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Brexit and the War for Talents: Push & pull evidence about competitiveness

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Abstract
Brexit raised the question of whether the UK will continue to attract internationals. Here the focus is on academic staff – a critical component of the "War for Talents" discourse and current geopolitics in the field. Despite a clear trend of loss of EU internationals, at least among western EU countries, the UK more than compensates for this fall with extra-EU internationals. This is even more evident among younger generations. However, the most notable effect, also having a long-term impact as far as it deals with newer generations, is about average quality of such talents (in this study: salaries at parity of age). Brexit is reducing the capacity to attract/retain the best academics. This happens especially among younger cohorts, and if they come from countries that perform better in GDP per capita, R&D investment, but also national ranking in tolerance and creative class scores. Overall, Brexit is detrimental to the UK in relation to attraction of talents, cutting through a long-term pattern of success.

Keywords Brexit · War for talent and global competition · Salary · Mobility · Push and pull · Career

Introduction

The referendum about "Should the United Kingdom remain a member of the European Union or leave the European Union?" that took place in the UK on 23 June 2016 is usually referred to as "Brexit". Brexit triggered a series of complex and long negotiations. The UK invoked article 50 of the EU Treaty to formally start a process of secession from the EU on 17 March 2017. The UK formally exited the EU on 31 January 2020, but the transition period did not end until 31 December 2020. For EU people living in the UK, Brexit mostly meant they needed to pass through the EU Settlement Scheme (EUSS) to acquire the Indefinite Leave to Remain (ILR) – an application that has been modified since 2017. EUSS allows anyone already officially in the UK before the end of 2020 to secure the same legal conditions applied when the UK was part of the EU. It is widely appreciated that Brexit had an instant effect in terms of uncertainty about what "post-Referendum" would

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have been. We refer in this paper to "post-Referendum" (or "Brexit") as a convenient term to signify this long process of phasing out up to current days, establishing academic year 2016/2017 as a convenient moment in time that splits pre- and post-Referendum.

Looking more closely at higher education, early on since post-Referendum, there have been a series of preoccupations about the impact for higher education and science. These preoccupations are still pending and under scrutiny. The capacity of the UK to continue to attract an academic labour force from abroad is a point in case. In this regard, Brexit might be put in parallel with an overall "post-globalization" sentiment, namely neo-nationalism affecting contexts such as the US and the UK (Friedman, 2018). Neo-nationalism also has an effect on the attraction and retention of academic staff. In the US, for instance, the "China Initiative" is found to exert a cost for the sake of competition, representing a trade-off policy choice (Lee & Li, 2023). Other reflections about specific types of visas for highly skilled personnel came to the conclusion that the US is reducing its attractiveness (Kerr, 2020; Jacobs, 2022). Brexit is a similar and at the same time different policy: it represents a closure, but it is enacted via the rebuttal of Freedom of Movement (FoM), a cornerstone of the European Union (van der Wende, 2020).

This paper focusses solely on evidence about the changed trends in the specific topic of attraction of academic staff, with the latest data available. The main research question is that Brexit might have altered the patterns of international mobility of academic staff by origin countries and regions (EU/non-EU, and others, see further), age, and quality of international academic staff (see further). In particular, the paper adopts a push and pull (P&P) framework, a consolidated approach nested in rational choice arguments. We temper P&P by "soft" factors, as per literature in the field (see further). Such a research question is suitable to feed empirically the emergent debate about geopolitics in higher education (Cantwell & Grimm, 2018). The debate about Brexit and a new place for the UK in academic science is florid (Peters, 2021; Parnell, 2022). Here we use evidence to contribute to such debate.

The paper discusses related policies occurred post-Referendum. Thus, literature about attracting talents follows. The Data and Method section answers the question of whether during post-Referendum there has been an impact on the attraction of international academic staff. This includes also limitations carried over from data constraints. The Results section splits between an analysis of the number of internationals from one side, and respective quality of internationals on the other side. The Discussion and Conclusions synthetise the main lessons to learn from Brexit as an unprecedented and still unfolding process.

Unfolding Brexit

Scenarios about the possible impact of Brexit prospered since the morning of 24 June 2016. This event brought vivid debate, disentangling different possible versions to manage this transition. However, research about this specific topic evidenced soon that Brexit would have mostly detrimental consequences irrespective of either implementing a "soft" or a "hard" Brexit (Petersen & Puliga, 2017) – a popular jargon in early post-Referendum discourse. Most of the research during the post-Referendum period focussed on feelings by academics (Marginson, Papatsiba, & Xu, 2020), being too early, and policies uncertain, to conclude a clear outcome.

