Immigration, Trade and Productivity in Services: Evidence from UK Firms

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Research Question

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  3. diversity effects
  - Which may promote trade by making it easier for firms to overcome fixed trade barriers
UK Balance of Trade in Goods and Services
Seasonally adjusted, quarterly trade balance, £ billion

Source: Reuters EcoWin
Outline

1 Model
2 Data
3 Specification & Identification
4 Results
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- Stylized facts with respect to services very similar to goods
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- Consider a single local labor market as a small, open economy
- Intermediate services are transformed into differentiated final services (associated with individual firms)
- and delivered to foreign customers located in countries \( x = 1, \ldots, X \)
For a firm with efficiency \( \varphi > 0 \) the total cost of delivering (exporting) its service to country \( x \) is
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$$C_x = p_{f,x} f_x + p_{f,x} t_x \frac{q_x}{\varphi} + p \frac{q_x}{\varphi}$$

where $q_x$ is output exported to $x$
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- $p_{f,x} f_x$ is a **fixed export cost** incurred in terms of a bundle of $x$-specific intermediate services with price index $p_{f,x}$

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- $p / \varphi$ is the **marginal production cost** incurred in terms of a bundle of services not specific to $x$ with price index $p$
Model

\[ C_x = p_{f,x}f_x + p_{f,x}t_x \frac{q_x}{\varphi} + p \frac{q_x}{\varphi} \]

- The export cost parameters \( f_x \) and \( t_x \):

Are increasing in the cultural distance between the local labor market and destination.

Are increasing in the cultural content of the service.

We think of cultural distance in terms of linguistic and institutional differences and of cultural content in terms of linguistic and institutional intensity.
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- but natives provide imperfectly substitutable services as well
- Let $p_{m,x}$ and $p_{o,x}$ denote the prices of $x$-specific intermediate services sourced from immigrants or offshore workers

\[
p_m = \left( p_n \right)^{1-\sigma} + X \sum_{x=1} \left( p_f, x \right)^{1-\sigma}
\]

\[
p_f, x = \left( p_m, x \right)^{1-\theta} + \left( p_o, x \right)^{1-\theta}
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Model

- $x$-specific intermediate services can be provided by **immigrants** from $x$ or can be **imported** from $x$
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p_{f,x} = \left[ (p_{m,x})^{1-\theta} + (p_{o,x})^{1-\theta} \right]^{\frac{1}{1-\theta}}
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where $\theta > \sigma$
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\[ \varphi_x = \left( \frac{\delta}{\delta - 1} \frac{p + p_{f,x}t_x}{\bar{P}_x} \right) \left( \frac{p_{f,x}f_x\delta}{E_x} \right)^{\frac{1}{\delta - 1}} \]
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where \( \delta > 1 \) is the top-tier elasticity across final services
Model: Immigration

- Immigration Shocks

\[ p_m, x \equiv p_m, x (\mu_x) \]

where \( \mu_x \) is an \( x \)-specific immigration cost (premium over reservation wage) and

\[ p'_m, x (\mu_x) > 0 \]

and

\[ \varepsilon_{p_m, x, \mu_x} = \frac{\mu_x p'_m, x (\mu_x)}{p_m, x (\mu_x)} > 0 \]

defines this elasticity.

A reduction in \( \mu_x \) reflects a positive \( x \)-specific immigration shock in the local labor market.
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Model: Comparative Statics

- General Productivity Effect
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- Let \( s_{m,x} \in (0, 1) \) define the cost share of intermediate services supplied by immigrants from \( x \)
General Productivity Effect

Let $s_{m,x} \in (0, 1)$ define the cost share of intermediate services supplied by immigrants from $x$

and $\tau_y \equiv p / \left( p + p_{f,y} t_y \right) \in (0, 1)$ define the “tradability” of final services with respect to shipments to country $y \neq x$
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\[
\frac{d \ln \varphi_y}{d \ln \mu_x} = \frac{p}{p + p_{f,y} t_y} \frac{d \ln p}{d \ln \mu_x} = \tau_y s_{m,x} \varepsilon_{p_{m,x}, \mu_x} > 0
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▶ The fraction of firms exporting to any country (including $x$) is increasing in the share of immigrant services in costs
Model: Comparative Statics

