

The Choice of Mode in Service Trade

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Global service trade

- occurs in four different modes (WTO classification)
- has increased at least as fast as trade in goods in the last two decades
- improvements in tradability of services
 - digitalization
 - communication technology
 - growing network of multinational firms
- important in WTO negotiations
- deregulation on other levels (EU Service directive)

Service trade pattern at the micro level

- WTO distinguishes four mode
 - mode 1, 2, and 4 collapsed into one category: cross-border supply
 - mode 3 commercial presence
- We study choice between commercial presence and cross-border supply
 - value added generated at home or abroad
 - commercial presence more strongly affected by foreign regulation
- Do firms actually face a discrete choice?
- How strongly is this choice affected by political barriers?

Choice of channel

- research based on aggregate data
 - often finds the channels to be complements
 - sector characteristics important
 - likely to result from aggregation bias
 - attractive markets usually attract service trade through both channels
- we study the channel at firm level
 - strong evidence for discrete choice
 - firm characteristics main drivers
 - sector characteristics of trading firms important

The Data

- two confidential micro data sets from the *Deutsche Bundesbank*
- whole population of German exporters and importers
- cross-border supply from *Balance of Payments Statistics*
 - every transaction with more than 12,500 Euro
 - sector classification of trading firm
- service exports through affiliates sales from *Microdata Direct Investment (MIDI)*
 - information on foreign affiliates
 - some information on parent firms including sector classification

The Sample

- data for 2005
- excluded tourism and financial services
- 209,060 observations
 - 157,586 cross-border importers
 - 24,331 cross-border exporters
 - 1,386 German firms owning 4,163 foreign service affiliates
 - 3,552 German service affiliates of foreign firms
- many use more than one channel

Sector differences

| Sector | Exporters +MNEs | Foreign Sales | Part. Ratio | Exporter Ratio | Export Ratio | Firms in Germany |
|--|--------------------|------------------|----------------|-------------------|-----------------|---------------------|
| Construction | 902 | 23.1 | 0.00 | 0.94 | 0.36 | 361,070 |
| Transport | 758 | 39.1 | 0.01 | 0.89 | 0.38 | 61,621 |
| Auxiliary Transport | 475 | 46.8 | 0.02 | 0.84 | 0.13 | 24,119 |
| Insurance | 512 | 96.5 | 0.31 | 0.91 | 0.30 | 1,633 |
| Post & Tele- communications | 205 | 49.0 | 0.02 | 0.86 | 0.06 | 9,386 |
| Data Processing | 995 | 21.9 | 0.02 | 0.94 | 0.31 | 47,104 |
| Personnel Services | 474 | 3.6 | 0.11 | 0.99 | 0.25 | 4,268 |
| R & D | 1,033 | 12.8 | 0.24 | 0.98 | 0.85 | 4,391 |
| Management Service | 1,449 | 6.8 | 0.01 | 0.99 | 0.80 | 129,073 |
| Advertising | 667 | 3.5 | 0.03 | 0.97 | 0.79 | 25,516 |
| Holding Activities | 1,504 | | 0.12 | 0.85 | 0.43 | 12,058 |
| Total, excl. Holdings | 7,470 | 307.0 | 0.01 | 0.94 | 0.30 | 674,215 |
| Source: MIDI (2007), authors' computation. | | | | | | |

Within-sector heterogeneity

| Decile | Exports (mill. Euro) | Average Sales | Average Number of | |
|--------|-------------------------|------------------|-------------------|------------------|
| | | | Countries Served | Services Offered |
| 1 | 10 | 8.44 | 1.15 | 1.03 |
| 2 | 30 | 18.98 | 1.45 | 1.09 |
| 3 | 80 | 36.81 | 1.89 | 1.15 |
| 4 | 160 | 48.67 | 2.63 | 1.25 |
| 5 | 340 | 67.81 | 3.77 | 1.33 |
| 6 | 690 | 96.15 | 5.2 | 1.38 |
| 7 | 1,370 | 158.5 | 5.88 | 1.47 |
| 8 | 3,130 | 332.4 | 6.45 | 1.46 |
| 9 | 8,530 | 554.3 | 9.5 | 1.62 |
| 10 | 288,000 | 8,848 | 17.5 | 1.86 |
| Total | 302,340 | 1,017 | 5.53 | 1.37 |

Source: MIDI (2007), BoP (2009), authors' computation.

