

**What Determines Services TFP :
Services Trade or Services-Trade Regulation?**

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Lausanne, Friday September 10, 2010

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ETSG2010 Conference

Introduction

- **Empirical estimation of:**

What are the different types of services trade and services-trade regulation that determine Total Factor Productivity in services?

- **Motivation / literature**

- **Broad “stylized” facts on TFP**

- **Empirical description**

- Economy-wide cross-sectoral
- Sector-specific panel estimation

- **Open issues for further estimation**

- **Concluding remarks**

Motivation

- **A “perceived” productivity problem in services**
 - Notably personal services (Baumol, 1967; Nordhaus, 2008; Hartwig, 2010)
- **Services (market) driver of overall labor productivity growth (US)**
 - Triplett and Bosworth (2004); Blanchard (2004)
- **TFP essential factor in explaining productivity growth differences across countries**
 - Timmer, Inklaar and Ark (2008)
- **Literature favours factor intensities as explanators for TFP**
 - Aghion, Mehir and Vandenbussche (2006); Triplett and Bosworth (2006)
- **Entry barriers also determinant for services TFP growth**
 - Nicoletti and Scarpetta (2003); Timmer, Inklaar and Ark (2008)

Motivation (bis)

- **Services liberalisation and growth**
 - Eschenbach and Hoekman (2006);
 - Mattoo, Rathindran and Subramanian (2006)

- **Services FDI and manufacturing productivity**
 - Arnold, Javorcik and Mattoo (2007)

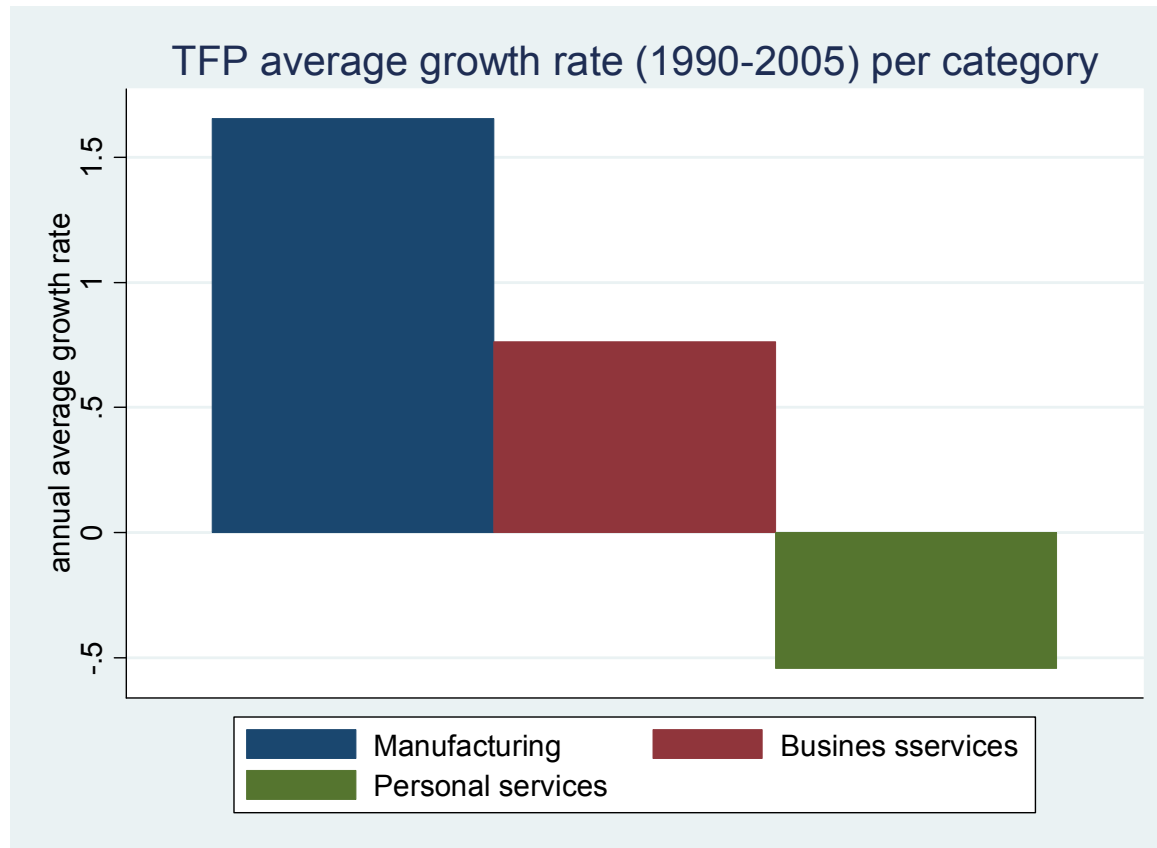
- **Domestic openness: privatization and domestic competition**
 - Fink, Mattoo and Rathindran (2003); Cammins and Rubio-Misas (2006)