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\section*{Model: Comparative Statics}

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    \begin{itemize}
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    \end{itemize}
\end{itemize}
Model: Comparative Statics

- **General Productivity Effect**

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\]

- The fraction of firms exporting to any country (including \( x \)) is increasing in the share of immigrant services in costs

- Note that \( \tau_y \) is decreasing in
  - the cultural content of the service \( (p_{f,y}/p) \)
  - the cultural distance between \( y \) and the local labor market \( (t_y) \)
Similarly, on the intensive margin
\[ d \ln R_y(\phi) d \ln \mu_x = - (\delta - 1) \tau y_s m_x \epsilon_p m_x, \mu_x < 0. \]

Sales to all countries are increasing in the share of immigrant services in production costs.

Note that general equilibrium is a Rybczynski Effect.
General Productivity Effect Continued

Similarly, on the intensive margin

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\frac{d \ln R_y(\varphi)}{d \ln \mu_x} = - (\delta - 1) \tau y s_{m,x} \varepsilon_{p_{m,x},\mu_x} < 0
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General Productivity Effect Continued

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General Productivity Effect Continued

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Model: Comparative Statics

- Bilateral Effect

There is an additional term specific to $x$ on both margins

$$d \ln \phi_x = \left[ \tau_x s, \mu_x \right] + (1 - \tau_x) \delta - 1 s, \mu_x > 0$$

and

$$d \ln R_x(\phi) = -(\delta - 1) \left[ \tau_x s, \mu_x \right] + (1 - \tau_x) s, \mu_x < 0$$

where $s, \mu_x$ is the share of immigrant services from $x$ in the cost of foreign services.

The relative importance of the General vs Bilateral Effect is decreasing in cultural distance and content.
Bilateral Effect

There is an additional term specific to \( x \) on both margins

\[
\frac{d \ln \varphi_x}{d \ln \mu_x} = \left[ \tau_x s_{m,x} + (1 - \tau_x) \frac{\delta}{\delta - 1} s_{f,m,x} \right] \varepsilon_{p,m,x,\mu_x} > 0
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Model: Comparative Statics

- **Bilateral Effect**

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\]

- and
Model: Comparative Statics

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\frac{d \ln \varphi_x}{d \ln \mu_x} = \left[ \tau_x s_{m,x} + (1 - \tau_x) \frac{\delta}{\delta - 1} s_{f,x}^1 \right] \varepsilon_{p_m,x,\mu_x} > 0
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\frac{d \ln R_x(\varphi)}{d \ln \mu_x} = - (\delta - 1) \left[ \tau_x s_{m,x} + (1 - \tau_x) s_{f,x}^1 \right] \varepsilon_{p_m,x,\mu_x} < 0
\]

- where $s_{f,m,x}^1$ is the share of immigrant services from $x$ in the cost of foreign services
Model: Comparative Statics

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Model: Comparative Statics

- **Import Substitution Effect**
Model: Comparative Statics

- Import Substitution Effect
- Variation in $\mu_x$ affects the margin between immigrants and imports
Import Substitution Effect

Variation in $\mu_x$ affects the margin between immigrants and imports

The share of foreign services offshored is $s_{o,x}^f = 1 - s_{m,x}^f = \left( \frac{p_{f,x}}{p_{o,x}} \right)^{\theta - 1}$
Model: Comparative Statics

