several different specifications can assuage doubts about the importance of Chinese competition as a determinant of Brexit. In Table 2 we only report the most relevant results.

[8] In Table A6, in Section D of the Online Appendix, we show that this result is robust to the iterative exclusion of subsets of NUTS-1 regions.

[9] These negative correlations are basically unchanged –and the stock of immigrants is still statistically significant– if we exclude all the regions in Greater London and in Scotland from the analysis. Hence this association is not driven by specific characteristics of these two areas.

[10] See Samii (2016) for a discussion of post-treatment bias and over-conditioning in political science research; Angrist and Pischke (2008) for a discussion of "bad controls".

We refer to the Online Appendix for a full discussion of the robustness checks.

Table 2: Regional-level robustness

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave Share	Leave Share	Leave Share	Leave Share	Leave Share	Leave Share
Import Shock	9.391**	14.920**	9.460**	10.592**	9.765**	7.997*
	[3.858]	[6.061]	[4.084]	[4.075]	[4.125]	[4.011]
Immigrant Share	-0.328**	-0.282**	-0.592***	-0.617***	-0.462***	-0.529***
	[0.130]	[0.123]	[0.178]	[0.183]	[0.163]	[0.147]
Immigrant Arrivals	-1.141	-1.434*	-0.083	0.025	-0.102	0.309
	[0.822]	[0.751]	[0.777]	[0.809]	[0.713]	[0.652]
EU Accession Immigrants (2001)	-12.045**	-10.301				
	[5.824]	[8.104]				
EU Accession Immigrants Growth (2001-2011)	1.527***	2.431*				
	[0.549]	[1.286]				
EU Accession Immigrants * Import Shock		-15.685				
		[34.567]				
EU Accession Immigrants Growth * Import Shock		-1.831				
		[3.745]				
Fiscal Cuts			0.022***	0.014		
			[0.006]	[0.013]		
Cancer Treated in 62 days			-0.591	-0.503		
			[0.596]	[0.616]		
Public Employment Growth			0.813	0.910*		
			[0.519]	[0.536]		
Fiscal Cuts * Import Shock				0.028		
				[0.031]		
EU Economic Dependence					0.683*	
					[0.384]	
Change in Relative Income vs. Median Region						-0.225***
						[0.059]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
Observations	167	167	167	167	167	167
R-squared	0.68	0.68	0.70	0.70	0.66	0.69
Model	Linear	Linear	Linear	Linear	Linear	Linear

Standard errors clustered by NUTS-2 area in all columns.
*** p<0.01, ** p<0.05, * p<0.1

In column 1 of Table 2 we control for the initial stock of immigrants from countries that joined the European Union after 2004 (*EU Accession Immigrants*), and for its growth rate. Regions with a larger stock of immigrants from EU accession countries in 2001 were on average less supportive of Leave, while regions that experienced faster growth in EU accession immigrants between 2001 and 2011 were more supportive of Leave. A one standard deviation difference in the growth rate is associated with an increase in expected vote for Leave by around 2.5 percentage points. In column 2 we include interactions between the import shock measure and the EU accession immigration variables, to provide a first explo-

ration of the interplay between Chinese competition and immigration as complementary factors behind Brexit. Indeed, immigration might be perceived more as a problem in regions that are experiencing long-term economic decline induced by a contraction of manufacturing. None of the interactions, though, are close to statistical significance, pointing to the absence of evidence in favor of heterogeneity in the effect of the import shock as a function of immigration. Importantly, the coefficient on the import shock is always positive and statistically significant, and approximately of the same magnitude as compared to the baseline estimate of column 4 in Table 1. In light of the importance that immigration had in the referendum campaign, we further explore the interplay between Chinese imports and attitudes about immigration in the individual-level analysis.

Next, we include measures of fiscal cuts and underprovision of public services to explore how they might compound with the globalization shock in affecting the referendum outcome. We focus on three variables: *Fiscal Cuts*, *Cancer Treated in 62 Days*, and *Public Employment Growth*. *Fiscal Cuts* is the average financial loss per working adult in each region, due to reduced benefits as a consequence of fiscal cuts implemented in the UK between 2010 and 2015.[11] Data sourced from Beatty and Fothergill (2013) at the level of local authorities are aggregated at the NUTS-3 level. *Cancer Treated in 62 Days*, a proxy for National Health Service (NHS) quality, is the share of suspected cancer patients treated within 62 days from the moment in which they are first seen by a doctor. We aggregate at the NUTS-3 level the NHS data for "clinical commission groups" in England and "boards" in Scotland and Wales. *Public Employment Growth*, an additional proxy for the provision of public services within each area, is the growth rate in public employment within each region between 2009 and 2015, computed from Business Register and Employment Survey data. We standardize and center all these variables for ease of interpretation of the interactive models.

In column 3, we include the three variables as linear controls. Only the coefficient on

[11]This includes disability and incapacity benefits, housing benefits, non-dependant deductions, child benefits, and tax credits.

fiscal cuts is statistically significant, pointing to a positive –albeit small– association with the Leave vote share. The coefficient on the import shock remains positive, statistically significant, and in line with the baseline estimate. In column 4, we interact import shock and fiscal cuts. The interaction term is not statistically significant; nevertheless, there is mild evidence that the impact of the shock was stronger in areas hit harder by fiscal austerity. Notice, though, that by construction higher fiscal cuts are recorded in areas in which relatively more people relied on government transfers in the first place. As discussed by Becker et al. (2016), most austerity policies entailed linear cuts; regional variation in their impact is largely driven by variation in local demand for benefits. As a result, *Fiscal Cuts* might be itself endogenous to economic distress deriving (also) from import competition. Similar results are presented in the Online Appendix for the interactions between the import shock and the other two variables.

In column 5, we include an index of *EU Economic Dependence*: the share of regional value added attributable to consumption and investment demand in other EU countries. This can be interpreted as a proxy for EU economic integration of a region. Data for 2010 are sourced from Springford et al. (2016), who provide an inter-regional extension of the World Input Output Database (Timmer et al. 2015).[12] The coefficient on this variable is positive and close to statistically significant, in line with earlier findings (Becker et al., 2016; Springford et al., 2016).[13] As we discuss in the conclusions, this result points to a non-fully-instrumental dimension of the Leave vote choice, as regions that stood to lose more from Brexit were more supportive of it. Importantly, the coefficient on the import shock is still positive and statistically significant.

Finally, in column 6 we include a measure capturing the most comprehensive channel through which globalization might induce spatial variation in voting behavior: an increase in inequality across regions, through the creation of geographically concentrated "winners"

[12]Data are available at http://www.cer.org.uk/insights/brexiting-yourself-foot-why-britains-eurosceptic-regions-have-most-lose-eu-withdrawal.