- **International trade as a transmitter of efficiency-enhancing ideas, skills and ICT, which then becomes a determinant for services TFP**

- **Skills may be particularly important because of the nature of services stemming from their joint consumption and production, non-storability and organisational delivery**
 - Triplett and Bosworth (2006)

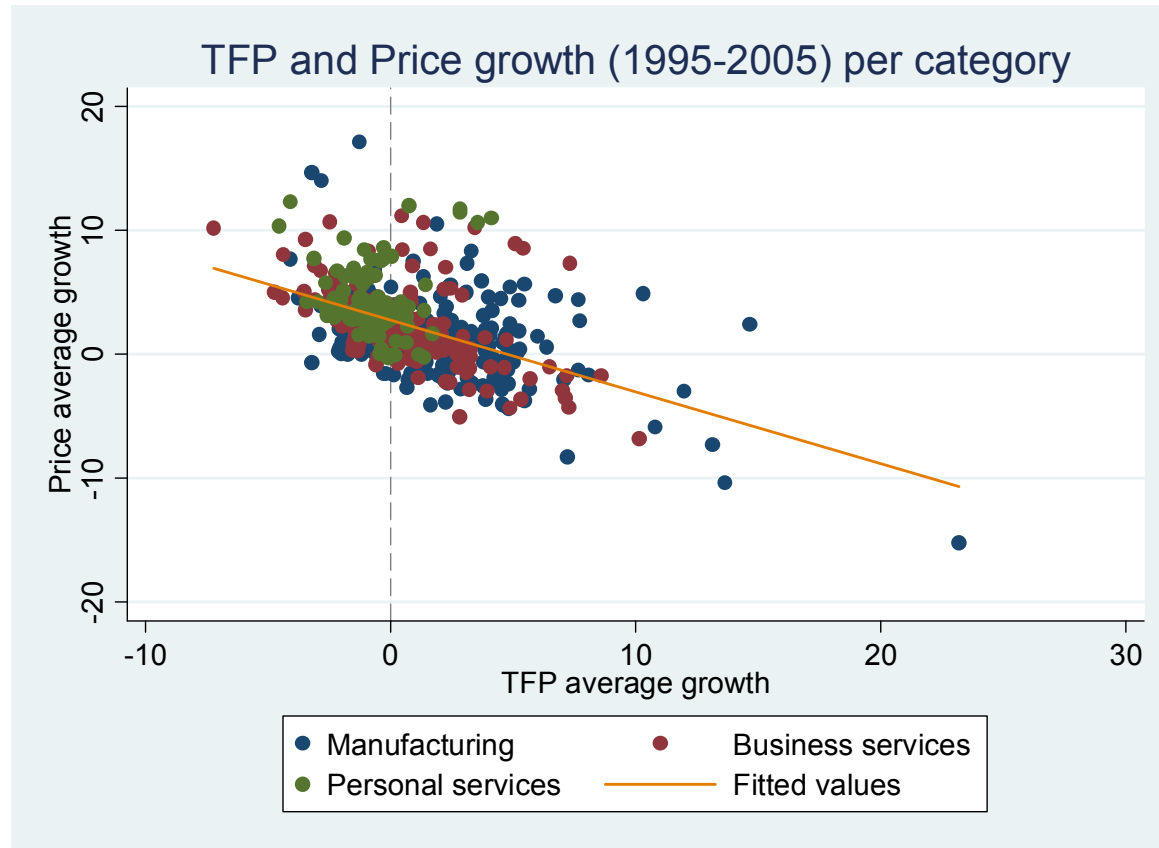
Stylized facts on TFP

Annual Average Growth Rate 1990-2005
of TFP per service category



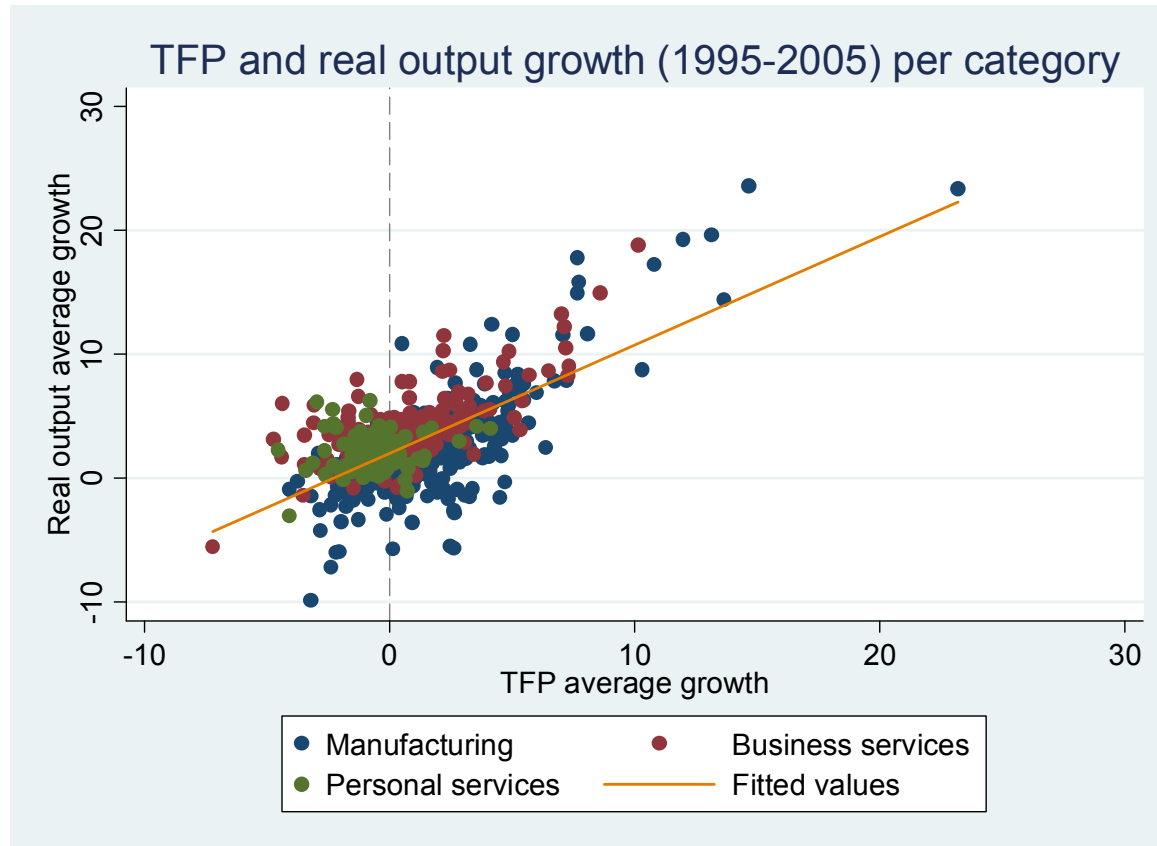
TFP and Prices

Annual Average Growth Rate in Cross-country



TFP and Real output

Annual Average Growth Rate in Cross-country



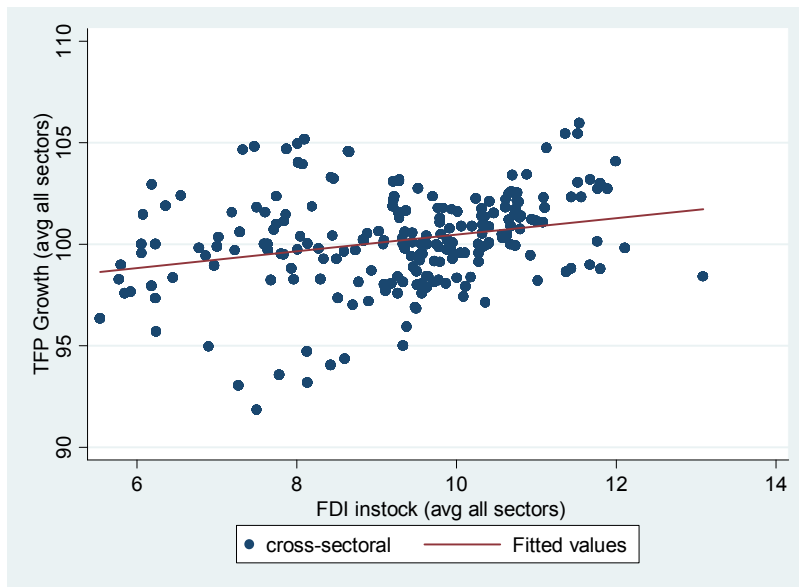
Empirical description

- **Estimate TFP level and growth on services trade and regulation**
- **Cross-sectoral vs. within a sector**
 - Cross-section (level) data vs. panel data (level and growth)
 - Sector specific in panel data: 14 services sectors (2 and 3 digit); 14 countries
 - TFP Growth and level (EUKlems)
 - Trade in Services: Services Trade (OECD)
 Foreign Direct Investment Stock and Flows (OECD)
 Sales of Foreign affiliates (FATS) (OECD)
 - Regulation: Entry barriers (NMR / PMR)
 Regulation behind the border (conduct) (NMR /PMR)
 FDI restrictions (Golub, 2009)
- **Endogeneity problem**
- **Omitted variable bias: high-skilled labor and ICT investments included**
- **Interaction terms with technology gap and high-skilled**