- **Import Substitution Effect**
  - Variation in $\mu_x$ affects the margin between immigrants and imports
  - The share of foreign services offshored is $s_{o,x}^f = 1 - s_{m,x}^f = \left(\frac{p_{f,x}}{p_{o,x}}\right)^{\theta-1}$
  - Differentiating (and noting $\theta > 1$, $\sigma > 1$):
    \[
    \frac{d \ln s_{o,x}^f}{d \ln \mu_x} = (\theta - 1) s_{m,x}^f \varepsilon_{p_{m,x},\mu_x} > 0
    \]
Model: Comparative Statics

- **Import Substitution Effect**

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- Differentiating (and noting $\theta > 1$, $\sigma > 1$):

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- Differentiating (and noting $\theta > 1$, $\sigma > 1$):
  
  $$\frac{d \ln s_{o,x}^f}{d \ln \mu_x} = (\theta - 1) s_{m,x}^f \epsilon_{p_{m,x},\mu_x} > 0$$

- and
  
  $$\frac{d \ln s_{f,x}^f}{d \ln \mu_x} = - (\sigma - 1) \left(1 - s_{f,x}^f\right) s_{m,x}^f \epsilon_{p_{m,x},\mu_x} < 0$$

- Immigration from $x$ reduces offshoring, and disproportionately offshoring to $x$
Model Summary

- Prop. 1 (“Productivity effect”): Larger employment share of immigrants promotes firm productivity and exports.
- Prop. 2 (“Bilateral export promotion effect”): Larger employment share of immigrants from a country promotes exports to that country.
- Prop. 3 (“Bilateral import substitution effect”): Larger employment share of immigrants from a country reduces firm imports from that country (and other countries).
Prop. 1 ("Productivity effect"): Larger employment share of immigrants promotes firm productivity and exports
Model Summary

- Prop. 1 ("Productivity effect"): Larger employment share of immigrants promotes firm productivity and exports

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Prop. 1 ("Productivity effect"): Larger employment share of immigrants promotes firm productivity and exports

Prop. 2 ("Bilateral export promotion effect"): Larger employment share of immigrants from a country promotes exports to that country

Prop. 3 ("Bilateral import substitution effect"): Larger employment share of immigrants from a country reduces firm imports from that country (and other countries)
Moreover:

The primary margin of substitution is between immigrants and offshore workers. The immigrant share should not affect native employment that much. The Bilateral Export Promotion Effect of immigrants should be greater for services that have a strong country-specific component (e.g., cultural, linguistic, institutional). These effects should be stronger when there is a larger linguistic, cultural or institutional difference between countries.
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Moreover:

- The primary margin of substitution is between immigrants and offshore workers
  - The immigrant share should not affect native employment that much
- The Bilateral Export Promotion Effect of immigrants should be greater for services that have a strong country-specific component (e.g., cultural, linguistic, institutional)
- These effects should be stronger when there is a larger linguistic, cultural or institutional difference between countries
Data

- Three UK datasets: ARD (firm survey, universe of large firms, agg. services trade), ITIS (services trade survey), QLFS (worker survey)
Data

- Three UK datasets: ARD (firm survey, universe of large firms, agg. services trade), ITIS (services trade survey), QLFS (worker survey)
  - No Financial Services in ITIS

There are 29,160 TTWA-Sector-Country cells. 24% are zeros.
Data

- Three UK datasets: ARD (firm survey, universe of large firms, agg. services trade), ITIS (services trade survey), QLFS (worker survey)
  - No Financial Services in ITIS
- Match ARD-ITIS by firm identifier (74% match by number, 99% by value)

24% are zeros

Services Trade Barriers by country and service type (OECD STRI)

Diversity Index:

\[
\text{ImmDiv}_{kt} = 1 - \sum_{n=1}^{N} \left( \text{ImmSh}_{nk} \right)^2
\]
Three UK datasets: ARD (firm survey, universe of large firms, agg. services trade), ITIS (services trade survey), QLFS (worker survey)
  - No Financial Services in ITIS
  - Match ARD-ITIS by firm identifier (74% match by number, 99% by value)
  - Match to QLFS by TTWA and 1-digit Sector, 1999-2005