The UK launched brand new visas to propel attractiveness to the highly skilled – the "Global Talent visa".[1] This scheme received a number of applications from EU countries which was below expectations (Torjesen, 2020). A more focussed and restricted scheme for Nobel prizes instead received zero applications – academics and Nobel laureates themselves sarcastically labelling such initiative (Murugesu, 2021). Although the UK attention to the topic of attractiveness is to be praised, probably any favourable visa is less favourable than the EU FoM per se, both in terms of economic and social security conditions, and general sense of being welcome.

After years of uncertainty about which status, if any, the UK would have in the future within EU funding schemes, on 7 September 2023 the UK re-entered the EU Horizon and Copernicus (but not Euratom) schemes as an Associate Country – a status already in place for non-EU members like Norway and the Helvetic Confederation. Whilst this agreement ends one of the most pernicious elements of the post-Referendum period (uncertainty), and potentially restores the UK reputation, it does not give back FoM. At the same time, these first seven years of post-Referendum exacerbate the need for empirical analysis about its effects, if any.

Literature on attracting talents

The topic of mobility of academics is classic in the field of science and higher education, as well as in the broader set of highly skilled workers – being academic staff "talents" by definition. Although the literature appreciates that the P&P perspective is only an approximation to understand the phenomenon of academic mobility (Huisman, 2022), this approach is consolidated and undoubtedly explains some patterns.

Mobility is a win–win dynamic among mobile workers and employers. However, it is a zero-sum game, a competition, across sending (brain-drain) and receiving (brain-gain) entities – the "war for talent" argument (Michaels et al., 2001). This competition is intrinsically and implicitly "global" and "international" at the same time. Competition is tricky per se. For instance, rankings confirm expectations of (competition for) excellence, rather than representing a kick-off of a game with an undecided, contestable outcome (Li & Lowe, 2016; Kim, 2017). Competition is also subject to more generic nation branding (Silvanto et al., 2015). It is also shaped by ad hoc policies to tackle brain-drain (Latukha et al., 2022). Top destinations are attractive per se, but they also bring high expectations and pressures. In this sense, second tier countries which are still highly developed but requiring less pressure may represent a good deal (Zha, 2016). This dynamic happens also at the EU level for semi-peripheries (Luczay, 2023). Brain-back is also possible. Countries and/or institutions incentivise this for the sake of global prestige (Shi et al., 2023; Marini & Yang, 2021). On top of the manifest advantage of gaining brains whose productivity and quality are higher, the stake of attraction includes the implicit, or hidden, definition of which institutions and countries are worthy of having a gravitational attracting force. In fact, reverse brain drain may be facilitated by, inter alia, munificent working conditions (Chou, 2021) or the lure of adventure for unconventional venues (Lee & Kuzhabekova, 2018). Nevertheless, these latter two drivers are arguably exceptions confirming the norm. Debates, also at policy level, assess the issue of visas, finding this extra-paperwork is not necessarily a critical hindrance

[1] https://www.gov.uk/global-talent-researcher-academic/academic-or-researcher.

(Mayhew, 2022), potentially minimising any possible disruption brought over from Brexit. However, specific visas might also represent a pitfall, similar to the H-1B one in the US (Kerr, 2020; Jacobs, 2022).

On top of wages, and economic development of destination and origin contexts, there are also "soft" factors influencing international mobility that temper some limitations of a pure P&P framework. This is the case of the "creative class" argument (Florida et al., 2015). It implies that talents search for tolerant and open-minded places where they can flourish, not necessarily just high salaries. The argument of the creative class emerged to demonstrate how cultural values, namely and foremost liberal ones, are functional to boost GDP in those contexts where creative class is more welcome (or at least tolerated). Arguably, universities are one of the main institutions where such values may prosper, or at least it is one of those institutions that is more expected to respect and nourish such values. An application to higher education is that of cities that ought to be "global" to secure attractiveness (Labrianidis et al., 2022). In this regard, it is relevant to highlight that the UK universities are leaders in respecting some minorities, such as the LGTB+ community, at least if compared to many other countries (Hamilton & Giles, 2022). At the same time, research explains that BAME (Black and Asian Minority Ethnics) academics in the UK may feel discriminated against by "White" colleagues, leading them to migrate elsewhere. This makes academic international mobility also a matter of expectations and relief from negative experiences (Bophal et al., 2016). It is known in literature that the climate of destination places might be of secondary importance, relative to the features of those of origin (Andersen et al., 2010).