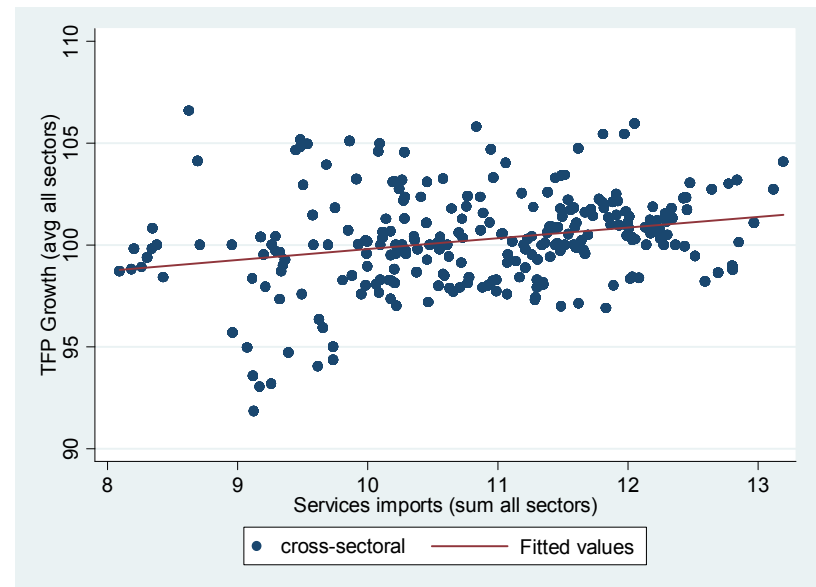
Cross-sectoral Patterns

Average TFP and trade across all services sectors

TFP level and FDI inward stock



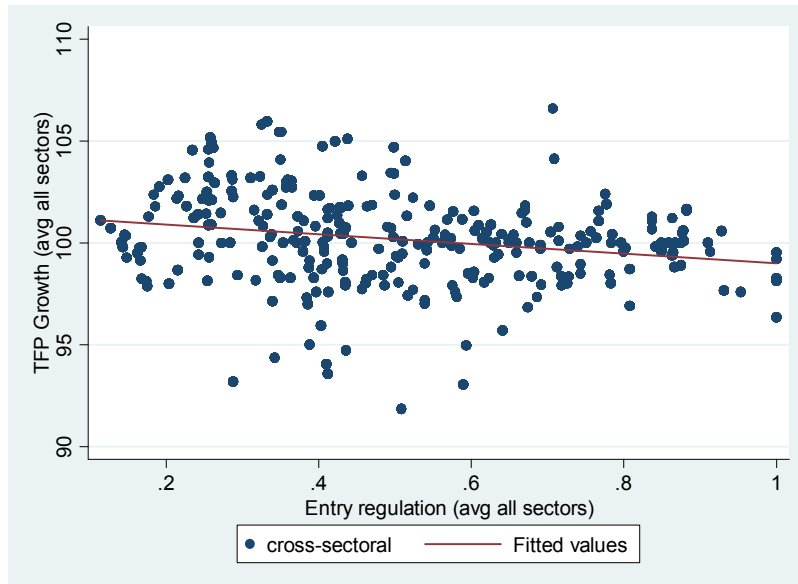
TFP level and Services Trade



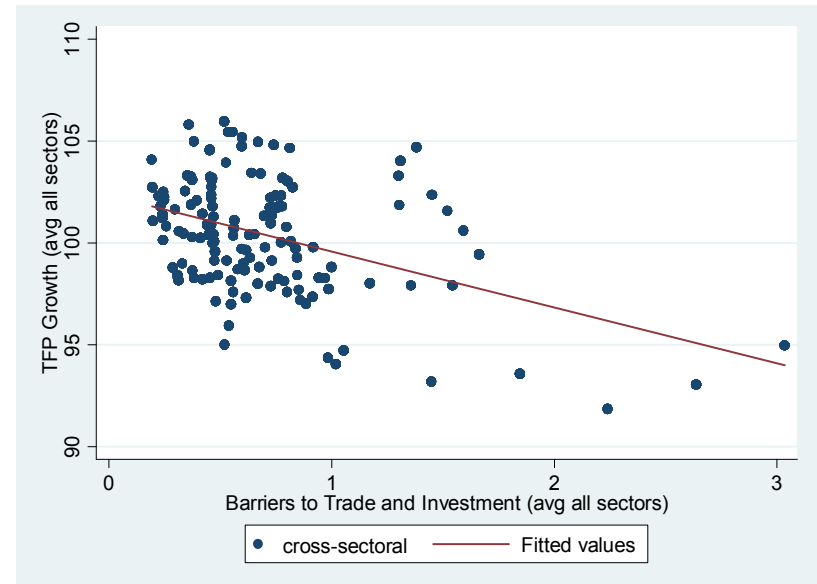
Cross-sectoral Patterns (bis)

Average TFP across all services sectors, economy-wide regulation

TFP level and barriers to trade and inv.



TFP level and product market regulation



Sector-specific Panel Data

Baseline specification

- $TFP_{ijt} = \alpha + \beta G_{ijt} + \zeta F_{ijt} + \delta T_{ijt} + \varphi R_{ijt} + \psi X_{ijt} * G_{ijt} + \xi X_{ijt} * F(H)_{ijt} + \theta_i + \theta_j + \theta_t + \varepsilon_{ijt}$
- Regression with country (θ_i), sector (θ_j) and year (θ_t) fixed effects
- Estimations for both the level and growth ($\Delta \ln$)
- Interactions with technology gap: relative to the technology frontier
 - o if: - matters more closer to technology frontier
 - o If: + matters more further away from technology frontier
- Technology gap defined as in Timmer, Inklaar and van Ark (2008)

Sector-specific Panel Data

Estimation results for the TFP level and Trade

| VARIABLES | 1 TFP level | 2 TFP level | 3 TFP level | 4 TFP level | 5 TFP level |
|------------------|---------------------|---------------------|------------------|------------------|---------------------|
| Technolgy gap | | | | | |
| FDI inward stock | 0.443*** (0.157) | | | | -0.785* (0.440) |
| Services imports | | 0.770*** (0.157) | | | 1.750*** (0.516) |
| FATS sales | | | 0.213 (0.190) | | 2.206*** (0.569) |
| FDI inflows | | | | 0.126 (0.111) | |
| Observations | 1887 | 3018 | 1145 | 2135 | 416 |
| R-squared | 0.252 | 0.286 | 0.382 | 0.288 | 0.525 |