[13]EU Economic Dependence only varies at the NUTS-2 level. Its coefficient becomes highly statistically significant if we omit the NUTS-1 dummies.

and "losers". In particular, we include as a regressor the *Change in Relative Income* (CRI) between 1997 and 2015, computed as explained earlier with respect to the median region. By doing this, we are essentially blocking an important channel for the effect of the Chinese import shock. The coefficient on CRI is negative and significant, pointing to higher support for Leave in areas falling behind in relative terms. Nevertheless, the coefficient on the import shock is still positive and, albeit smaller, in the same order of magnitude of the baseline estimate (around 8 vs. 12 in the main specification of Table 1). The effect of imports is less precisely estimated, hence the p-value falls just above conventional levels of statistical significance (being equal to 0.053).

If we regress CRI on the import shock –instrumented using US imports from China– we find that a one-standard-deviation increase in the strength of the shock leads to a decrease in CRI by a quarter of a standard deviation. While this is not a proper mediation analysis, it suggests that the import shock is an important determinant of heterogeneity in regional performance, which is at the core of our identification strategy. We can also use CRI as a measure of the "treatment", and the import shock instrument as an instrument for CRI in a regression with Leave share as outcome. Such a model estimates that: a decline like the one experienced by Thurrock leads, all else equal, to an increase in the Leave vote share by almost 15 percentage points; a decline like the one experienced by Torbay leads to an increase in Leave share by 10 percentage points; and a convergence to the median like that experienced by North Lanarkshire leads to a decrease in support for Leave by around 25 percentage points.

6.2 Individual-level data

Individual-level data allow us to investigate more in depth the patterns underlying the effect of the import shock at the regional level. We can use two sources: Wave 8 and Wave 9 of the British Election Survey. Wave 8 contains self-reported vote intentions, as it was carried before the referendum. Wave 9 contains also some information on self-reported voting behavior, since some of the respondents were interviewed after the referendum. The main

advantage of Wave 8 is that it contains also information on attitudes and perceptions about immigration, which we exploit in our analysis of the interplay between the import shock and immigration in the next section. In light of this, to avoid confusion deriving from using different samples in different estimations, all the results presented in this section are based on Wave 8. Nevertheless, in Section D of the Online Appendix we replicate exactly the same tables using Wave 9 data. The results are substantially unchanged.

Table 3 reports the baseline estimation results of eq. (3), where the dependent variable is an indicator equal to one if the respondent declares the intention to vote for the Leave option. We proceed as in the regional-level analysis. Columns 1-3 refer to a parsimonious specification in which we only include the import shock, NUTS-1 fixed effects $\alpha_{j(\ell)}$, and those basic background covariates at the individual-level that are either clearly pre-treatment (*Age* and *Gender*), or plausibly pre-treatment (education level). Specifically, education is controlled for through 5 dummies indexing increasing levels of attainment, with the control group made up by individuals with no qualifications.[14] Column 1 reports results from a probit estimation with clustered standard errors. Column 2 refers to a multilevel linear probability model, with NUTS-3 random intercepts in addition to NUTS-1 fixed effects. Column 3 shows results from an IV probit with the same specification as in column 1, where Chinese imports to the UK are instrumented using Chinese imports to the US. In columns 4 to 6, we augment the models of columns 1 to 3, respectively, by adding the two variables on immigration.

The effect of the import shock on the propensity to vote Leave in the referendum is positive and statistically significant across the board, regardless of the estimation method. Also in this case, the IV probit yields approximately the same coefficient as the plain probit, further reassuring us about the absence of a clear endogeneity bias. The individual-level evidence on import competition is fully consistent with the regional-level results in Table 1. In particular, in substantive terms, the magnitude of the effect is essentially the same.

[14] Dummy ED1 refers to GCSE D-G; ED2 to GCSE A*-C; ED3 to A-level; ED4 to undergraduate; ED5 to postgraduate. GCSE stands for "General Certificate of Secondary Education".

For instance, considering the linear probability model of column 5 in Table 3, the import shock coefficient of 0.085, with a standard error of 0.039, is not statistically different from 0.12, the coefficient estimated across specifications in Table 1, accounting for the different scale of the dependent variable. Specifically, the regional dependent variable is on a 0-100 scale, and the estimated coefficient is 12. Rescaling the vote share on a 0-1 scale, making it directly comparable with the individual probability of voting Leave, yields a coefficient of 0.12, with a standard error of 0.04, thus not statistically distinguishable from 0.085.

A difference between regional and individual-level results emerges on the share of immigrants, with a negative and significant coefficient in the regional analysis but not in the individual one. In Section F of the Online Appendix we show how this difference might be driven by a correlation between socio-demographic composition of the population and incidence of immigration across regions. In particular, consistent with earlier evidence, our findings in Table 3 suggest that older, male, and less educated voters are more likely to support Leave. Once these factors are accounted for, in the individual-level analysis, the immigrants' share loses significance. This is consistent with relatively more immigrants settling in regions with younger and more educated population (e.g., London).

How big is the effect of import competition? The coefficient on the linear probability model in column 5 is 0.085. This implies that a change in the import shock from the minimum (0.06) to the maximum (0.75) would induce an increase in the probability of supporting Leave by around 6 percentage points. One gets a similar figure by computing marginal effects from the IV probit in model 6. To describe this further, let us compare two individuals of the same age, gender, and education, who live in the same NUTS-1 region but in two different NUTS-3 regions. Suppose that one NUTS-3 region gets a weak import shock (at the 10th percentile) and the other gets a strong shock (at the 90th percentile). Then, the individual living in the region facing the stronger shock is 3 percentage points more likely to support Leave than the other individual. Overall, the effect we detect is far from negligible, pointing to swings that could have been decisive in reversing the referendum outcome. Notably, our estimates are also net of average shocks at the NUTS-1 level, which

are captured by the fixed effects.

The British Election Study database contains information on the political orientation of respondents. In particular, we know which party they feel closest to (i.e. their party ID), as well as their left-right self-placement. These variables are post-treatment to the extent that people choose or revise their political orientation or affiliation due to the globalization shock. Nevertheless, their inclusion in the specification does not alter our probit results, i.e. the coefficient on the import shock remains positive and statistically significant. Not surprisingly, we find that supporters of the UKIP and, to a lesser extent, Tory identifiers, are significantly more in favor of Leave (by almost 40 percentage points in the case of UKIP). In addition, our evidence shows that in general more right-wing individuals favor Leave at higher rates. We also interact the import shock with dummies for party ID. As one might expect, we find that the import shock has a particularly strong effect on Labour and Scottish National Party identifiers (two groups whose party directorates officially sided with Remain) and with non-identified voters.[15]

In Table 4 we investigate how the effect of the Chinese import shock varies across individuals depending on their labor market status and occupation. We do so by augmenting the probit model of column 4 in Table 3 with dummies for specific categories of people, as well as interactions of these dummies with the import shock variable. In particular, we consider six dummies indicating, respectively: retired people (column 1); students (column 2); unemployed (column 3); manual workers (column 4); self-employed (column 5); service workers (column 6).[16]

Results in column 1 suggest that retired people are essentially sheltered from the import shock. There is also evidence that, regardless of the shock, students are less likely to vote for Leave (column 2), while manual workers are more likely to do so (column 4). Besides that, in columns 2 to 6 all the interactions between our dummies and the import shock are

[15]All these results are available upon request.