Discrete choice framework

■ CES utility function

- profit comparison of the two channels
- relative profits larger one \rightarrow production abroad

$$\frac{\pi_k^{pa}}{\pi_k^{cb}} = \left(\frac{w_H}{w_j d_{lj}} \right)^{1-\sigma} - \frac{\sigma F_j}{r_{kj}}$$

- w wage
- d discount if selling at arm's length
- F fixed costs
- σ elasticity of substitution
- r^{pa} revenue if producing abroad

Estimating a discrete choice

- firm-country-product group combination unit of observation
- actually mutually exclusive
 - correlation between cross-border supply and commercial presence -0.98
 - 423 out of 45,424 combinations report both strategies

$$\begin{aligned} D_{mode} = & \beta_0 + \beta_1 Internationality + \beta_2 Diversity + \\ & + \beta_3 Sector\ Heterogeneity + \beta_4 Transaction\ costs \\ & + \beta_5 \ln(Wage) + \beta_6 \ln(Distance) + \beta_7 \ln(Market\ Size) \\ & + \beta_8 \ln(Service\ FDI\ Restrictions) + D_{Servicegroup} + u \end{aligned}$$

Probit regression results: choice of channel

| | P1 | P2 | P3 |
|----------------------------|----------------------|----------------------|----------------------|
| <i>Internationality</i> | -0.0002 (1.35) | -0.0003 (1.64) | -0.0003* (1.82) |
| <i>Diversity</i> | 0.0048*** (5.12) | 0.0048*** (5.28) | 0.0047*** (5.45) |
| <i>Heterogeneity</i> | 0.0005*** (2.72) | 0.0005*** (2.65) | 0.0005*** (2.76) |
| <i>Transaction costs</i> | 0.0040*** (3.02) | 0.0044*** (3.39) | 0.0050*** (4.03) |
| <i>ln(wages)</i> | -0.0053*** (3.67) | | |
| <i>ln(GDP per capita)</i> | | -0.0034*** (3.47) | -0.0007 (0.77) |
| <i>ln(distance)</i> | -0.0025** (2.44) | -0.0019* (1.72) | -0.0012 (1.20) |
| <i>ln(GDP)</i> | 0.0053*** (6.05) | 0.0045*** (5.70) | 0.0039*** (6.55) |
| <i>FDI restrictions</i> | 0.0109* (1.73) | 0.0040 (0.79) | |
| <i>R&D-Intensity</i> | 0.000 (0.26) | 0.000 (0.22) | 0.000 (0.27) |
| <i>Cap. Intensity</i> | 0.0001 (1.23) | 0.0001 (1.23) | 0.000 (1.36) |
| <i>Manufacturing Dummy</i> | -0.0224*** 2.61 | -0.0242*** (2.93) | -0.0235*** (2.93) |
| <i>Same Sector Dummy</i> | 0.0871*** 7.17 | 0.0861*** (6.96) | 0.0826*** (6.71) |
| observations | 24,461 | 30,497 | 34,514 |
| from countries | 46 | 75 | 165 |
| R ² | 0.16 | 0.17 | 0.17 |

The table reports marginal effects. All regressions included sector dummy variables.
Robust z-values into Brackets. *, **, *** Significantly different from 0 at 10% level.
at 5% level, at 1% level.