In these post-Referendum first years, research about the effect of Brexit on academic staff focussed on perceptions, intentions, and speculations (Leisyte & Rose, 2017; Lulle et al., 2019). Some early research on the topic highlighted that Brexit would imply less cooperation and more competition. In this context marked by uncertainty, practical, rather than ideological, responses are the main ones (Seidenschnur et al., 2020). This may lead to having less openness between new "unbounded from EU" UK and EU-now-27 member States (Veiga, 2021). Furthermore, whenever the UK has been chosen as a destination in post-Referendum, Europeans have not felt it as staying within the framework of FoM (Sédès et al., 2022). This may mean that Brexit already fully happened in relation to how new immigrants are welcomed. It may also mean that new immigrants acknowledge that post-Referendum UK is moving abroad all the way. However, one may also conceive that universities represent a happy exception to a wider context, at least to some extent. These reflections let suggest that academic staff may just seek their personal best choice albeit appreciating post-Referendum minuses, which corroborates some rational choice assumption nested in P&P analysis. In terms of academic mobility of staff and empirical evidence, younger researchers from other European countries no longer look at the UK as one of the main destinations, despite European countries not absorbing this novel void of expectations from the supply side (Courtois & Veiga, 2020; Courtois & Sautier, 2022). This would be consistent with wider "creative class" studies referring to first employment job searches as the most critical in triggering mobility choices (Hansen & Niedomysl, 2009). Post-Referendum UK heralded new opportunities between the UK and extra-EU countries. Looking at some countries such as Ghana and South Africa, both former British colonies, research suggests that the UK withdrawing from the EU equals disrupting a chain of ties, with no clear or probable replacement (Langa et al., 2019). Other evidence-based research argued a net loss within the youngest cohort of academics from the EU who had higher salaries, arguably enacted via portability of grants (Marini, 2018). This evidence dates back to the first stages of Brexit which might have been either over-reactions about detrimental Brexit,

or first glimpses of Brexit doomed to increase its actual impact by time. More recent data confirms a loss of attractiveness for EU academic staff (Locke & Marini, 2021).

Data and Methods

We refer to Higher Education Statistics Agency (HESA) data about staff in UK higher education institutions ("providers") in full time equivalent (fte) values accessed under Heidi Plus Gold-User privilege (available to staff with a UK academic email address and subject to specific training and acceptance of institutional ethical review). These data are the census from 2007/08 until 2021/22 academic years (latest data are hence about March 2021–March 2022). This operation totals almost 5 million fte academics expressed as stock. This excludes non-academic staff in universities. It also excludes the atypicals whose headcount is large, but the respective fte is relatively small. Along with nationality, we use age (10 bands) and salary (6 bands) – the most fine-grained information for both variables. Salary at parity of age is a convenient measure of "quality" of talents, assuming that: (1) the labour market may fairly appreciate each person skills and value; (2) and that individuals may pursue mobility seeking their best matching, if felt undervalued. Although data operate on only 60 combinations, we find this choice the only one currently easily accessible to assess some form of "quality of talents". Salary bands are the same across these years; therefore, we input an annual salary as the intermediate point in the bands. We also adjust by inflation to obtain 2022-year values (£ parity of purchased power – PPP).

We treat data to understand two phenomena as per the main research question: whether EU nationals declined in numbers relative to the pre-2016/17 period; and, regardless of the number of people working in the UK as academics, whether quality of internationals changed across time by a series of different terms of comparison. We add in this dataset some information at the country level, such as GDP per capita (Sanliturk et al., 2023), gross domestic expenditure on R&D (GERD) (Petersen & Puliga, 2017), national scores of "tolerance" and "creative class" (Florida et al., 2015). These variables are relevant to confound EU and non-EU countries in terms of conventional P&P assumptions.

The data analysis strategy follows two roads. The first part provides fte trends by country before and after 2016/17 ("Trend of number of internationals"). In this part it is assumed as null hypothesis that in post-Referendum years, the patterns each single country had had pre-Referendum should have not changed. The second part considers "quality" of academic staff operationalized as salary at parity of age ("Impact of Brexit on attracting the best talents"). For this second part of the analysis, we provide difference-in-difference tests, grouping countries into several categories, and keeping nevertheless some confounding variables at country level as covariates.