Maximum variation we exploit: workers from top 20 origin countries located across 243 TTWAs, working within 6 one-digit industries and trading 3 aggregate service types over 7 years

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24% are zeros

Services Trade Barriers by country and service type (OECD STRI)

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- There are 29,160 TTWA-Sector-Country cells.
  - 24% are zeros
- Services Trade Barriers by country and service type (OECD STRI)
- Diversity Index: $ImmDiv_{kt} = 1 - \sum_{n=1}^{N} (ImmSh_{kt}^n)^2$
Top Export Destinations
As Share of Total Exports

- UNITED STATES OF AMERICA
- GERMANY
- NETHERLANDS
- IRELAND
- SWITZ.
- FRANCE
- JAPAN
- BELG.
- OTH.
- SAUDI A.
Top Import Source Countries

As Share of Total Imports

- UNITED STATES OF AMERICA
- GERMANY
- FRANCE
- NETHERLANDS
- SWITZ.
- IRELAND
- JAPAN
- BELG.
- ITALY
- OTH.
Figure 1. Share of foreign-born workers; top (travel-to-work) Areas
Figure 2. U.K. Services Exports and Imports by Service Type, 1999-2005

Thousands of UK Pounds
Main Specification

\[
\ln(y)_{iskt} = \phi_i + \theta_t + \zeta_{jt} + \zeta_{at} + \gamma_t^n + \beta_1 ImmShr_{kt} + \beta_2 ImmDiv_{kt} \\
+ \beta_3 ImmShr^n_{kt} + \tau_s^n + \beta_x \ln X_{ikt} + \epsilon^n_{iskt}
\]

- Unit of obs: service type \(s\) associated with firm \(i\) in TTWA (a)-Sector (j) cell \(k\) in year \(t\)
- \(y^n_{iskt}\) is imports from or exports to country \(n\)
- \(ImmShr_{kt}\) is the share of immigrants in cell \(k\) (minus country \(n\))
- \(ImmDiv_{kt}\) is country-of-birth immigrant diversity (minus country \(n\))
- \(ImmShr^n_{kt}\) is employment share of immigrants from country \(n\)
- \(X_{ikt}\) is a set of firm-level control variables; \(\phi_i\) and \(\theta_t\) are firm and year fixed effects
- \(\zeta_{jt}\) and \(\zeta_{at}\) are sector-by-year and TTWA-by-year fixed effects
- \(\gamma_t^n\) is a destination-year fixed effect
- \(\tau_s^n\) are service-type specific trade barriers
- \(H_0: \beta_1 > 0\) and \(\beta_2 > 0\) (Productivity Effect - Prop. 1); \(\beta_3 < 0\) (Substitution Effect - Prop. 2) or \(\beta_3 > 0\) (Export Promotion Effect - Prop. 3)
Results are robust to PPML specification.
Results are robust to PPML specification.
Why PPML?
Results are robust to PPML specification.

Why PPML?

When errors are heteroskedastic taking logs introduces a bias due to Jensen’s Inequality
Results are robust to PPML specification.

Why PPML?

When errors are heteroskedastic taking logs introduces a bias due to Jensen’s Inequality

The expected value of the log error is mechanically correlated with the regressors
- Results are robust to PPML specification.
- Why PPML?
- When errors are heteroskedastic taking logs introduces a bias due to Jensen’s Inequality
- The expected value of the log error is mechanically correlated with the regressors
- Also: zeros (less of an issue)
We exploit an enclave-based IV strategy (Altonji and Card (1991), Card (2001))
Identification

- We exploit an enclave-based IV strategy (Altonji and Card (1991), Card (2001))
- Start with 1997 share of immigrants by country across cells (TTWA-Sector)
We exploit an enclave-based IV strategy (Altonji and Card (1991), Card (2001))

Start with 1997 share of immigrants by country across cells (TTWA-Sector)

Allocate future aggregate growth of immigrants by country (relative to UK population growth) to cells according to this distribution
Identification