Probit regressions, zero inflated model

| | Probit | Ordered Probit | Bivar.: mode 1 | Bivar.: mode 3 |
|--------------------------|----------------------|----------------------|---------------------------------|----------------------|
| <i>Internationality</i> | 0.0013*** (16.1) | 0.0303*** (17.2) | 0.0344*** (14.3) | 0.0125*** (6.47) |
| <i>Diversity</i> | -0.0022*** (6.17) | -0.0499*** (5.38) | -0.076*** (7.24) | 0.0632*** (4.46) |
| <i>Heterogeneity</i> | -0.0000 (0.81) | -0.0010 (1.49) | 5.31 10 ⁻⁶ (0.00) | -0.0108*** (4.36) |
| <i>Trans. costs</i> | -0.0010*** (3.43) | -0.0266*** (3.52) | 0.0317*** (4.18) | 0.044* (1.95) |
| <i>ln(GDP per cap)</i> | 0.0038*** (21.3) | 0.0988*** (21.1) | 0.1073*** (20.9) | 0.0653*** (3.59) |
| <i>ln(distance)</i> | -0.0104*** (54.6) | -0.2789*** (54.3) | -0.276*** (55.9) | -0.178*** (9.82) |
| <i>ln(GDP)</i> | 0.0112*** (72.1) | 0.2991*** (76.3) | 0.39*** (72.4) | 0.2204*** (15.7) |
| <i>FDI restrictions</i> | 0.0012 (1.41) | 0.0326 (1.38) | -0.016 (0.59) | 0.007 (0.08) |
| <i>R&D-Intensity</i> | 0.000 (1.30) | 0.0001 (1.50) | 0.0001* (1.68) | 0.0002** (1.96) |
| <i>Cap. Intensity</i> | -0.000 (1.53) | -0.0001* (1.77) | -0.0000 (0.52) | -0.0004*** (5.72) |
| <i>Manufacturing</i> | -0.0009 (0.70) | -0.0594* (1.86) | 0.0997*** (2.84) | -1.587*** (11.86) |
| | cut-off 1: | 6.013 | Res. corr.: 0.415 | |
| | stand. dev.: | 0.102 | stand. dev.: 0.035 | |
| | cut-off 2: | 7.627 | | |
| | stand. dev.: | 0.116 | | |
| observations | 528,770 | 528,770 | 632,325 | 632,325 |
| from countries | 75 | 75 | 75 | 75 |
| R ² | 0.32 | 0.30 | - | - |

All regressions included sector dummy variables. Robust z-values into Brackets.
 *, **, *** significantly different from 0 at 10% level, at 5% level, at 1% level.

Poolability across service groups

| | Constr. | Transport | Aux. Transp. | Commun. | Insurance |
|---------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Internationality</i> | 0.0002 (0.73) | -0.0008 (1.53) | 0.0075*** (22.0) | 0.0181*** (32.5) | 0.0066*** (18.0) |
| <i>Diversity</i> | 0.0368*** (19.9) | -0.2259*** (24.9) | -0.021*** (9.06) | -0.0474*** (14.6) | 0.0319*** (13.9) |
| $\ln(\text{GDP per cap})$ | -0.0843*** (10.7) | 0.0262*** (2.62) | -0.035*** (3.41) | -0.0685*** (4.47) | 0.0292*** (2.95) |
| $\ln(\text{distance})$ | -0.0211*** (3.38) | 0.111*** (12.4) | -0.1335*** (16.0) | -0.194*** (14.4) | -0.112*** (14.6) |
| $\ln(\text{GDP})$ | -0.002 (0.39) | -0.0958*** (14.0) | -0.012* (1.73) | -0.004 (0.36) | -0.0473*** (7.38) |
| observations | 34,582 | 34,582 | 34,582 | 34,582 | 34,582 |
| R^2 | 0.21 | 0.12 | 0.14 | 0.13 | 0.16 |

