# Appendix

Table A.1: Robustness checks of estimations with alternatives demand-parameters (coef= 0.438 from long-run estimations and 0.237 from Scheffler et al 2008)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Dependent variable LN(GRADUATES) average over 8 to 9 years later | | | | Dependent variable ln(IMMIGRATION RATE) no delay | | | | Dependent variable ln(EMIGRATION RATE) no delay | | | |
|  | OLS estimations | | IV | | OLS estimations | | IV | | OLS estimations | | IV | |
|  | coef 0.438 | coef 0.237 | coef 0.438 | coef 0.237 | coef 0.438 | coef 0.237 | coef 0.438 | coef 0.237 | coef 0.438 | coef 0.237 | coef 0.438 | coef 0.237 |
| Shortages | 0.738\*\*\* | 0.722\*\*\* | 0.258 | 0.285 | 0.126\*\*\* | 0.126\*\*\* | 0.134\*\* | 0.138\*\* | 0.160\*\* | 0.166\*\*\* | 0.110\*\* | 0.113\*\* |
|  | (0.267) | (0.271) | (0.513) | (0.525) | (0.0442) | (0.0441) | (0.0579) | (0.0588) | (0.0315) | (0.0321) | (0.0458) | (0.0469) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| j | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | 0.801 | YES |
| t | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| ***First stage*** |  |  |  |  |  |  |  |  |  |  |  |  |
| lnphysdependancyratio55 |  |  | 0.0845\*\*\* | 0.0891\*\*\* |  |  | 0.0844\*\*\* | 0.0819\*\*\* |  |  | 0.0844\*\*\* | 0.0819\*\*\* |
|  |  |  | (0.0192) | (0.0151) |  |  | (0.0143) | (0.0144) |  |  | (0.0143) | (0.0144) |
| lndensiteruralaussi |  |  | -0.104\* | -0.127\*\*\* |  |  | -0.0306\*\* | -0.0298\*\* |  |  | -0.0306\*\* | -0.0298\*\* |
|  |  |  | (0.0587) | (0.0361) |  |  | (0.0118) | (0.0123) |  |  | (0.0118) | (0.0123) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Observations | 224 | 224 | 188 | 188 | 237 | 237 | 181 | 181 | 237 | 237 | 181 | 181 |
| R-squared | 0.857 | 0.857 | 0.855 | 0.855 | 0.993 | 0.993 | 0.997 | 0.997 | 0.989 | 0.989 | 0.965 | 0.965 |
| Cluster | jt | jt | jt | jt | jt | jt | jt | jt | jt | jt | jt | jt |
| Hansen Test (P-Value) |  |  | 0.134 | 0.136 |  |  | 0.547 | 0.545 |  |  | 0.371 | 0.370 |
| Kleibergen-Paap test |  |  | 23.98 | 23.54 |  |  | 25.10 | 22.84 |  |  | 25.10 | 22.84 |
| F-Test |  |  | 31.89 | 31.99 |  |  | 2254 | 2328 |  |  | 76.62 | 77.92 |

Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Figure A.1: Average shortage measures for the US, the UK, Canada, Australia, New Zealand and Ireland between 1991 and 2004  Figure A.2: Average shortage measures for France, Germany, Italy, Portugal, Austria and Belgium between 1991 and 2004 Figure A.3: Average shortage measures for Denmark, Norway, Sweden, Finland, and Switzerland between 1991 and 2004