Limitations

These data, despite being from the census, suffer from a series of limitations. Although salary is a valid measure of one's abilities, bands of it, especially for the open upper band, are not entirely satisfactory. In many regards, scientometric data may better capture dimensions of quality, if research ability is assumed the be the main measure of quality in academic work. However, one may argue that, in the UK, premium for supervision (meaning, taking managerial functions within academia) is high (Leonida et al., 2022). Such premium is present in higher education as well, and research per se is not the only criterion to give

Table 1 International staff as fte and row percentage, time series

Academic year	EU	non-EU	GB	Tot	EU	non-EU
2007/08	15178	14365	98501	128044	11.85%	11.22%
2008/09	16461	14629	100641	131731	12.50%	11.11%
2009/10	16927	14821	101242	132990	12.73%	11.14%
2010/11	17331	14749	100241	132321	13.10%	11.15%
2011/12	18054	14567	100149	132770	13.60%	10.97%
2012/13	19549	15001	102073	136624	14.31%	10.98%
2013/14	21827	15835	104735	142398	15.33%	11.12%
2014/15	23842	16785	107706	148333	16.07%	11.32%
2015/16	25509	17590	110114	153213	16.65%	11.48%
2016/17	26537	18335	113104	157976	16.80%	11.61%
2017/18	27032	19292	116183	162508	16.63%	11.87%
2018/19	26984	20727	118764	166476	16.21%	12.45%
2019/20	25857	21658	110139	157655	16.40%	13.74%
2020/21	24656	22206	107212	154074	16.00%	14.41%
2021/22	23497	24107	107933	155536	15.11%	15.50%

job offers and promotions. This subpoint tempers the first limitation. Second, fluxes, rather than stocks, would better assess migrations. Third, any other supplementary variable which is available from HESA would enrich the analysis: sex, discipline, institutional affiliation (Highman, 2019), type of contract, economic source of one's salary (which may disentangle between EU derived funding like 2020 Horizon, or other national UK research funding – a distinction presumably worth exploring talking of Brexit), ethnicity – they all matter. However, skipping these variables allows one to avoid breaching the principle of anonymity. This is particularly cogent if one keeps the argument of different single countries representing attracting force at different extents (P&P). More precisely, including further variables would impinge upon the capacity to have reliable figures about salary for most countries of origin, invalidating the use of a single country variable. A fourth limitation deals with the definition of academic staff. Despite differences, arguably by specific type of research funding (such as the federal ones in the US, and some EU or national ones in the UK), globally leading countries are conducive of attracting internationals at entry, non-tenured, levels in the academic labour market (Mayhew, 2022). The effects of Brexit, in fact, have been since the beginning more concerning for those under atypical and fixed-term contracts (Reichl Luthra, 2021). Post-Referendum more likely has affected attraction, retainment and attrition of staff of this kind. Only fixed-term staff is included here. However, focussing on non-atypicals renders any found impacts more reliable, avoiding segments of staff more likely to give upper bounds impact.

Results

Trend of number of internationals

EU nationals grew consistently reaching a plateau in 2016/17 with a percentage of 16.8% of total staff (peak in absolute numbers is reached following academic year with 27.032

fte staff). These shares are higher than those reported in some studies about specific research-related occupations (Begum et al., 2019) or wider definitions of talents (Petersen & Puliga, 2017). In the following years, this share started declining, even in absolute terms (see Table 1). Non-EU countries more than compensated for this deficit. This pattern is even more visible for the younger cohorts (staff in their 30s or below). In absolute terms, EU nationals had a peak in 2017/18, confirming similar, older, findings (Locke & Marini, 2021). In the most recent available academic year (2021/22), non-EU surpassed EU nationals. Within the EU nationals, the migration stocks are not homogeneous. Central/Eastern Europeans have been paid particular attention in relation to consequences of FoM (Burrell, 2010). This part of Europe is also inclined to brain-drain problems altogether (Kazlauskienė & Rinkevičius, 2006). Apparently, Brexit per se is reckoned deeply linked to this specific migration origin (Lumsden et al., 2019). Splitting the EU countries between the first 15 to establish/access it (14 considering the UK is excluded), and the others (the 13 "accessing" ones), it is apparent that the latter ones continue also in post-Referendum to have increasing numbers: they were 13% in 2007/8 (despite Romania, Bulgaria and Croatia not yet in the EU) and almost 19% in 2021/22.