[16]Service workers are identified as reporting one of the following occupations: intermediate sales and service; semi-routine sales; semi-routine service; semi-routine childcare; routine sales and service.

Table 3: Individual-level results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave	Leave	Leave	Leave	Leave	Leave
Import Shock	0.247**	0.084**	0.227**	0.246**	0.085**	0.222**
	[0.104]	[0.039]	[0.108]	[0.104]	[0.039]	[0.106]
Immigrant share				-0.006	-0.002	-0.006
				[0.005]	[0.002]	[0.005]
Immigrant arrivals				0.011	0.003	0.010
				[0.024]	[0.008]	[0.024]
Age	0.014***	0.005***	0.014***	0.014***	0.005***	0.014***
	[0.001]	[0.000]	[0.001]	[0.001]	[0.000]	[0.001]
Gender	-0.048*	-0.017*	-0.048*	-0.050*	-0.017*	-0.049*
	[0.028]	[0.010]	[0.028]	[0.028]	[0.010]	[0.028]
ED1	-0.094	-0.029	-0.094	-0.097	-0.029	-0.098
	[0.085]	[0.029]	[0.085]	[0.085]	[0.029]	[0.085]
ED2	-0.183***	-0.060***	-0.183***	-0.186***	-0.061***	-0.186***
	[0.059]	[0.020]	[0.059]	[0.059]	[0.020]	[0.059]
ED3	-0.445***	-0.164***	-0.445***	-0.449***	-0.164***	-0.450***
	[0.059]	[0.020]	[0.059]	[0.059]	[0.020]	[0.059]
ED4	-0.728***	-0.268***	-0.728***	-0.729***	-0.268***	-0.730***
	[0.059]	[0.020]	[0.059]	[0.059]	[0.020]	[0.059]
ED5	-1.072***	-0.380***	-1.072***	-1.072***	-0.380***	-1.073***
	[0.066]	[0.021]	[0.066]	[0.066]	[0.021]	[0.066]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
NUTS-3 Random intercepts	N	Y	N	N	Y	N
Observations	16,331	16,331	16,331	16,331	16,331	16,331
Kleibergen-Paap F statistic			819.8			826.4
Number of groups		167			167	
Model	Probit	Linear Hierarchical	IV Probit	Probit	Linear Hierarchical	IV Probit

Standard errors clustered by NUTS-3 area in all columns except 2 and 5.
*** p<0.01, ** p<0.05, * p<0.1

not statistically different from zero. At the same time, the coefficient on the linear term of the shock is still positive and significant across the board. Overall, this evidence suggests that the impact of import competition is not restricted to a specific category of voters, e.g. the unemployed, who might be most directly affected by the shock. Rather, the effect is not statistically different from the average even for service workers, whose jobs are not directly affected by manufacturing imports from China.[17] By and large, this evidence is consistent with a sociotropic reaction of voters to the globalization shock, rather than a purely pocketbook one. In other words, individuals seem to respond broadly to the general economic situation of their region, regardless of their specific condition.

[17]The results for the import shock are unchanged if we estimate the multi-level version of the model or the IV probit, i.e. augmenting columns 5 and 6 of Table 3.

Table 4: Individual-level results with labor market interactions

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave	Leave	Leave	Leave	Leave	Leave
Import Shock	0.322***	0.228**	0.219**	0.230**	0.232**	0.217**
	[0.119]	[0.103]	[0.111]	[0.110]	[0.104]	[0.111]
Retired	0.027					
	[0.078]					
Retired * Import Shock	-0.407**					
	[0.200]					
Student		-0.456**				
		[0.178]				
Student * Import Shock		-0.103				
		[0.475]				
Unemployed			-0.081			
			[0.239]			
Unemployed * Import Shock			0.700			
			[0.695]			
Manual				0.230**		
				[0.096]		
Manual * Import Shock				-0.137		
				[0.282]		
Self-employed					-0.055	
					[0.134]	
Self-employed * Import Shock					0.227	
					[0.428]	
Service						-0.079
						[0.167]
Service * Import Shock						0.481
						[0.473]
Immigrant share	-0.006	-0.005	-0.006	-0.004	-0.006	-0.006
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Immigrant arrivals	0.012	0.011	0.012	-0.006	0.011	0.011
	[0.024]	[0.024]	[0.024]	[0.024]	[0.024]	[0.024]
Individual controls	Y	Y	Y	Y	Y	Y
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
Observations	16,331	16,331	16,331	14,763	16,331	16,331
Model	Probit	Probit	Probit	Probit	Probit	Probit

Standard errors clustered by NUTS-3 area.
*** p<0.01, ** p<0.05, * p<0.1

6.3 The role of immigration

In the results shown so far, there is only weak evidence that the incidence of immigration in a region is a driver of Leave votes. This may seem surprising, given the importance of immigration as a self-reported motivation of Leave supporters (Ipsos MORI 2016; Lord Ashcroft 2016). Wave 8 of BES allows us to investigate this issue further, since we have data on the perceptions of and attitudes towards immigration at the individual level. In particular, we employ four variables related to: the belief that immigration is good for Britain's economy (*Immig Econ*) and cultural life (*Immig Cultural*); the perception as to whether immigration is getting higher (*Immig Change*); and (4) the stance as to whether more immigrants should be allowed in the UK (*Immig Policy*). Higher values on Immig Change denote a stronger perception of increasing immigration. For the other three variables, higher values are associated with more positive views of immigration.[18]

Table 5 shows results from linear multilevel regressions where the dependent variable is, alternatively, one of the four variables capturing attitudes and perceptions on immigration.[19] On the right-hand side, the specification is the same as in column 5 of Table 3. In all the regressions, we find that individuals in NUTS-3 areas that have witnessed a stronger import shock tend to have more negative attitudes and perceptions with respect to immigration. The effect of the import shock is in itself substantively modest in size, but nonetheless far from negligible. For instance, if we compare two otherwise similar respondents, residing in the *same* NUTS-1 macro-region, and respectively in a NUTS-3 region at the 10th and at the 90th percentiles of import shock, they are expected to differ by around one tenth of a standard deviation of Immig Econ.[20]

In addition, the coefficients for background individual characteristics are predictive of

[18] Details in Section E of the Online Appendix.

[19] These variables refer to survey questions that are asked on a numerical scale visible to the respondent, hence it is legitimate to treat them as numerical (see Gelman and Hill 2006). Our findings are robust to estimating ordered probit models. Results are available upon request.

[20] Results are substantially unchanged if we omit the NUTS-1 fixed effects.

immigration attitudes and beliefs in unsurprising directions given the extant results in the literature (e.g., Mayda 2006): more educated, younger, and female respondents are in general less concerned with immigration, less supportive of restrictions, and perceive smaller trends in immigration.