- We exploit an enclave-based IV strategy (Altonji and Card (1991), Card (2001))
- Start with 1997 share of immigrants by country across cells (TTWA-Sector)
- Allocate future aggregate growth of immigrants by country (relative to UK population growth) to cells according to this distribution
- Construct IV for diversity index using these values
### Table 2. Immigrants and the Productivity of UK Firms

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
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<td><strong>Dependent Variable:</strong></td>
<td>Log of Gross Value Added per Worker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immigrant Share Aggregate</td>
<td>1.4**</td>
<td>1.2**</td>
<td>1.1*</td>
<td>1.1**</td>
<td>0.7**</td>
<td>1.8*</td>
</tr>
<tr>
<td></td>
<td>(0.6)</td>
<td>(0.5)</td>
<td>(0.5)</td>
<td>(0.4)</td>
<td>(0.3)</td>
<td>(1.0)</td>
</tr>
<tr>
<td>Immigrant Diversity Index</td>
<td>1.3**</td>
<td>1.4*</td>
<td>1.7**</td>
<td>1.1</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>(0.6)</td>
<td>(0.8)</td>
<td>(0.8)</td>
<td>(0.7)</td>
<td>(1.0)</td>
<td>(0.9)</td>
</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TTWA-Year FE</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sec-Year and TTWA-Year FE</td>
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<td>No</td>
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<td>6930</td>
<td>6930</td>
<td>6930</td>
<td>6930</td>
<td>6930</td>
</tr>
<tr>
<td>F-Statistic of first stage</td>
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<td>21</td>
<td>12</td>
<td>33</td>
<td>21</td>
<td>12</td>
</tr>
</tbody>
</table>

*Note: The dependent variable is the logarithm of gross value added per worker in the firm. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments. Number of observations is based on the right hand side number of cells. Specification (1), (2), and (3) differ from each other because of the inclusion of different sets of fixed effects included as described in the Table. The 2SLS regressions use, as in instrument, the imputed number of foreign born in the sector TTWA (Travel to Work) cells constructed as described in the text. The period considered is 1999 to 2005. Standard errors are clustered at the sector MTWTA level. ***, **, * denote significance at the 1%, 5%, 10% confidence level.
### Table 7. Immigrants and the Services Exports (Total and Bilateral) of UK firms

<table>
<thead>
<tr>
<th>Dep. Variable: Log of Export Value</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immigrant Share Aggregate</td>
<td>2.2***</td>
<td>2.1**</td>
<td>2.5***</td>
<td>1.7***</td>
<td>3.6**</td>
<td>1.5***</td>
</tr>
<tr>
<td></td>
<td>(0.4)</td>
<td>(0.8)</td>
<td>(0.8)</td>
<td>(0.2)</td>
<td>(1.8)</td>
<td>(0.2)</td>
</tr>
<tr>
<td>Immigrant Share Bilateral</td>
<td>8.1*</td>
<td>10.1**</td>
<td>10.4**</td>
<td>6.2</td>
<td>8.9*</td>
<td>9.3*</td>
</tr>
<tr>
<td></td>
<td>(5.5)</td>
<td>(5.2)</td>
<td>(5.0)</td>
<td>(8.0)</td>
<td>(5.9)</td>
<td>(6.2)</td>
</tr>
<tr>
<td>Immigrant Diversity</td>
<td>-0.0</td>
<td>-0.0</td>
<td>0.0</td>
<td>-1.0*</td>
<td>-0.7*</td>
<td>-1.1*</td>
</tr>
<tr>
<td></td>
<td>(0.1)</td>
<td>(0.1)</td>
<td>(0.0)</td>
<td>(0.5)</td>
<td>(0.4)</td>
<td>(0.6)</td>
</tr>
<tr>
<td>Service Barrier Index</td>
<td>-0.3*</td>
<td>-0.6*</td>
<td>-0.4*</td>
<td>-0.5*</td>
<td>-0.3</td>
<td>-0.5*</td>
</tr>
<tr>
<td></td>
<td>(0.2)</td>
<td>(0.3)</td>
<td>(0.2)</td>
<td>(0.3)</td>
<td>(0.3)</td>
<td>(0.3)</td>
</tr>
<tr>
<td>Firm and Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sec-Year and TTWA-Year FE</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sec-, TTWA-, Dest-Year FE</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
</tr>
<tr>
<td>TTWA-Sec F-Stat (Agg, Bilat)</td>
<td>33, 49</td>
<td>21, 40</td>
<td>12, 23</td>
<td>33, 49</td>
<td>21, 40</td>
<td>12, 23</td>
</tr>
</tbody>
</table>