Computing some expected values of fte out of observed years from 2011 and 2016, we compute in Fig. 1 whether a specific country, in the average of the last two available years (2020/21 and 2021/22), has shown such forecasted trend. One may appreciate that almost all economically advanced countries, and definitely all EU countries, have had in total *fewer* people of their own nationality working in UK universities in the past two years in comparison to the forecast based on the 2007/2008–2016/17 time series. This is true for some relevant countries such as the US, Canada, Australia and New Zealand. These are notable findings because part of Brexiteers' rhetoric has been based on re-launching relationships with countries such as these. Among the most developed countries, Norway is the only one having sent/kept more academics than expected out of the pre-Referendum trend.

Overall, if the problem is set at the capacity to recruit/retain staff from abroad, apparently the UK has no difficulties in the post-Referendum period (another interpretation reads: the UK has not been able to reduce its own demand of international academic staff for its own universities). Nevertheless, the composition of such internationals clearly

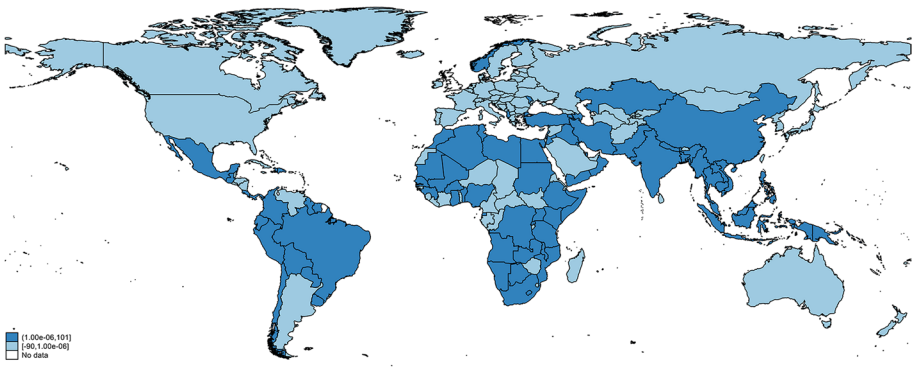

Fig. 1 Countries improving after Brexit the number of academics of their nationality working in UK universities by higher (dark blue) or lower (light blue). Data are results of differences between observed fte academic staff in last two academic years (2020/21 and 2021/22) and the forecasted number of academics of respective nationality computed from the observed time series in years from 2011/12 up to 2016/17 (both included)

changed in the post-Referendum period, with a halt to the increase of EU nationals, and then even a decline in absolute terms. Meanwhile there is a more steeped growth of non-EU nationals. Within the EU bloc, people from accessing countries continue to grow in absolute numbers, although less prominently than during the pre-Referendum period. This means that the UK lost predominantly academics from western EU countries. The only exception is the Republic of Ireland – a country not subject to the removal of FoM. Remarkably, one of the main contributors of international academic staff, with an apparent outlook of increasing its share in the future, is China (going from 1.19% of all academic labour force in 2016/17 to 1.67% in 2021/22).

Impact of Brexit on attracting the best talents

Talents are not all the same. Some might be more talented than others. This is coherent with the idea of excellence which is nested in the superlative assumption of the term: once we talk about the top (all academics as talents), it is the top of the top to make the difference (the best talents are key). It is interesting to check whether the UK is attracting talents of higher, lower, or same quality altogether. It is also relevant to study whether country constraints may explain quality of attraction of talents. This is coherent with the "war for talent" argument. We hence use wage at parity of age as a measure of quality, or talents within talents, bearing in mind discussed limitations.

The hypothesis is that lower wages for internationals, at parity of age, between pre- and post-Referendum, and relative to a base of comparison (UK nationals, but other bases may apply – see further) means that the UK is altogether less attractive. Notably, less attractive does not mean poorly attractive, or less attractive than other countries. The point is to find an impact of Brexit during the post-Referendum years, not to test attractiveness of the UK altogether, which is likely to remain in place.

Observational figures

In relation to observed wages, which overall declined consistently at PPP even before the late 2022 double-digit inflation rate, internationals on average earn more (Table S1). These figures are consistent with recent recriminations raised by the University and College Union and respective strikes organized in the past few years. However, there are some clear patterns by type of internationals and age. During the post-Referendum period (2016/17–2021/22), EU nationals lost more salary than other internationals, if focussing on those aged under 45. For example, EU nationals aged 41–45 lost, in real terms and on average, 13.1% of their salary between 2016/17 and 2021/22. Other internationals lost 10.1%; UK nationals lost 8.9% (Table S1). This evidence is relevant as international academics are not necessarily of homogenous quality (Huisman, 2022; Luczaj & Bahna, 2020), assuming quality is fairly measured by this proxy.