Sector-specific Panel Data

Estimation results for the TFP level and Trade & Regulation

| VARIABLES | 1 TFP level | 2 TFP level | 3 TFP level | 4 TFP level | 5 TFP level |
|--------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Technology gap | | | | | |
| FDI inward stock | -0.978*** (0.279) | | | | -2.962*** (0.621) |
| Services imports | | -1.293** (0.585) | | | -3.923* (2.129) |
| FATS sales | | | -0.739* (0.400) | | 0.418 (1.085) |
| FDI inflows | | | | -0.158 (0.193) | |
| Entry Barriers | -9.669*** (1.872) | -14.16*** (2.322) | -10.54*** (2.687) | -7.151*** (2.050) | -9.522 (6.219) |
| Conduct Regulation | -1.168 (2.948) | -5.808** (2.712) | -5.607* (3.071) | -5.552** (2.611) | 5.049 (6.307) |
| FDI Restrictions | -2.543 (2.118) | -8.602** (3.567) | -6.751* (3.911) | -6.180*** (2.274) | 13.91* (8.191) |
| Observations | 739 | 829 | 612 | 886 | 151 |
| R-squared | 0.620 | 0.599 | 0.544 | 0.515 | 0.841 |

Sector-specific Panel Data

Estimation results for the TFP growth, Trade & Regulation

| VARIABLES | 1 TFP growth | 2 TFP growth | 3 TFP growth | 4 TFP growth | 5 TFP growth |
|--------------------|------------------------|------------------------|-----------------------|-------------------------|------------------------|
| Technology gap | 0.00249 (0.00544) | 0.0128*** (0.00480) | -0.00144 (0.00488) | 0.00704 (0.00574) | -0.0117 (0.0212) |
| FDI inward stock | -0.000385 (0.00142) | | | | -3.15e-05 (0.00603) |
| Services imports | | -0.00515 (0.00399) | | | 0.00969 (0.0218) |
| FATS sales | | | 0.00160 (0.00208) | | 0.0109* (0.00568) |
| FDI inflows | | | | -0.000223 (0.000582) | |
| Entry Barriers | 0.00268 (0.00634) | -0.00463 (0.00553) | -0.00743 (0.00790) | 0.00472 (0.00611) | -0.00459 (0.0167) |
| Conduct Regulation | 0.00200 (0.0126) | -0.00247 (0.0134) | 0.00486 (0.0172) | -0.0197 (0.0133) | 0.0452 (0.0484) |
| FDI Restrictions | -0.00465 (0.0110) | -0.0651** (0.0261) | -0.0193 (0.0207) | -0.0215** (0.0101) | -0.00655 (0.0536) |
| Observations | 449 | 609 | 335 | 517 | 78 |
| R-squared | 0.271 | 0.300 | 0.312 | 0.273 | 0.515 |

Sector-specific Panel Data

TFP growth, Trade & Regulation and Technology gap

| VARIABLES | 1 | 2 | 3 | 4 | 5 |
|-----------------------------|-----------------------|---------------------|------------------------|-----------------------|---------------------|
| | TFP growth | TFP growth | TFP growth | TFP growth | TFP growth |
| Type of services Trade | FDI Stock | Imports | FATS | FDI flow | All* |
| Technology gap | 0.00713 (0.00639) | 0.0105 (0.00747) | -0.000436 (0.00554) | 0.0143** (0.00674) | 0.00442 (0.0313) |
| Entry barriers | -0.00586 (0.0253) | -0.0218 (0.0155) | 0.00613 (0.0224) | 0.00185 (0.0170) | 0.0824 (0.0884) |
| Entry barriers*Tech gap | 0.0173 (0.0274) | 0.0177 (0.0142) | -0.0125 (0.0207) | 0.00420 (0.0174) | -0.0859 (0.0962) |
| Conduct regulation | -0.139*** (0.0472) | -0.0285 (0.0387) | -0.124* (0.0747) | -0.0984** (0.0439) | -0.175 (0.256) |
| Conduct regulation*Tech gap | 0.170*** (0.0534) | 0.0284 (0.0419) | 0.139* (0.0803) | 0.0861* (0.0496) | 0.208 (0.236) |
| FDI restrictions | 0.0505* (0.0285) | -0.0161 (0.0435) | 0.0335 (0.0502) | -0.00550 (0.0336) | 0.0985 (0.112) |
| FDI restrictions*Tech gap | -0.0744** (0.0313) | -0.0461 (0.0340) | -0.0701 (0.0618) | -0.0147 (0.0336) | -0.158 (0.158) |
| Observations | 449 | 609 | 335 | 517 | 78 |
| R-squared | 0.300 | 0.322 | 0.329 | 0.293 | 0.543 |