Table 5: Determinants of attitudes towards immigration

	(1)	(2)	(3)	(4)
VARIABLES	Immig Econ	Immig Cultural	Immig Change	Immig Policy
Import Shock	-0.454***	-0.471***	0.125**	-0.435*
	[0.140]	[0.152]	[0.064]	[0.234]
Immigrant Share	-0.005	-0.004	0.008***	-0.018*
	[0.006]	[0.006]	[0.003]	[0.010]
Immigrant Arrivals	0.093***	0.089***	-0.055***	0.211***
	[0.031]	[0.033]	[0.014]	[0.051]
Age	-0.014***	-0.019***	0.012***	-0.031***
	[0.001]	[0.001]	[0.000]	[0.001]
Gender	-0.216***	0.051*	0.055***	-0.072*
	[0.024]	[0.026]	[0.012]	[0.038]
ED1	0.201***	0.184**	-0.055*	0.154
	[0.068]	[0.074]	[0.033]	[0.107]
ED2	0.390***	0.322***	-0.069***	0.326***
	[0.049]	[0.053]	[0.024]	[0.077]
ED3	0.962***	0.868***	-0.284***	1.204***
	[0.051]	[0.055]	[0.025]	[0.080]
ED4	1.499***	1.458***	-0.473***	2.056***
	[0.048]	[0.052]	[0.023]	[0.075]
ED5	1.985***	1.904***	-0.648***	2.856***
	[0.057]	[0.062]	[0.028]	[0.090]
NUTS-1 Fixed effects	Y	Y	Y	Y
NUTS-3 Random intercepts	Y	Y	Y	Y
Observations	20,299	20,467	20,623	19,339
Number of groups	167	167	167	167
Model	Hierarchical	Hierarchical	Hierarchical	Hierarchical

Standard errors in brackets

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

The stock and inflow of immigrants in the area in which the respondent resides have a somewhat counter-intuitive association with attitudes and beliefs about immigration. In particular, while the stock of immigrants is significantly and positively associated with a perceived stronger trend in immigration, the inflow of immigrants is statistically significantly associated with more favorable views of immigrants, and also with a smaller perceived trend in immigration. This evidence lines with existing studies showing how attitudes about immigration are to some extent unrelated to the actual presence of immigrants (Sides and Citrin 2007; Fetzer 2000; McLaren 2003).

While this piece of analysis does not aim at being a comprehensive exploration of immigration attitudes in Great Britain, our results suggest that one of the channels through which the Chinese import shock might increase Leave support is by worsening people's concerns with immigration. This finding is consistent with earlier studies showing that anti-immigration attitudes are largely driven by perceptions of the state of the economy (e.g., Citrin et al. 1997).

There are three main, non-mutually-exclusive mechanisms that might link import shock and immigration concerns. First, increased scarcity of employment opportunities, driven by the crisis of traditional manufacturing due to globalization, might have triggered concerns about increased competition from immigrants. Evidence exists that immigration to the UK has had little effect on native employment rates or wages (Dhingra et al. 2016). Yet, workers might hold a "lump-of-labor" belief, by which the labor market is perceived as a zero-sum game: if someone wants to get a job, she needs to take it away from someone else (Kemmerling 2016). In that case, regardless of the real effects of immigration, voters would be acting with the goal of protecting their employment prospects.

Second, and relatedly, we might be observing a "scapegoating" phenomenon like the one detected by Cochrane and Nevitte (2014), who show how anti-immigrant sentiments are systematically associated with the combination of high unemployment and the presence of a radical right party. This would be involved in shifting blame for unemployment towards immigrants. The main proponent of Brexit was the UK Independence Party, which

can be uncontroversially classified also as a populist anti-immigrant party.

Third, an increased reliance on existing welfare state provisions, related to the globalization shock, might spur concerns that immigration creates overcrowding and congestion for users of public services. The role of this type of concern in creating anti-immigrant attitudes is documented by Hainmueller and Hiscox (2010).

We are agnostic regarding which one of the mechanisms is most important. It might even be that anti-immigration sentiments and the Brexit vote are spuriously related, being held together only by party politics and policy bundling. Golder (2003) shows that immigration, especially when combined with high unemployment, leads to support for populist extreme-right parties. The UKIP happens to be, at the same time, a populist anti-immigration party, and the main agitator behind the Leave campaign. It is beyond the scope of this paper to empirically adjudicate among the mechanisms, or estimate their relative importance in the British electorate at the time of Brexit.

7 Conclusion

In this paper we show how globalization affected vote for Brexit. Our findings suggest that geographically concentrated economic distress –driven by the Chinese import shock– led to an increase in Leave support. The evidence we provide leads to some considerations. First, in order to understand Brexit, but also analogous phenomena like support for radical right parties in Western Europe, or the success of Trump in the 2016 presidential race, it is important to allow for a central role of "globalization without compensation". While trade liberalization is estimated to have generated net welfare gains in advanced countries, its benefits have been distributed highly unequally, leaving some social groups and, importantly, some geographic areas worse off. The inability of governments to set up effective compensation policies for the "left behind" of globalization might have led to a crisis of embedded liberalism, breeding isolationism and neo-nationalism.

It is questionable whether Brexit will lead to any relief for the segments of society bearing most of the adjustment costs from globalization. If anything, exiting the EU might

entail even more trade integration between the UK and China, through a new free trade agreement. Without a general shift of policy making in a more inclusive direction, Brexit might end up frustrating the expectations of many.

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A List of low-income countries

Table A1 reports the list of 52 low-income countries identified by Bernard et al. (2006), using as a criterion a level of GDP per-capita below 5% of the US figure.

Table A1: Low-income countries

Afghanistan	Ethiopia	Moldova
Albania	Gambia	Mozambique
Angola	Georgia	Nepal
Armenia	Ghana	Niger
Azerbaijan	Guinea	Pakistan
Bangladesh	Guinea Bissau	Rwanda
Benin	Guyana	Samoa
Bhutan	Haiti	Sao Tome
Burkina Faso	India	Sierra Leone
Burundi	Kenya	Somalia
Cambodia	Lao PDR	Sri Lanka
Central African Rep	Lesotho	St. Vincent
Chad	Madagascar	Sudan
China	Malawi	Togo
Comoros	Maldives	Uganda
Congo	Mali	Vietnam
Equatorial Guinea	Mauritania	Yemen
Eritrea		

B NACE subsections

Table A2: Nace Revision 1.1 manufacturing subsections

DA	Manufacture of food products, beverages and tobacco
DB	Manufacture of textiles and textile products
DC	Manufacture of leather and leather products
DD	Manufacture of wood and wood products
DE	Manufacture of pulp, paper and paper products; publishing and printing
DF	Manufacture of coke, refined petroleum products and nuclear fuel
DG	Manufacture of chemicals, chemical products and man-made fibres
DH	Manufacture of rubber and plastic products
DI	Manufacture of other non-metallic mineral products
DJ	Manufacture of basic metals and fabricated metal products
DK	Manufacture of machinery and equipment n.e.c.
DL	Manufacture of electrical and optical equipment
DM	Manufacture of transport equipment
DN	Manufacturing n.e.c.