Moving towards more advanced analysis, Table 2 provides an OLS regression with quadratic age, GDP, GERD, tolerance score, and creative class score – covariates that are present but omitted in further analyses' outputs. It excludes domestic academic staff, and it compares coefficients before and after 2016/17. In looking at such coefficients, one may argue that Brexit appears to have engendered a process of losing attractiveness towards more developed countries. One more percentage point of GERD for a person of that nationality is associated with 2800+£ higher salaries, before Brexit. In more recent, post-Referendum years, this is reduced to £2388 higher salary. In other terms, an academic coming

Table 2 Push and pull covariates in explaining annual gross wages at PPP levels before and after Brexit

	Pre-Referendum	Post-Referendum
GERD	2838.401***	2388.485***
GDP per capita	0.239***	0.227***
Tolerance (rank)	68.048***	59.173***
Creative class (score)	–345.528***	–327.894***
Age	YES	YES
Age^2	YES	YES
Adj R2	0.1300	0.1506

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

from a country investing more in R&D had a higher salaries pre- than post-Referendum (PPP £), which reads as the following: before 2016/17, academics from more performing countries in terms of R&D used to be attracted to better positions relative to the post-Referendum period, in UK universities. This interpretation also holds true for GDP per capita, and positions in tolerance (expressed ranking values; the lower the value, the better the position) and creative class score.

Seeking different possible impacts on quality of talents

Analysis proceeds testing a series of difference-in-difference regressions to check whether some groups of internationals earned comparatively less than others during the post-Referendum period, also keeping other factors under control. The splitting time is the 2016/17 academic year used for analyses. However, skipping this specific year, or putting the "Brexit time" one year later, both do not change the patterns shown in this section. Also, excluding Irish nationals on the ground that have special arrangements between the UK and the Republic of Ireland in terms of mobility, does not change the results significantly. Additionally, the exclusion of Northern Ireland from the rest of the UK does not change these patterns. Supplementary material provides parallel trend test assumptions evidence (Figs. S1–S7), supporting cogency of the results provided in Table 3.

We tested several combinations of possible effects, namely using a series of different "treated" vs. "non-treated" groups. These different binary variables are based on nationality groups (or regions) and reflect different assumptions. Model 1 tests the effect of EU nationality on UK nationals following the idea that Brexit may have impacted EU nationals only, relative to the UK ("treated" are those stopped to be equalised to domestic workers). Extra-EU vs. UK, Model 2, tests whether Brexit might represent an unleashing effect – the idea of "Global Britain" ("treated" are those non-EU internationals who benefitted from "unbounded UK"). When comparing any international against UK (EU and extra-EU vs. UK, Model 3), we assume that Brexit may have an effect in terms of lost cosmopolitanism ("treated" are equally affected by "post-truth, populistic post-Referendum UK"). Under Model 3 assumption, Brexit would have a similar effect on any international. Model 4 tests the possible effect of Brexit within internationals only, assuming that removing EU status to EU internationals downgrades EU internationals to the rank of "any international" ("treated" are those stopped to be equalised to domestic staff, but the term of comparison is other internationals, meaning that Brexit may de-differentiate different types of internationals). When we compare EU15 against the other 13 "accessing" EU countries (Model 5), we assume that countries that have been in the EU longer

Table 3 Impact of Brexit on quality of retained/attracted academic talents. Difference in difference estimates by each age band for salary (2022 £PPP, annual gross) by pre- and post-Referendum (last pre-Brexit academic year is 2016/17), by several dummy variables identifying treatment (EU vs. UK; extra-EU vs. UK; any internationals vs. UK; EU vs. extra-EU; EU15 vs. other EU; OECD vs. UK; Commonwealth vs. Other internationals). Estimates account for GDP per capita, Gerd, tolerance and creative class score (omitted in table). Totals refer to all ages accounted in quadratic function