Sector-specific Panel Data

TFP growth, Trade & Regulation, Technology gap & High-skilled

| VARIABLES | 1 | 2 | 3 | 4 | 5 |
|-------------------------------------|------------------------|----------------------|----------------------|-----------------------|----------------------|
| | TFP growth | TFP growth | TFP growth | TFP growth | TFP growth |
| Type of services Trade | FDI Stock | Imports | FATS | FDI flow | All* |
| Entry barriers | -0.00679 (0.0284) | -0.0233 (0.0171) | 0.0433* (0.0262) | 0.00254 (0.0165) | 0.0557 (0.103) |
| Entry barriers*Tech gap | 0.0165 (0.0324) | 0.0201 (0.0144) | -0.0394* (0.0218) | 0.00575 (0.0175) | -0.0549 (0.111) |
| Entry barriers*High-skilled labor | 0.0255 (0.0434) | 0.00836 (0.0434) | -0.117** (0.0465) | -0.0125 (0.0219) | -0.197 (0.268) |
| Conduct regulation | -0.136*** (0.0457) | -0.0212 (0.0400) | -0.147* (0.0782) | -0.0990** (0.0441) | 0.0114 (0.209) |
| Conduct regulation*Tech gap | 0.171*** (0.0520) | 0.0217 (0.0425) | 0.159* (0.0824) | 0.0868* (0.0501) | 0.0272 (0.190) |
| Conduct reg.*High-skilled labor | -0.0436 (0.0944) | -0.205 (0.151) | -0.0600 (0.123) | 0.000972 (0.116) | -0.673 (0.619) |
| FDI restrictions | 0.0621** (0.0280) | -0.00863 (0.0421) | 0.0416 (0.0477) | -0.00477 (0.0339) | 0.0794 (0.119) |
| FDI restrictions*Tech gap | -0.0831*** (0.0302) | -0.0460 (0.0356) | -0.0589 (0.0610) | -0.0139 (0.0339) | -0.0636 (0.149) |
| FDI restrictions*High-skilled labor | -0.157*** (0.0594) | -0.181 (0.187) | -0.526*** (0.162) | -0.0242 (0.0680) | -1.585*** (0.508) |
| Observations | 449 | 609 | 335 | 517 | 78 |
| R-squared | 0.306 | 0.331 | 0.370 | 0.295 | 0.632 |

Sector-specific Panel Data (business)

TFP growth, Trade & Regulation, Technology gap & High-skilled

| VARIABLES | 1 TFP growth | 2 TFP growth | 3 TFP growth | 4 TFP growth | 5 TFP growth |
|-------------------------------------|-----------------------|----------------------|----------------------|----------------------|---------------------|
| Type of services Trade | FDI Stock | Imports | FATS | FDI flow | All* |
| Entry barriers | -0.00674 (0.0294) | -0.0230 (0.0171) | 0.0409 (0.0274) | 0.00774 (0.0172) | 0.0695 (0.104) |
| Entry barriers*Tech gap | 0.0186 (0.0335) | 0.0200 (0.0144) | -0.0352 (0.0226) | 0.00204 (0.0187) | -0.0643 (0.112) |
| Entry barriers*High-skilled labor | 0.00474 (0.0446) | 0.00709 (0.0434) | -0.0962* (0.0502) | -0.0156 (0.0234) | -0.192 (0.270) |
| Conduct regulation | -0.140*** (0.0524) | -0.0215 (0.0399) | -0.134* (0.0758) | -0.106** (0.0493) | -0.0185 (0.216) |
| Conduct regulation*Tech gap | 0.167*** (0.0565) | 0.0219 (0.0424) | 0.129 (0.0786) | 0.0909* (0.0544) | 0.0446 (0.195) |
| Conduct reg.*High-skilled labor | 0.00907 (0.102) | -0.206 (0.151) | 0.00833 (0.140) | -0.0143 (0.128) | -0.584 (0.638) |
| FDI restrictions | 0.0640* (0.0329) | -0.00951 (0.0420) | 0.0292 (0.0566) | 0.00514 (0.0386) | 0.0941 (0.122) |
| FDI restrictions*Tech gap | -0.0771** (0.0343) | -0.0454 (0.0354) | -0.0254 (0.0707) | -0.0238 (0.0375) | -0.0863 (0.155) |
| FDI restrictions*High-skilled labor | -0.129* (0.0663) | -0.174 (0.187) | -0.520*** (0.175) | -0.00755 (0.0747) | -1.456** (0.545) |
| Observations | 333 | 602 | 258 | 389 | 73 |
| R-squared | 0.265 | 0.328 | 0.348 | 0.276 | 0.643 |