C Robustness checks controlling for regional characteristics

In this Section, we augment the specification of column 4 in Table 1 with a large number of additional controls. Tables A3 to A5 report, respectively, results controlling for: additional immigration measures; political and social factors; and economic factors. As discussed in the paper, the inclusion of these variables is motivated by the correlational evidence presented in other contributions, and most comprehensively in Becker et al. (2016). Many of the controls we include are plausibly post-treatment, hence we do not consider these models as yielding the most accurate estimate of the effect of the import shock.[21] Nonetheless, the robustness of our main result under several different specifications can assuage doubts about the importance of Chinese competition as a determinant of Brexit.

Table A3 contains results from regressions in which additional measures of immigration are included. We start in column (7) by including the variable *Temporary*, i.e. the inflow of temporary immigrant workers disaggregated at the NUTS-3 level, sourced from ONS. The anti-immigration backlash could be in fact driven more by competition with seasonal workers rather than with settled immigrants, as captured by our main immigration variables. While temporary immigrants are not significantly associated with Brexit vote, the coefficient on the import shock is still positive and statistically significant, and its magnitude is slightly larger than in column 4 of Table 1, probably due to the loss of the 23 observations for Scotland.[22]

[21] See Samii (2016) for a discussion of post-treatment bias and over-conditioning in political science research, and Angrist and Pischke (2008) for a discussion of "bad controls".

[22] We also test the robustness of our finding regarding the import shock including a measure of the acceleration in the inflow of immigrants between 2005 and 2015, in line with the explanation proposed by Langella and Manning (2016). The acceleration is defined as $A = \frac{Arrivals_{2015}}{Arrivals_{2005}}$. The magnitude and statistical significance of the import shock coefficient are unaffected. At the same time, the acceleration does have a positive and statistically significant association with Leave vote share. To understand this further, we estimate the model in log scale, including separately both the (log) arrivals in 2005 and the

Table A3: Regional-level robustness - immigration

VARIABLES	(7) Leave Share	(8) Leave Share	(9) Leave Share	(10) Leave Share	(11) Leave Share
Import Shock	15.985***	9.391**	14.920**	15.643***	10.216**
	[4.520]	[3.858]	[6.061]	[5.704]	[4.263]
Immigrant Share	-0.453**	-0.328**	-0.282**	-0.48	-0.045
	[0.189]	[0.130]	[0.123]	[0.320]	[0.203]
Immigrant Arrivals	-0.224	-1.141	-1.434*	-2.702	2.050*
	[0.796]	[0.822]	[0.751]	[1.914]	[1.039]
Temporary Immigrants	0.114				
	[1.393]				
EU Accession Immigrants (2001)		-12.045**	-10.301	4.388	-4.115
		[5.824]	[8.104]	[10.819]	[6.365]
EU Accession Immigrants Growth (2001-2011)		1.527***	2.431*	3.271**	-0.341
		[0.549]	[1.286]	[1.546]	[0.790]
EU Accession Immigrants * Import Shock			-15.685	-70.423	
			[34.567]	[49.979]	
EU Accession Immigrants Growth * Import Shock			-1.831	-4.874	
			[3.745]	[4.323]	
Immigrant Share * Import Shock				0.497	
				[0.807]	
Immigrant Arrivals * Import Shock				5.239	
				[5.953]	
EU 15 Immigrants (2001)					-1.416
					[1.877]
EU 15 Immigrants Growth (2001-2011)					-3.742***
					[1.014]
Other Immigrants (2001)					-0.807*
					[0.401]
Other Immigrants Growth (2001-2011)					-0.003
					[0.023]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y
Observations	144	167	167	167	167
R-squared	0.58	0.68	0.68	0.68	0.74
Model	Linear	Linear	Linear	Linear	Linear

Standard errors clustered by NUTS-2 area in all columns.
*** p<0.01, ** p<0.05, * p<0.1

Table A4: Regional-level robustness - political and social factors

VARIABLES	(12) Leave Share	(13) Leave Share	(14) Leave Share	(15) Leave Share	(16) Leave Share	(17) Leave Share
Import Shock	4.551**	14.889***	9.460**	10.592**	9.849**	9.630**
	[2.166]	[5.245]	[4.084]	[4.075]	[3.913]	[4.193]
Immigrant Share	-0.148	-0.024	-0.592***	-0.617***	-0.601***	-0.592***
	[0.096]	[0.308]	[0.178]	[0.183]	[0.179]	[0.179]
Immigrant Arrivals	0.573	0.795	-0.083	0.025	-0.053	-0.077
	[0.426]	[1.573]	[0.777]	[0.809]	[0.778]	[0.780]
BNP Vote Share	4.153***					
	[0.675]					
UKIP Vote Share	0.820***					
	[0.072]					
Lib-Dem Vote Share	-0.016					
	[0.110]					
Labour Vote Share	0.004					
	[0.061]					
Green Vote Share	-0.677***					
	[0.148]					
Conservative Vote Share	-0.067					
	[0.072]					
Share High Skilled		-1.003***				
		[0.162]				
Share Above 60		1.009***				
		[0.343]				
Share Above 60 Growth		0.331**				
		[0.161]				
Share Home Owners		0.28				
		[0.166]				
Share Home Owners Growth		-1.081***				
		[0.318]				
Share Council Rented		0.446**				
		[0.201]				
Share Council Rented Growth		0.025				
		[0.018]				
Share Commuters to London		0.254**				
		[0.101]				
Fiscal Cuts			0.022***	0.014	0.021***	0.022***
			[0.006]	[0.013]	[0.006]	[0.006]
Cancer Treated in 62 days			-0.591	-0.503	0.271	-0.594
			[0.596]	[0.616]	[1.157]	[0.596]
Public Employment Growth			0.813	0.910*	0.802	0.97
			[0.519]	[0.536]	[0.541]	[1.190]
Fiscal Cuts * Import Shock				0.028		
				[0.031]		
Cancer Treated in 62 days * Import Shock					-3.512	
					[3.449]	
Public Employment Growth * Import Shock						-0.531
						[2.853]
NUTS-1 Fixed effects	Y	N	Y	Y	Y	Y
Observations	167	139	167	167	167	167
R-squared	0.93	0.52	0.70	0.70	0.70	0.70
Model	Linear	Linear	Linear	Linear	Linear	Linear

Standard errors clustered by NUTS-2 area in all columns.
*** p<0.01, ** p<0.05, * p<0.1

Table A5: Regional-level robustness - economic factors

VARIABLES	(18) Leave Share	(19) Leave Share	(20) Leave Share	(21) Leave Share	(22) Leave Share
Import Shock	13.275**	9.765**	10.848***	8.900**	7.997*
	[5.244]	[4.125]	[3.869]	[3.332]	[4.011]
Immigrant Share	-0.529**	-0.462***	-0.585**	-0.360**	-0.529***
	[0.196]	[0.163]	[0.221]	[0.160]	[0.147]
Immigrant Arrivals	0.025	-0.102	-0.028	-0.715	0.309
	[0.780]	[0.713]	[0.965]	[0.696]	[0.652]
Agriculture	0.605				
	[0.603]				
Agriculture * Import Shock	-2.369**				
	[1.072]				
EU Economic Dependence		0.683*			
		[0.384]			
Unemployment			1.017**		
			[0.400]		
Median Wage				-3.014***	
				[0.480]	
Median Wage Growth				-0.123	
				[0.098]	
Change in Relative Income vs. Median Region					-0.225***
					[0.059]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y
Observations	158	167	166	167	167
R-squared	0.66	0.66	0.67	0.72	0.69
Model	Linear	Linear	Linear	Linear	Linear