Age band	Model1 EU vs. UK	Model2 Extra-EU vs. UK	Model3 Any foreigner vs. UK	Model4 EU vs. Extra-EU	Model5 EU15 vs. other EU	Model6 OECD vs. UK	Model7 Commonwealth vs. other int.
18_25	–539.63***	100,87	–427.89***	–385,04	–2753.72***	–718.54***	235.08
26_30	–377.70***	243,82	–256.95**	–711.58***	–3730.68***	–367.01***	370.81
31_35	–114,55	200,89	–96,49	–357.09*	–2880.67***	–115.89	1400.77***
36_40	–1513.69***	–491.44*	–1447.30***	–1135.32***	468,19	–1457.32***	1077.03**
41_45	–2733.26***	–973.21***	–2475.32***	–1984.16***	427,76	–2895.59***	2313.56***
46_50	–2627.68***	–3046.19***	–2881.10***	485,91	–19,24	–2778.05***	1944.29**
51_55	–1228.06***	–3777.52***	–2118.46***	3013.06***	–916,20	–1224.74***	231.48
56_60	795.76*	–3288.59***	–921.15**	4555.82***	4059.17***	885.93*	1934.73
61_65	2469.34***	–1942.51**	245,40	4730.21***	10982.28***	2318.39***	3094.15*
66+	–1266,10	–4913.15***	–2821.47***	4145.96**	73,60	–1.341.92	530.71
Tot	–745.34***	–880.51***	–873.05***	–23,69	–1410.49***	–1045.12***	1379.76***

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

and are also on average more competitive in science and other cognate factors are more likely to be affected by Brexit, following a P&P argument pivoted strongly on contextual national features and infrastructures. Whilst this might be checked regardless of any transnational body such as the European Union, in Model 5 the argument of conventional P&P is reinforced by the parity of legal framework that the EU conveys. "Treated" in this case are those EU nationals who are from countries more likely to attract back their own nationals (or other nationals, such as, say, Polish academics moving from the UK to the Netherlands). In contrast to the previous model, Model 6 assumes that P&P factors are more relevant than legal ones brought by EU membership. It tests a possible effect of Brexit on academics whose passport is from any OECD country, which broadly encompasses other covariates in the model, but overlaps with EU membership ("treated" are those internationals who are from countries that are more likely to offer a similar background for science and higher education). If Model 6 were to yield relevant outputs, it would signify that the EU per se is not so relevant in shaping mobility of the most talented. Last, Model 7 checks whether being of any nationality of the Commonwealth of Nations makes any difference against any other internationals. This model checks a possible positive effect of Brexit brought over from a relaunched affiliation such as that stemming from the British Empire. Model 7 is different from Model 2 for also keeping the comparison within internationals only. Tests are replicated for each age band to lessen the issues of granularity. Totals refer to all ages in quadratic function.

From the tests displayed in Table 3, one may visualise a cohort effect, which impacts negatively (negative or positive is a point of view matter, here we refer by default to the UK's point of view) mostly the younger generations, especially those of EU nationality. There is also a reverse impact for the eldest. For the youngest, from age 25 to 45, Brexit meant the UK would attract internationals of lower wage (Models 1, 3, 4, 5, and 6). This can be seen as the following, for Model 1: for those EU nationals (and EU15 relative to "accessing" EU nationals, Model 5 – the one showing the effect with highest magnitude among young academics) who are in their late 20s, 30s and early 40s, and are also more competitive in the labour market (more options to get a job offer in different places, such as for having some portable grants, or for having a better profile altogether), the UK is less likely to be the place to go (or remain, for those who already happened to reside in the UK). For the older generations (those in their 50s), those who are EU citizens and are more competitive (of "higher quality" based on their salary), the UK is, continues to be, and is increasingly a good package overall, when compared to other internationals (Model 4). The main reason for this latter evidence might be that those who are older are already established and find a way to develop their own career in the country where they arguably spent already a consistent stint of their (working) life. Conversely, the younger "higher quality" cohorts, if they can, do not bet on the UK and prefer to skip at least the uncertainty period brought on from the first years of post-Referendum. If we look at non-EU internationals compared to UK nationals (Model 2), Brexit has the opposite effect: in post-Referendum, the UK has attracted 46+ year-old academics who are on average less competitive (lower wages). Remarkably, only for Model 7 Brexit has an overall (all ages) positive impact on quality of attracted/retained academics, refuting empirically some worries (Langa et al., 2019).