Note: The dependent variable is the logarithm of the value of exports from the firm to a country. The unit of analysis is the firm-country couple. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments.

Number of observations is number of TTWA-Sector-Year-Destination cells. Specifications (1), (2), and (3) differ from each other because of the inclusion of different sets of fixed effects as described in the Table above. The 2SLS regressions use as instrument the imputed number of foreign-born in the sector-TTWA cells, constructed as described in the text. The period considered is 1999-2005. Standard errors are clustered at the sector-TTWA level. ***,**,* denote significance at the 1%, 5%, 10% confidence level.
Comparing our 2SLS estimates with existing immigrant-goods export elasticities
Comparing our 2SLS estimates with existing immigrant-goods export elasticities

Our estimates imply that a 10% rise in immigration leads to a 3 to 5% increase in services exports to a destination
Economic Magnitude

- Comparing our 2SLS estimates with existing immigrant-goods export elasticities
- Our estimates imply that a 10% rise in immigration leads to a 3 to 5% increase in services exports to a destination
- Genc, et al. (2011) meta-analysis reports estimates for goods between 0.6 and 6.5%
Comparing our 2SLS estimates with existing immigrant-goods export elasticities

Our estimates imply that a 10% rise in immigration leads to a 3 to 5% increase in services exports to a destination

Genc, et al. (2011) meta-analysis reports estimates for goods between 0.6 and 6.5%
  - Mean: 1.5%
## Table 8. Immigrants and the Extensive Margin of Exports

<table>
<thead>
<tr>
<th>Dependent Variable: Export Status Indicator (0,1)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
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<td><strong>OLS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Immigrant Share Aggregate</strong></td>
<td>0.12***</td>
<td>0.14*</td>
<td>0.11**</td>
<td>0.10**</td>
<td>0.10*</td>
<td>0.11*</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.07)</td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td><strong>Immigrant Share Bilateral</strong></td>
<td>0.32</td>
<td>0.04</td>
<td>0.22*</td>
<td>0.27</td>
<td>0.03</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>(0.41)</td>
<td>(0.04)</td>
<td>(0.12)</td>
<td>(0.47)</td>
<td>(0.11)</td>
<td>(0.29)</td>
</tr>
<tr>
<td><strong>Immigrant Diversity</strong></td>
<td>0.02</td>
<td>0.14**</td>
<td>0.03</td>
<td>0.14</td>
<td>0.12*</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.05)</td>
<td>(0.03)</td>
<td>(0.17)</td>
<td>(0.06)</td>
<td>(0.10)</td>
</tr>
<tr>
<td><strong>Service Barrier Index</strong></td>
<td>-0.22**</td>
<td>-0.18*</td>
<td>-0.33**</td>
<td>-0.21*</td>
<td>-0.14</td>
<td>-0.27*</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.10)</td>
<td>(0.15)</td>
<td>(0.11)</td>
<td>(0.13)</td>
<td>(0.14)</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<tr>
<td><strong>Sec-Year and TTWA-Year FE</strong></td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Sec-, TTWA-, Dest-Year FE</strong></td>
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<td>No</td>
<td>Yes</td>
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<td>Yes</td>
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<td><strong>Number of Observations</strong></td>
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<td>138,600</td>
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<td>138,600</td>
<td>138,600</td>
</tr>
<tr>
<td><strong>TTWA-Sec F-Stat (Agg, Bilat)</strong></td>
<td>33,49</td>
<td>21,40</td>
<td>12,23</td>
<td>33,49</td>
<td>21,40</td>
<td>12,23</td>
</tr>
</tbody>
</table>