Standard errors clustered by NUTS-2 area in all columns.
*** p<0.01, ** p<0.05, * p<0.1

In the following columns, we add immigration variables disaggregated by country of origin, using UK Census data. In particular, in column 8 we single out immigrants from countries that have entered the European Union after 2004 (*EU Accession Immigrants*). Following Becker et al. (2016), we control both for the stock of immigrants in 2001 as a share of the resident population, and for their growth rate between 2001 and 2011. In column 9 we also interact these variables with the import shock. These results are discussed in the paper (columns 1 and 2 of Table 2). In model 10 we add interactions between the import shock and the overall measures of immigration. The estimates indicate that regions experiencing faster growth in EU accession immigrants were more supportive of Leave. None of the interactions are close to statistical significance, pointing to the absence of any evidence in favor of heterogeneity in the effect of the import shock as a function of actual immigration. Finally, in column 11 we report estimates of a specification that includes all the disaggregated measures of immigration by country of origin, but without interactions with the import shock. In particular, besides EU accession immigrants, we also control for immigrants from EU 15 countries, as well as immigrants from the rest of the world. This leads to a loss of significance for growth in immigration from EU accession countries.

To sum up, in all the specifications the coefficient on the import shock is positive and statistically significant, and approximately of the same magnitude as compared to the baseline estimate of column 4 in Table 1. There is some evidence that the composition of the pool of immigrants mattered, pointing to higher Leave support in areas that experienced faster growth in immigration from EU accession countries. Conversely, we find no evidence of an interactive effect between immigration and the trade shock. In any case, in light of

(log) arrivals in 2015. This is equivalent to estimating a model with the log acceleration, as $\log A = \log \frac{Arrivals_{2015}}{Arrivals_{2005}} = \log Arrivals_{2015} - \log Arrivals_{2005}$. It emerges that the relationship between acceleration and Leave share is driven only by the denominator (i.e., arrivals of foreign workers in 2005). In other words, the association between acceleration in arrivals and Leave share seems to be a manifestation of the lower popularity of Leave in areas with more non-UK born residents, i.e., those in which past arrivals were higher.

the importance that immigration had in the referendum campaign, we further explore the interplay between Chinese imports and attitudes about immigration in the individual-level analysis.

In Table A4, we check the robustness of the import shock result to the inclusion of political and social variables. In the first column we include regional-level vote shares for several parties in the latest European Parliament election of 2014. These are meant to control for differences in political preferences across regions, especially in virtue of the system of proportional representation that applies to these elections. Three of the coefficients on vote shares are statistically distinguishable from zero: those on BNP, UKIP, and Green Party. Their signs are intuitive, as higher support for Leave is observed in areas where more people voted for BNP and UKIP, whereas a higher Green Party share is associated to lower backing for Leave. The coefficients on the major parties outside of Scotland –i.e., Labour, Conservative, and Liberal Democrats– are negligibly small in substantive terms and not statistically significant. This might be due to the bluntness of the measures, i.e. vote shares aggregated by NUTS-3 regions, and does not exclude potential differences in the treatment effect across supporters of different parties. For this reason, we also investigate the interaction between partisanship and the import shock in the individual-level analysis.

Once we account for the party share variables, the estimate of the effect of the import shock is reduced in magnitude, but it is still positive and statistically significant, with a t-ratio above 2.1. Party shares are anyway arguably post-treatment with respect to the trade shock. Hence, by including them in the regression, we are effectively blocking one of the channels that might link the import shock to Leave vote: support for anti-establishment and, importantly, also vocal anti-EU parties like the UKIP. The fact that we still find a positive and significant coefficient for the import shock, albeit reduced, further corroborates the robustness of our main finding.

In column 13 of Table A4 we control for the socio-economic composition of the population in each region. First, since skill-biased technical change in the recent past might have led regions with a less educated workforce to be left behind, we include the variable *Share*

High Skilled, i.e. the share of the population with a higher education degree in the oldest available year (2000). Higher education is defined as levels 5 to 8 of the International Standard Classification of Education (ISCED), which cover from short-cycle tertiary education up to doctoral degree or equivalent. Data are drawn from Eurostat and are only available at the NUTS-2 level of regional disaggregation. For this reason, we do not include NUTS-1 fixed effects in column 13, as there would not be enough variation left for identification. Besides controlling for the high-skilled share, we also include: the share of the population older than 60 (*Share Above 60*); the share of the population living in an owned home, possibly with a mortgage (*Share Home Owners*); and the share of the population residing in public housing (*Share Council Rented*). These variables are sourced from the UK Census, and are aggregated at the NUTS-3 level. For all of them, following Becker et al. (2016), we include both the level in 2001 and the growth rate between 2001 and 2011. We also control for the share of residents in the working age that commute to Inner London for work (*Share Commuters to London*), obtained from the UK Census. We lose 28 observations due to education data availability (7 from North West England, and 21 from Greater London). Despite the smaller dataset, the coefficient on the import shock is positive, close to the baseline estimate, and statistically significant. At the same time, skills seem to be a strong predictor of the Brexit vote, in the expected direction. Indeed, if we compare two areas located in NUTS-2 regions that differ by one standard deviation in higher education levels, the area in the more skilled region is expected to support the Leave option by almost five percentage points less than the area in the less skilled region, *ceteris paribus*. In addition, there is a positive and statistically significant association between support for Leave and, respectively, an aging population and the share of population living in public housing in 2001 (but not its growth rate). On the other hand, areas with a stronger growth in home ownership tend to be less supportive of Leave, possibly capturing the effect of a dynamic real estate market at the regional level. Finally, all else equal, a larger share of commuters to London is associated with more support for Leave.

In models 14-17 we include measures of fiscal cuts and underprovision of public ser-

vices at the regional level, and we explore how they might compound with the globalization shock in affecting the referendum outcome. Specifically, we focus on three variables: *Fiscal Cuts*, *Cancer Treated in 62 Days*, and *Public Employment Growth*. These variables are presented in the paper, and the results of models 14-15 are also discussed in the manuscript (columns 3 and 4 of Table 2). In column 16, we include the interaction between the import shock and the proxy for the quality of NHS services (*Cancer Treated in 62 Days*). This interaction is not statistically significant at conventional levels but, as for the case of fiscal cuts in model 15, it provides (very mild) evidence that the import shock had a stronger impact on the Leave vote share in areas with less efficient public services. Finally, in the last column of Table A4 we include the interaction between the import shock and public employment growth. Also in this case, the interaction is not statistically significant but points to a possible (yet very imprecisely estimated) interactive effect, slightly muting the main effect of the import shock in areas where public employment grew more (or better, decreased less).