Table 3 also allows one to see which model gives the highest effect by each age band (negative in red; positive in green). For the youngest academics (up to mid-30s), the most detrimental effect of Brexit is observed when the EU15 are compared to accessing EU countries. Interestingly, one of the few combinations of Brexit giving an advantage for internationals is when comparing EU vs. non-EU people aged 50+. Apparently, Brexit has had some lock-in effect for these EU nationals. However, for mid-aged (31–50 y.o.)

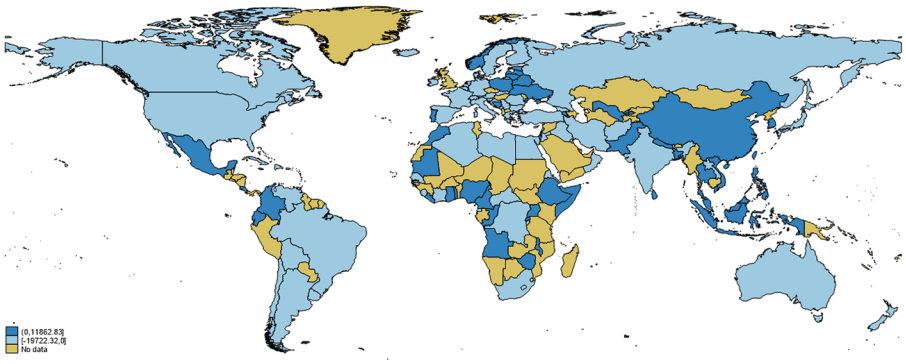

Fig. 2 Countries improving quality of their academics working in the UK (dark blue) and countries decreasing quality of their academics working in the UK (light blue). No data refer to academics working in UK universities for which there are no statistically significant coefficients for respective nationality, or no data at all. Data are results of differences in country coefficients from pre-Brexit (2007/8 until 2016/17) and post-Referendum (2017/18 until 2021/22) periods out of OLS regressions predicting annual income (2022 £PPP) accounting for quadratic function of age and other covariates as per Table 2 (Gerd; GDP per capita; tolerance; creative class score)

academics from the Commonwealth against those from non-Commonwealth nations there is a positive effect, possibly representing some beneficial effect of "unbounded UK".

Figure 2 summarises an OLS regression with all age bands plotting those countries "sending" internationals to the UK that are comparatively of lower quality during post-Referendum, from those instead that have increased the quality of their nationals working in UK universities. Similar to Fig. 1, most developed countries are giving the UK less competitive academics, despite remaining on average with salaries that are higher than those given to UK nationals. In relation to European countries, the impact of Brexit is negative (if seen from the UK point of view) with the exception of Portugal and some Eastern countries, both EU and non-EU ones. The findings about Portugal, the only EU Western country to increase, comparatively, quality of talents working as academics in UK universities, might be explained by the slump of working conditions that occurred in post-Troika years. In fact, brain-gain may happen even in countries with relatively poor prestige, but this is subject to financial efforts that are not necessarily continuously available (Delicado, 2019). Norway and South Korea are a few of the most developed countries that the UK managed to be comparatively more competitive in attracting the best of. Also, Chinese academics at parity of age earn more in the post-Referendum period. This is relevant as China is currently the third largest contributing country in numbers (first is Italy, second Ireland), with an increasing outlook if one considers a flat rate of absorption from the pool of post-graduate research Chinese internationals that the UK has.

Discussion and Conclusion

In relation to the so-called war for talents, Brexit has meant more internationals, but overall less competitive ones. The UK higher education "industry" apparently needs more international academics to "run the business". In the post-Referendum period, universities have recruited/retained internationals predominantly from non-EU, but also mostly non-OECD, or non-Global West, countries. Notably, Brexit is having an overall

effect in attracting academics of lower quality to the UK than in pre-Brexit years. This comes with an undesirable added detail in terms of age. Brexit is negatively affecting younger generations – the target of people enacting more long-lasting effects. Overall, these findings corroborate the idea that being "client" rather than "partner" of EU institutions (Mayhew, 2022) means locating oneself in a worse place. The case of China is particular. China is also "a competitor in the pursuit of technological leadership" (European Commission JRC, 2022), and a geopolitical rival. Therefore, to have an increasing reliability on them could represent a double-edged sword situation. From one side, the UK is subtracting talents from China; on the other side, the UK may continue to prepare high profile academics who may bring back to China their increased talents if they opt to become returnees. None of these effects seem to be coherent with heralded post-Referendum Global Britain (Peters, 2021), confirming instead a weakening position (Parnell, 2022).

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Declarations

Competing interests The author declares that they have no competing interests.

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