Note: The dependent variable is an indicator (0, 1) for the firm exporting to a country. The unit of analysis is the firm-country couple. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments. Number of observations is number of TTWA sector-year cells. Specifications (1), (2), and (3) differ from each other because of the inclusion of different sets of fixed effects as described in the Table above. The 2SLS regressions use as instrument the imputed number of foreign-born in the sector TTWA cells, constructed as described in the text. The period considered is 1999-2005. Standard errors are clustered at the sector TTWA level. ***,**,* denote significance at the 1%, 5%, 10% confidence level.
### Table 5. Immigrants and Imports of Services (Offshoring) by UK firms

<table>
<thead>
<tr>
<th>Dep. Variable: Log of Import Value</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
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<tr>
<td></td>
<td>OLS</td>
<td>2SLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immigrant Share Aggregate</td>
<td>12.2*** (3.4)</td>
<td>11.3*** (3.8)</td>
<td>9.8*** (2.5)</td>
<td>9.7** (5.9)</td>
<td>7.4** (3.7)</td>
<td>7.3** (3.4)</td>
</tr>
<tr>
<td>Immigrant Share Bilateral</td>
<td>-5.1* (3.3)</td>
<td>-4.0** (2.7)</td>
<td>-4.8** (2.6)</td>
<td>-8.2** (4.4)</td>
<td>-4.9* (3.4)</td>
<td>-7.9** (4.4)</td>
</tr>
<tr>
<td>Immigrant Diversity</td>
<td>3.0** (1.6)</td>
<td>2.1* (1.3)</td>
<td>2.8** (1.4)</td>
<td>1.0* (0.5)</td>
<td>0.7* (0.4)</td>
<td>1.0* (0.5)</td>
</tr>
<tr>
<td>Service Barrier Index</td>
<td>-0.5*** (0.2)</td>
<td>-0.6** (0.3)</td>
<td>-0.6*** (0.2)</td>
<td>-0.5* (0.3)</td>
<td>-0.6* (0.4)</td>
<td>-0.6* (0.4)</td>
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<td>138,600</td>
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<td>12,23</td>
<td>59,40</td>
<td>43,38</td>
<td>12,23</td>
</tr>
</tbody>
</table>

Note: The dependent variable is the logarithm of the value of the imports of traded services by the firm from the country. The unit of analysis is the firm-import-country couple. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments. Number of observations is number of TTWA-sector-year cells. Specifications (1), (2) and (3) differ from each other because of the inclusion of different sets of fixed effects included as described in the Table above. The 2SLS regressions use as instrument the imputed number of foreign born in the sector TTWA cells, constructed as described in the text. The period considered is 1999-2005. Standard errors are clustered at the sector TTWA level. ***,**,* denote significance at the 1%, 5%, 10% confidence level.
### Table 1: Tradable Service Sectors Divided by Category

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<th>Language-Human Resources</th>
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<td>Recruitment &amp; Training</td>
</tr>
<tr>
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<td>Procurement</td>
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<td>Management Consulting</td>
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<td>Surveying</td>
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<td>Other Technical</td>
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<td>Computer &amp; Information Services</td>
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<td>Cultural &amp; Recreational Services</td>
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### Table 6. Immigrants and Imports of Services (Offshoring), by Service Type

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Table 10. Immigrants and Exports of Legal & Related Services: Effect by Country Type

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</table>
We have identified some new facts with respect to immigration and services trade.
We have identified some new facts with respect to immigration and services trade and reconciled these facts with theory.
Concluding Remarks