Sector-specific Panel Data

TFP growth, Trade & Regulation using GMM estimator

| VARIABLES | 1 | 2 | 3 | 4 | 5 |
|--------------------|------------------------|------------------------|-----------------------|------------------------|------------------------|
| | TFP growth | TFP growth | TFP growth | TFP growth | TFP growth |
| Technology gap | 0.0139*** (0.00521) | 0.0428*** (0.00879) | 0.0310* (0.0170) | 0.0314** (0.0153) | 0.0343 (0.0340) |
| FDI inward stock | -0.000763 (0.00252) | | | | -0.00176 (0.0189) |
| Services imports | | 0.00741 (0.00456) | | | 0.0426 (0.151) |
| FATS sales | | | 0.00388 (0.0123) | | -0.000114 (0.00926) |
| FDI inflows | | | | -0.000886 (0.00649) | 2.95e-05 (0.00656) |
| Entry Barriers | -0.0103* (0.00542) | -0.0136** (0.00651) | -0.0116* (0.00685) | -0.0191** (0.00748) | -0.0170 (0.0677) |
| Conduct Regulation | -0.0166 (0.0150) | -0.0218 (0.0188) | -0.00431 (0.0600) | -0.0112 (0.0249) | 0.0228 (0.135) |
| FDI Restrictions | -0.0200** (0.00889) | -0.0318 (0.0219) | -0.0344 (0.0399) | -0.0124 (0.0143) | -0.0697 (0.134) |
| Observations | 594 | 722 | 473 | 621 | 75 |
| Number of cntryctr | 84 | 72 | 113 | 117 | 27 |

Further Estimation Issues

- **TFP based on growth accounting method**
 - Endogeneity in high-skilled and ICT investments?
 - Regress trade directly in the production function / TFP growth?
 - Business services (\neq materials) part of intermediate input use?
- **Trade endogeneity problem partly resolved**
- **Stricter form of fixed effect**
 - Importer x sector fixed effects leaves little room for variation
- **First GMM estimation reasonably well**
 - How to treat interaction variables in GMM
- **Splitting services sectors**
 - Limitations on quantity of observations

Conclusions

- **Trade does not determine TFP growth, regulation does**
- **The type of regulation matters for which type of trade**
 - Entry (imports/M1), conduct (FDI, FATS/M3), FDI restrictions (FDI, imports)
- **Entry and conduct impact for industries lying further behind relative to the technology frontier**
- **FDI regulation matters at the technology frontier**
- **FDI regulation matters relative more with high-skilled labor**
 - Goes beyond capital: permits for expats & management regulation
- **FATS statistics performs reasonably well**
- **Any predictions for high-skilled intensive personal services?**

Political Economy Implications

Import side and Regulation

- **Observe Mode 1/ 2 trade in personal services**
 - Patients moving abroad (health) ; policy encouraged (OECD, 2009)
 - Health insurance protection
 - Students going abroad (education)
 - Also reflected in GATS commitment in terms of Market Access

- **Regulatory competition less likely to occur (Messerlin, 2005)**
 - Foreign investors likely to adhere to national regulation and laws once invested / threaten vested interest much less than cross-border trade
 - Mode 1 and 2 generates competition between regulations
 - Regulators concerned about their ability to enforce domestic regulation

- **Economic and non-economic concerns in Mode 3 deregulation**
 - Publicly provided, price and trust involved – “Commercial”
 - Transfer of ownership concerns –“Foreign”
 - Better health and educational outcomes when liberalizing?

Thank you for your attention

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