Table A.2: SURE estimations

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Seemingly Unrelated Regression Equations (SURE) | | | | | | | | |
|  | Demand-based approach | | | Need-based approach | | | Mixed-based approach | | |
| VARIABLES | Graduates | Immigration | Emigration | Graduates | Immigration | Emigration | Graduates | Immigration | Emigration |
| Shortages | 0.612\*\* | 0.0878\*\*\* | 0.177\*\*\* | 0.732\*\*\* | 0.142\*\*\* | 0.172\*\*\* | 0.707\*\*\* | 0.111\*\*\* | 0.188\*\*\* |
|  | (0.264) | (0.0280) | (0.0277) | (0.211) | (0.0217) | (0.0222) | (0.257) | (0.0272) | (0.0269) |
| Ln(Tertiary school enrolment)t | -0.275\*\*\* |  |  | -0.251\*\*\* |  |  | -0.263\*\*\* |  |  |
|  | (0.0800) |  |  | (0.0781) |  |  | (0.0796) |  |  |
| Ln(Secondary school enrolment)t | 0.182\* |  |  | 0.191\* |  |  | 0.173\* |  |  |
|  | (0.105) |  |  | (0.102) |  |  | (0.104) |  |  |
| Ln(Population)t | -2.001\*\*\* | 0.0483 | -0.941\*\*\* | -2.017\*\*\* | -0.0113 | -0.921\*\*\* | -2.067\*\*\* | 0.0201 | -0.951\*\*\* |
|  | (0.655) | (0.0690) | (0.0682) | (0.629) | (0.0610) | (0.0623) | (0.650) | (0.0675) | (0.0668) |
| Ln(Age dependency)t | 0.817\*\*\* | 0.0509\* | -0.0936\*\*\* | 0.512\* | -0.0197 | -0.156\*\*\* | 0.769\*\*\* | 0.0394 | -0.104\*\*\* |
|  | (0.264) | (0.0292) | (0.0289) | (0.286) | (0.0300) | (0.0307) | (0.265) | (0.0290) | (0.0287) |
| Ln(GDP per capita)t | 1.161\*\*\* | -0.0355 | -0.0187 | 1.452\*\*\* | 0.0181 | 0.0578\*\* | 1.179\*\*\* | -0.0344 | -0.0122 |
|  | (0.227) | (0.0246) | (0.0243) | (0.229) | (0.0234) | (0.0239) | (0.225) | (0.0240) | (0.0238) |
| Ln(Social expenditure per cap)t | 0.335\*\*\* | -0.0204\* | -0.0271\*\* | 0.308\*\*\* | -0.0205\* | -0.0335\*\*\* | 0.330\*\*\* | -0.0194 | -0.0280\*\* |
|  | (0.114) | (0.0120) | (0.0119) | (0.112) | (0.0111) | (0.0113) | (0.114) | (0.0118) | (0.0117) |
| (Immig change level)t |  | 0.00285\*\*\* | -0.00241\*\* |  | 0.00280\*\*\* | -0.00212\*\* |  | 0.00278\*\*\* | -0.00240\*\* |
|  |  | (0.000980) | (0.000991) |  | (0.000922) | (0.000949) |  | (0.000968) | (0.000974) |
| (Immig restrictivness)t |  | 0.00971\*\*\* | -0.00406\* |  | 0.00918\*\*\* | -0.00428\* |  | 0.00953\*\*\* | -0.00422\* |
|  |  | (0.00244) | (0.00247) |  | (0.00231) | (0.00237) |  | (0.00241) | (0.00243) |
| Constant | 28.87\*\* | -0.0226 | 18.61\*\*\* | 25.73\*\* | 0.469 | 17.36\*\*\* | 29.93\*\* | 0.490 | 18.73\*\*\* |
|  | (12.45) | (1.318) | (1.304) | (11.62) | (1.116) | (1.140) | (12.30) | (1.283) | (1.270) |
| Observations | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| R-squared | 0.853 | 0.995 | 0.984 | 0.858 | 0.996 | 0.985 | 0.855 | 0.995 | 0.984 |
| j | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| t | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Cluster | jt | jt | jt | jt | jt | jt | jt | jt | Jt |

Figure A4: Simulation results for Australia

|  |  |
| --- | --- |
| Figure A4a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A4b: Immigrant physicians in level |
| Figure A4c: scenario 3 - Emigrant physicians in level | Figure A4d: Graduated physicians in level |