- We have identified some new facts with respect to immigration and services trade
- and reconciled these facts with theory
- We find that the productivity effects of immigrants are important in explaining services trade
Concluding Remarks

- We have identified some new facts with respect to immigration and services trade
- and reconciled these facts with theory
- We find that the productivity effects of immigrants are important in explaining services trade
  - above and beyond bilateral network effects
Concluding Remarks

- We have identified some new facts with respect to immigration and services trade
- and reconciled these facts with theory
- We find that the productivity effects of immigrants are important in explaining services trade
  - above and beyond bilateral network effects
- Furthermore, the bilateral effects operate differently in the case of services imports
Concluding Remarks

▶ We have identified some new facts with respect to immigration and services trade
▶ and reconciled these facts with theory
▶ We find that the productivity effects of immigrants are important in explaining services trade
  ▶ above and beyond bilateral network effects
▶ Furthermore, the bilateral effects operate differently in the case of services imports
  ▶ Immigrants substitute for some bilateral services offshoring
## Table 7b. Immigrants and the Services Exports (Total and Bilateral) of UK firms Non-London TTWAs

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<td>25, 42</td>
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Note: The dependent variable is the logarithm of the value of exports from the firm to a country. The unit of analysis is the firm-export country couple. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments. Number of observations is number of TTWA-Sector-Year cells. Specifications (1), (2) and (3) differ from each other because of the inclusion of different sets of fixed effects described in the table above. The 2SLS regressionsler use as instrument the imputed number of foreign-born in the sector-TTWA cells, constructed as described in the text. The period considered is 1999-2005. Standard errors are clustered at the sector-TTWA level. ***,**,* denote significance at the 1%, 5%, 10% confidence level.
### Table 5b. Immigrants and Imports of Services (Offshoring) by UK firms Non-London TTWAs

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<td>(1.7)</td>
<td>(2.8)</td>
</tr>
<tr>
<td>Immigrant Diversity</td>
<td>1.1*</td>
<td>0.6*</td>
<td>3.3*</td>
<td>0.8</td>
<td>0.6</td>
<td>2.2*</td>
</tr>
<tr>
<td></td>
<td>(0.6)</td>
<td>(0.3)</td>
<td>(1.6)</td>
<td>(0.5)</td>
<td>(0.4)</td>
<td>(0.9)</td>
</tr>
<tr>
<td>Service Barrier Index</td>
<td>-0.3**</td>
<td>-0.7*</td>
<td>-0.2***</td>
<td>-0.3*</td>
<td>-0.6*</td>
<td>-0.2*</td>
</tr>
<tr>
<td></td>
<td>(0.1)</td>
<td>(0.3)</td>
<td>(0.0)</td>
<td>(0.2)</td>
<td>(0.3)</td>
<td>(0.1)</td>
</tr>
<tr>
<td>Firm and Year FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sec-Year and TTWA-Year FE</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sec-, TTWA-, Dest-Year FE</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
<td>138,600</td>
</tr>
<tr>
<td>TTWA-Sec F-Stat (Agg. Bilat)</td>
<td>35, 40</td>
<td>15, 33</td>
<td>14, 21</td>
<td>25, 42</td>
<td>18, 34</td>
<td>15, 25</td>
</tr>
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</table>

**Note:** The dependent variable is the logarithm of the value of the imports of traded services by the firm from the country. The unit of analysis is the firm-import-country couple. Each regression contains firm fixed effects and the following controls: log capital investment, the log wage bill, and the log of computer software investments. Number of observations is number of TTWA-Sector-Year cells. Specifications (1), (2) and (3) differ from each other because of the inclusion of different sets of fixed effects included as described in the Table above. The 2SLS regressions use as instrument the imputed number of foreign born in the sector-TTWAs cells, constructed as described in the text. The period considered is 1999-2005. Standard errors are clustered at the sector-TTTWA level. ***,**,* denote significance at the 1%, 5%, 10% confidence level.