Summary

Skilled migration is key to understanding spatial productivity differences (static and dynamic).

Important variable for policy design in city planning, industrial policy, higher education.

Growing cultural polarisation, possible contribution to cultural grievances (Norris and Inglehart, 2019).
Internal migration moves into and out of London, year ending June 2013 (males)

Why do graduates move?

**Economic factors:**
- Earnings, career progression, cost of living.

**Amenities:**
- Cafes, theatres, shops, architecture, green spaces, weather.

**Culture:**
- Social networks, diversity, values, political views.
Bath, Somerset.
### Probit regressions for migration from university location

<table>
<thead>
<tr>
<th>Variable</th>
<th>All</th>
<th>Top grades</th>
<th>Onward migrants</th>
<th>Return migrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings</td>
<td>0.016***</td>
<td>0.026***</td>
<td>0.034***</td>
<td>-0.026***</td>
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<tr>
<td>House prices</td>
<td>-0.018***</td>
<td>-0.018***</td>
<td>-0.018***</td>
<td>-0.063***</td>
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<tr>
<td>Unemployment</td>
<td>0.010***</td>
<td>0.001</td>
<td>-0.007**</td>
<td>0.045***</td>
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<td>Rainfall</td>
<td>-0.011***</td>
<td>-0.009***</td>
<td>-0.013***</td>
<td>-0.028***</td>
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<tr>
<td>Temperature</td>
<td>-0.010***</td>
<td>-0.008***</td>
<td>-0.000</td>
<td>-0.017***</td>
</tr>
<tr>
<td>Population density</td>
<td>-0.006***</td>
<td>-0.007*</td>
<td>0.006</td>
<td>-0.134**</td>
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<tr>
<td>Heritage index</td>
<td>0.005**</td>
<td>0.010***</td>
<td>0.012***</td>
<td>0.022***</td>
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<tr>
<td>Extraversion</td>
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<td>0.015***</td>
<td>0.022***</td>
<td>0.020***</td>
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<tr>
<td>Agreeableness</td>
<td>0.012***</td>
<td>0.010***</td>
<td>0.011***</td>
<td>0.016***</td>
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<tr>
<td>Conscientiousness</td>
<td>-0.042***</td>
<td>-0.042***</td>
<td>-0.067***</td>
<td>-0.003</td>
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<td>Neuroticism</td>
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<td>-0.008***</td>
<td>-0.006***</td>
<td>-0.014***</td>
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<tr>
<td>Openness</td>
<td>0.005*</td>
<td>0.010***</td>
<td>0.013***</td>
<td>-0.006</td>
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<tr>
<td>Obs</td>
<td>85,422</td>
<td>54,443</td>
<td>58,401</td>
<td>32,551</td>
</tr>
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</table>
Additional findings

Graduates move for reasons other than jobs and cost of living - heritage and values matter.

Inequalities in skills are not just due to migration:
   Learning enhanced by agglomeration - from pre-school level.
   Inequalities in lifelong learning and training opportunities.
   Differences in the demand for skills - rather than supply.
Human DNA polymorphisms vary across geographic regions, with the most commonly observed variation reflecting distant ancestry differences. Here we investigate the geographic clustering of common genetic variants that influence complex traits in a sample of ~450,000 individuals from Great Britain. Of 33 traits analysed, 21 showed significant geographic clustering at the genetic level after controlling for ancestry, probably reflecting migration driven by socioeconomic status (SES). Alleles associated with educational attainment (EA) showed the most clustering, with EA-decreasing alleles clustering in lower SES areas such as coal mining areas. Individuals who leave coal mining areas carry more EA-increasing alleles on average than those in the rest of Great Britain. The level of geographic clustering is correlated with genetic associations between complex traits and regional measures of SES, health and cultural outcomes. Our results are consistent with the hypothesis that social stratification leaves visible marks in geographic arrangements of common allele frequencies and gene-environment correlations.
After correcting for ancestry differences, the Townsend index was significantly associated with all five phenotypes and all 21 geographically clustered polygenic scores, with the strongest associations for EA (Supplementary Figs. 7 and 8). All phenotypes and 21 geographically clustered polygenic scores showed significant differences between coal mining areas and the rest of Great Britain, based on both birthplace and current address (Supplementary Fig. 9), with EA showing the strongest differences (FDR-corrected $P \text{ value } < 10^{-200}$). We further compared phenotypes and ancestry-corrected polygenic scores among four groups of unrelated individuals. Moran's $I = 0.77$, $P < 1 \times 10^{-4}$; Moran's $I = 0.83$, $P < 1 \times 10^{-4}$; Moran's $I = 0.59$, $P < 1 \times 10^{-4}$; Moran's $I = 0.84$, $P < 1 \times 10^{-4}$; Moran's $I = 0.93$, $P < 1 \times 10^{-4}$.

Fig. 1 | Geographic distributions (birthplace) of the first five PCs, Moran's $I$ and empirical $P$ values for Moran's $I$. $P$ values denoted in green are significant after Bonferroni correction ($n = 320,940$ unrelated individuals). Maps were adapted from 2011 Census aggregate data (UK Data Service (February 2017 edition). Office for National Statistics; National Records of Scotland; Northern Ireland Statistics and Research Agency (2017); https://doi.org/10.5257/census/aggregate-2011-2).

Fig. 2 | Moran's $I$ of five phenotypes and 33 SBL U polygenic scores computed using the average polygenic score per region in 378 local authority regions ($n = 320,940$ unrelated individuals). Moran's $I$ values of the polygenic scores unadjusted for PCs (red) and adjusted for 100 PCs (green), where orange data points represent a significant FDR-corrected $P$ value $< 0.05$ (corrected for 38 tests). Orange lines between data points represent Moran's $I$ values significantly larger than 0, both before and after correcting for 100 PCs. See Supplementary Fig. 4 for the distributions of significant Moran's $I$ values from 10,000 permutations that were conducted to obtain the empirical $P$ values for the phenotypes and polygenic scores, respectively. ADHD, attention deficit hyperactivity disorder; MDD, major depressive disorder; no GB, excluding British cohorts.
Policy implications?

More radical policies on graduate migration:
  Preferential fees and writing-off of loans to stay in local area.
  Regional migration policies - with regional quotas.

Policies that cross thematic boundaries:
  Mental health and lifelong learning.
  Skills and infrastructure development (e.g. broadband).

More focus on the demand for skills:
  Skill ecosystems - regional policies, greater role for industrial associations, workplace innovation, schools.
ILO (2017) “Better use of skills in the workplace”: includes Innovation Workplaces case study from the East Midlands.