Figure A5: Simulation results for Austria

|  |  |
| --- | --- |
| Figure A5a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A5b: Immigrant physicians in level |
| Figure A5c: scenario 3 - Emigrant physicians in level | Figure A5d: Graduated physicians in level |

Figure A6: Simulation results for Belgium

|  |  |
| --- | --- |
| Figure A6a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A6b: Immigrant physicians in level |
| Figure A6c: scenario 3 - Emigrant physicians in level | Figure A6d: Graduated physicians in level |

Figure A7: Simulation results for Canada

|  |  |
| --- | --- |
| Figure A7a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A7b: Immigrant physicians in level |
| Figure A7c: scenario 3 - Emigrant physicians in level | Figure A7d: Graduated physicians in level |

Figure A8: Simulation results for Denmark

|  |  |
| --- | --- |
| Figure A8a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A8b: Immigrant physicians in level |
| Figure A8c: scenario 3 - Emigrant physicians in level | Figure A8d: Graduated physicians in level |

Figure A9: Simulation results for Finland

|  |  |
| --- | --- |
| Figure A9a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A9b: Immigrant physicians in level |
| Figure A9c: scenario 3 - Emigrant physicians in level | Figure A9d: Graduated physicians in level |

Figure A10: Simulation results for France

|  |  |
| --- | --- |
| Figure A10a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A10b: Immigrant physicians in level |
| Figure A10c: scenario 3 - Emigrant physicians in level | Figure A10d: Graduated physicians in level |

Figure A11: Simulation results for Germany

|  |  |
| --- | --- |
| Figure A11a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A11b: Immigrant physicians in level |
| Figure A11c: scenario 3 - Emigrant physicians in level | Figure A11d: Graduated physicians in level |

Figure A12: Simulation results for Ireland

|  |  |
| --- | --- |
| Figure A12a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A12b: Immigrant physicians in level |
| Figure A12c: scenario 3 - Emigrant physicians in level | Figure A12d: Graduated physicians in level |

Figure A13: Simulation results for Italy

|  |  |
| --- | --- |
| Figure A13a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A13b: Immigrant physicians in level |
| Figure A13c: scenario 3 - Emigrant physicians in level | Figure A13d: Graduated physicians in level |

Figure A14: Simulation results for New Zealand

|  |  |
| --- | --- |
| Figure A14a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A14b: Immigrant physicians in level |
| Figure A14c: scenario 3 - Emigrant physicians in level | Figure A14d: Graduated physicians in level |

Figure A15: Simulation results for Norway

|  |  |
| --- | --- |
| Figure A15a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A15b: Immigrant physicians in level |
| Figure A15c: scenario 3 - Emigrant physicians in level | Figure A15d: Graduated physicians in level |

Figure A16: Simulation results for Portugal

|  |  |
| --- | --- |
| Figure A16a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A16b: Immigrant physicians in level |
| Figure A16c: scenario 3 - Emigrant physicians in level | Figure A16d: Graduated physicians in level |

Figure A17: Simulation results for Sweden

|  |  |
| --- | --- |
| Figure A17a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A17b: Immigrant physicians in level |
| Figure A17c: scenario 3 - Emigrant physicians in level | Figure A17d: Graduated physicians in level |

Figure A18: Simulation results for Switzerland

|  |  |
| --- | --- |
| Figure A18a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A18b: Immigrant physicians in level |
| Figure A18c: scenario 3 - Emigrant physicians in level | Figure A18d: Graduated physicians in level |

Figure A1: Simulation results for the United Kingdom

|  |  |
| --- | --- |
| Figure A19a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A19b: Immigrant physicians in level |
| Figure A19c: scenario 3 - Emigrant physicians in level | Figure A19d: Graduated physicians in level |

Figure A20: Simulation results for the USA

|  |  |
| --- | --- |
| Figure A20a: Shortage (+) and surplus (-) in the labour market (in level) | Figure A20b: Immigrant physicians in level |
| Figure A20c: scenario 3 - Emigrant physicians in level | Figure A20d: Graduated physicians in level |