| | Data | R&D | Management | Advertising |
|---------------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Internationality</i> | -0.0029*** (6.96) | -0.014*** (24.1) | -0.0172*** (28.3) | -0.0063*** (14.0) |
| <i>Diversity</i> | 0.1123*** (48.9) | 0.1382*** (50.9) | 0.154*** (53.0) | 0.1235*** (48.5) |
| $\ln(\text{GDP per cap})$ | -0.0372*** (4.37) | -0.1702*** (19.5) | -0.0598*** (7.16) | -0.08*** (9.33) |
| $\ln(\text{distance})$ | -0.142*** (20.4) | -0.0998*** (13.9) | -0.155*** (22.6) | -0.1419*** (20.2) |
| $\ln(\text{GDP})$ | 0.0077 (1.39) | 0.0634*** (10.9) | 0.0395*** (7.18) | 0.0336*** (5.91) |
| observations | 34,582 | 34,582 | 34,582 | 34,582 |
| R^2 | 0.30 | 0.29 | 0.36 | 0.31 |

Robust z-values into Brackets.
 *, **, *** significantly different from 0 at 10% level, at 5% level, at 1% level.

Joint decision of channel and sales: system estimation

| | Probit 1st stage | ln(sales) 1st stage | Probit 2nd stage | ln(sales) 2nd stage |
|--------------------------|----------------------|------------------------|----------------------|------------------------|
| <i>pred other endog</i> | | | -0.1747*** (5.19) | 0.1316*** (2.31) |
| <i>Internationality</i> | -0.0035*** (5.66) | 0.0201*** (31.7) | | 0.0198*** (38.5) |
| <i>Diversity</i> | 0.0649*** (14.1) | -0.0007 (0.18) | 0.06481*** (13.2) | |
| <i>Heterogeneity</i> | 0.0059*** (5.23) | -0.0010*** (0.99) | 0.0057*** (4.72) | -0.002* (1.89) |
| <i>Trans. costs</i> | 0.0588*** (7.79) | 0.0781*** (8.73) | 0.0713*** (7.97) | 0.0719*** (8.32) |
| <i>ln(GDP per cap)</i> | -0.052*** (3.02) | 0.0764*** (4.70) | -0.0387*** (2.09) | 0.0692*** (4.41) |
| <i>ln(distance)</i> | -0.0484*** (3.43) | -0.17*** (13.2) | -0.0781*** (5.09) | -0.1436*** (11.8) |
| <i>ln(GDP)</i> | 0.0599*** (5.29) | 0.2775*** (26.4) | 0.1083*** (7.63) | 0.2537*** (24.6) |
| <i>FDI restrictions</i> | 0.5128*** (5.72) | 0.6403*** (7.08) | 0.6247*** (6.23) | |
| <i>R&D-Intensity</i> | -0.000 (-0.21) | 0.0003*** (8.27) | 0.0000 (0.75) | 0.0002*** (8.34) |
| <i>Cap. Intensity</i> | 0.0002*** (9.16) | 0.0004*** (14.0) | -0.0003*** (9.20) | 0.0004*** (12.8) |
| <i>Manufacturing</i> | -0.4614*** (8.07) | -0.1966*** (4.50) | -0.5947*** (8.12) | -0.1732*** (4.10) |
| <i>Same Sector</i> | 0.8923*** (22.2) | 0.7943*** (18.3) | 1.0311*** (18.9) | 0.6761*** (10.5) |
| observations | 30,389 | 30,389 | 30,389 | 30,389 |
| from countries | 75 | 75 | 75 | 75 |
| R ² | 0.14 | 0.11 | 0.14 | 0.11 |

All regressions included sector dummy variables. Robust z-values into Brackets.
 *, **, *** significantly different from 0 at 10% level, at 5% level, at 1% level.

Summary

- firm level analysis of the choice of service export channel
- at firm level mutually exclusive choice → discrete choice framework
- firm, service group, and country level variables important
- sector classification of trading firm explains a lot
- signs and size of coefficients robust to change of sample, different decision structures
- pattern of coefficients similar for different sectors
 - exception: insurance, transport
 - business services very close
- pattern robust to endogeneity bias
- nearly whole population of service exporters → discrete choice framework suitable