Table A5 probes the robustness of our result regarding the import shock to the inclusion of additional economic characteristics of NUTS-3 regions. In the first column we include the variable *Agriculture*, i.e., the share of agriculture in regional GDP, and its interaction with the import shock. The agricultural share of GDP is obtained from Eurostat, and is averaged over the period 2004-2013. Regardless of the import shock, more agricultural areas are somewhat more in favor of Leave, albeit not statistically significantly so. Importantly for our argument, the vote share for Brexit is less sensitive to the import shock in more agricultural areas. In fact, in regions above the 90th percentile of importance of agriculture in GDP, the effect of the import shock is no longer statistically distinguishable from zero. This further reassures us that our measure of the Chinese import shock is picking up the actual effect of import competition, which strongly affects areas that are traditionally specialized in manufacturing, and from which more agricultural regions are to some extent sheltered.

In the second column, we include an index of *EU Economic Dependence*. This robustness check is discussed in the paper (column 5 of Table 2). In the third column, we include

in the specification the unemployment rate at the NUTS-3 level (*Unemployment*), measured in the most recent year prior to the referendum (2015). Data are from the Office for National Statistics. As expected, a higher unemployment rate is significantly associated with higher support for Leave. Yet, its inclusion does not eliminate the effect of the import shock, which remains close to the baseline estimate. The unemployment rate in a region is clearly post-treatment with respect to the import shock. However, its inclusion shows that globalization, with the ensuing decline of manufacturing, is a long-term structural process whose effects work beyond an increase in the unemployment rate, that could also be largely reflecting a temporary economic downturn. Overall, our evidence suggests that globalization drove support for the Leave option through a broader type of impact, possibly involving increasing uncertainty, reduced income, and even higher mental distress on top of unemployment, as found in a recent study on the UK by Colantone et al. (2015).

In the fourth column, we include two measures that capture another channel through which the import shock might be operating: *Median Wage* and *Median Wage Growth*. Specifically, we include the median (gross) wage level for the year 2005, and its change between 2005 and 2015. These variables are based on data from the Annual Survey of Hours and Earnings of the ONS, averaged at the NUTS-3 level. While there is no statistically significant evidence that growth in the median wage in the past decade is, all else equal, associated with a lower Leave vote share, the coefficient on median wage in 2005 is negative and highly statistically significant. That is, regions with higher hourly pay were less in favor of Leave. To put this result in context, a one-standard-deviation difference in median hourly pay in 2005 is associated with lower support for Leave by about 5 percentage points. In particular, if we compare Greater Manchester South West (UKD34), which had a median hourly wage of 9.60 GBP, and Blackburn with Darwen (UKD41, in Lancashire), at 8 GBP, they are expected to differ by 4.8 percentage points in their support for Leave. In fact, Leave shares differed by around 7 percentage points between these two areas. The coefficient on the import shock is still positive and significant, although slightly reduced in magnitude as compared to the baseline estimate. This is in line with lower wages being a possible

channel for the effect of the trade shock on voting.

Finally, in the fifth column we include one further variable that captures the most comprehensive channel through which globalization might induce spatial variation in voting behavior: an increase in inequality across regions, through the creation of geographically concentrated "winners" and "losers". In particular, for each NUTS-3 region we compute the *Change in Relative Income* (CRI) between 1997 (the earliest year for which we have data) and 2015. This regression is also presented and discussed in the paper (column 6 of Table 2). The estimated coefficient on CRI is negative and significant, pointing to higher support for Leave in areas that are falling behind in relative terms. Nevertheless, the coefficient on the import shock is still positive and, albeit smaller, in the same order of magnitude of the baseline estimate (around 8 vs. 12 in the main specification of Table 1). The effect of imports is less precisely estimated, hence the p-value falls just above conventional levels of statistical significance (being equal to 0.053).[23]

[23]We also calculate analogous measures of CRI based on the mean and maximum values of regional GVA per capita, rather than the median. The results obtained with these measures are unsurprisingly similar to the ones reported in Table A5, and are available upon request.

D Additional Results

In Table A6 we show that our main regional-level result is robust to the exclusion of specific NUTS-1 regions. In particular, if we omit Scotland and Greater London, two potentially outlying regions, the coefficient on the import shock is 14.3 (t=2.99). If we omit these two NUTS-1 macro-regions and, iteratively, also one additional NUTS-1 region, the coefficient on the import shock varies from a minimum of 12.8 (t=2.48) to a maximum of 16.7 (t=3.05). The smallest t-ratio we estimate is 2.43. A hierarchical varying-slope varying-intercept model, where the slope and the intercept are allowed to vary by NUTS-1, yields a coefficient for the mean of the slopes of 13.6 (t=3.04) and a standard deviation for the varying component of the slope of 2.05, which points to a modest degree of variation of the slope across NUTS-1 macro-regions.

Table A6: Regional-level results - robustness

	Coeff.	Std. Err.	Obs.	R-sq.
1) Excluding London (UKI) and Scotland (UKM)	14.334***	[4.792]	123	0.3
Excluding also:				
2) North East (UKC)	14.942***	[4.899]	116	0.3
3) North West (UKD)	12.891**	[5.041]	103	0.3
4) Yorkshire and the Humber (UKE)	13.274**	[4.795]	112	0.3
5) East Midlands (UKF)	16.740***	[5.487]	112	0.3
6) West Midlands (UKG)	12.748**	[5.144]	109	0.3
7) East of England (UKH)	15.474***	[4.874]	107	0.4
8) South East (UKJ)	13.632**	[5.056]	103	0.3
9) South West (UKK)	14.476***	[4.923]	111	0.3
10) Wales (UKL)	14.199**	[5.851]	111	0.3

In all rows the specification is the same as in column 4 of Table 1.
Standard errors clustered by NUTS-2 area.
*** p<0.01, ** p<0.05, * p<0.1

In Tables A7 and A8 we replicate the individual-level regressions using BES data from Wave 9. These include information on self-reported vote.

Table A7: Individual-level results - BES Wave 9

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave	Leave	Leave	Leave	Leave	Leave
Import Shock	0.244**	0.095**	0.228**	0.234**	0.092**	0.213**
	[0.100]	[0.038]	[0.107]	[0.103]	[0.039]	[0.109]
Immigrant Share				-0.010*	-0.003	-0.010*
				[0.006]	[0.002]	[0.006]
Immigrant Arrivals				0.011	0.003	0.01
				[0.029]	[0.011]	[0.029]
Age	0.011***	0.004***	0.011***	0.011***	0.004***	0.011***
	[0.001]	[0.000]	[0.001]	[0.001]	[0.000]	[0.001]
Gender	-0.011	-0.005	-0.011	-0.013	-0.005	-0.013
	[0.024]	[0.009]	[0.024]	[0.024]	[0.009]	[0.024]
ED1	-0.159**	-0.055**	-0.159**	-0.160**	-0.055**	-0.160**
	[0.070]	[0.025]	[0.070]	[0.070]	[0.025]	[0.070]
ED2	-0.138***	-0.048***	-0.138***	-0.141***	-0.049***	-0.141***
	[0.046]	[0.016]	[0.046]	[0.046]	[0.016]	[0.046]
ED3	-0.458***	-0.173***	-0.459***	-0.464***	-0.174***	-0.464***
	[0.050]	[0.018]	[0.050]	[0.050]	[0.018]	[0.050]
ED4	-0.737***	-0.277***	-0.737***	-0.738***	-0.277***	-0.739***
	[0.050]	[0.018]	[0.050]	[0.051]	[0.018]	[0.051]
ED5	-1.030***	-0.375***	-1.030***	-1.029***	-0.375***	-1.029***
	[0.059]	[0.020]	[0.059]	[0.059]	[0.020]	[0.059]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
NUTS-3 Random intercepts	N	Y	N	N	Y	N
Observations	15,923	15,923	15,923	15,923	15,923	15,923
Kleibergen-Paap F statistic			798.9			815.4
Number of groups		167			167	
Model	Probit	Linear Hierarchical	IV Probit	Probit	Linear Hierarchical	IV Probit

Standard errors clustered by NUTS-3 area in all columns except 2 and 5.
*** p<0.01, ** p<0.05, * p<0.1

Table A8: Individual-level results with interactions - BES Wave 9

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave	Leave	Leave	Leave	Leave	Leave
Import Shock	0.362***	0.215**	0.226**	0.257**	0.235**	0.252**
	[0.123]	[0.098]	[0.106]	[0.121]	[0.104]	[0.113]
Retired	0.104					
	[0.083]					
Retired * Import Shock	-0.603***					
	[0.220]					
Student		-0.514**				
		[0.201]				
Student * Import Shock		0.139				
		[0.587]				
Unemployed			0.029			
			[0.198]			
Unemployed * Import Shock			0.165			
			[0.538]			
Manual				0.195*		
				[0.111]		
Manual * Import Shock				0.113		
				[0.305]		
Self-employed					0.042	
					[0.103]	
Self-employed * Import Shock					0.017	
					[0.307]	
Service						0.108
						[0.117]
Service * Import Shock						-0.142
						[0.304]
Immigrant Share	-0.010*	-0.009	-0.010*	-0.016***	-0.010*	-0.010*
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Immigrant Arrivals	0.013	0.008	0.01	0.049	0.011	0.011
	[0.030]	[0.031]	[0.029]	[0.032]	[0.029]	[0.030]
Individual Controls	Y	Y	Y	Y	Y	Y
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
Observations	15,923	15,923	15,923	12,579	15,923	15,923
Model	Probit	Probit	Probit	Probit	Probit	Probit

Standard errors clustered by NUTS-3 area.
*** p<0.01, ** p<0.05, * p<0.1

E Attitudes about immigration

In the analysis of attitudes about immigration, in Section 5.3 of the paper, the reference survey questions are: (1)"Do you think that immigration is good or bad for Britain's economy?" (*Immig Econ*); (2) "And do you think that immigration undermines or enriches Britain's cultural life" (*Immig Cultural*); (3) "Do you think that the level of immigration is getting higher, getting lower or staying about the same?" (*Immig Change*); (4) "Some people think that the UK should allow many more immigrants to come to the UK to live and others think that the UK should allow many fewer immigrants. Where would you place yourself and the parties on this scale?"(*Immig Policy*). The survey questions are answered, respectively, on a 7-point scale for the first two, a 5-point scale for Immig Change, and an 11-point scale for Policy.

F Reconciling regional and individual analysis

As discussed in the paper, the regional-level results of Table 1 are consistent with the individual-level outcomes of Table 3, except for the findings on the share of immigrants in the population. Indeed, in the regional analysis we obtain a negative and significant coefficient on this variable, which is instead not significant in the individual-level analysis. It is important to assess the possible reasons for such a discrepancy.

In general, there are two possible explanations for differences in results on contextual variables between aggregate and individual analysis. On the one hand, differences in the socio-demographic composition of regions could be correlated with regional-level explanatory variables. As a result, when controlling for socio-demographic characteristics, at the individual level, results on the regional-level explanatory variables could change as compared to the regional analyis. On the other hand, such differences in results could also stem from a suboptimal representativeness of the survey sample across regions.

In order to investigate which of these two explanations applies to our case, in Table A9 we replicate all the individual-level regressions of Table 3, but excluding the individual controls: age, gender, and education dummies. The results are very reassuring on the representativeness of our sample of individuals. In fact, the coefficients on the import shock –e.g., around 0.14 in the linear model of column 5– are very close in substantive terms to the ones obtained at the regional level in Table 1, around 12. One should of course take into account that the dependent variable in the regional analysis is the Leave vote share, on a scale between 0 and 100. Therefore, a coefficient of 12 in those regressions is equivalent to a coefficient of 0.12 if one rescales the vote share on a 0-1 scale, thus making it immediately comparable to the individual probability of voting Leave.

Interestingly, when omitting the individual controls, in Table A9, we retrieve again a negative and significant coefficient for the share of immigrants in the population, as in the regional analysis. This suggests that the differences between Table 1 and Table 3 are driven by a correlation between the socio-demographic composition of the population and the incidence of immigration across regions. Specifically, the evidence is consistent with rela-

tively more immigrants settling in regions characterized by a younger and more educated population (e.g., London). Indeed, younger and more educated people are less likely to vote Leave. In turn, when age and education are controlled for at the individual level, in Table 3, the share of immigrants is not found to be statistically significant. Conversely, if one omits the individual controls from the individual-level regressions, as we do in Table A9, the share of immigrants emerges again as a significant correlate of the probability of voting Leave. Also in this case, the substantive magnitude of the coefficient is very close to the one obtained in the regional analysis. For instance, in the linear probability model of column 5 in Table A9, the coefficient on the share of immigrants is -0.004. This is very similar to the coefficient of around -0.5 obtained across specifications in Table 1, considering the different scale of the dependent variable.

Overall, this evidence suggests that immigration is endogenous to the socio-demographic characteristics of regions. This is a well-known result in the literature on immigration, where recent work is exploiting policy changes that induce exogenous variation in the presence of immigrants across regions, in order to identify causal effects of immigration on voting (e.g. Dustmann et al., 2016).

Table A9: Individual-level results: excluding individual controls

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Leave	Leave	Leave	Leave	Leave	Leave
Import Shock	0.411***	0.152***	0.389***	0.374***	0.144***	0.348***
	[0.134]	[0.053]	[0.131]	[0.116]	[0.049]	[0.114]
Immigrant Share				-0.013**	-0.004*	-0.013**
				[0.005]	[0.002]	[0.005]
Immigrant Arrivals				-0.003	-0.002	-0.004
				[0.026]	[0.010]	[0.027]
NUTS-1 Fixed effects	Y	Y	Y	Y	Y	Y
NUTS-3 Random intercepts	N	Y	N	N	Y	N
Observations	16,331	16,331	16,331	16,331	16,331	16,331
Kleibergen-Paap F statistic			788.6			791.2
Number of groups		167			167	
Model	Probit	Linear Hierarchical	IV Probit	Probit	Linear Hierarchical	IV Probit

Standard errors clustered by NUTS-3 area in all columns except 2 and 5.
*** p<0.01, ** p<0.05, * p<0.1