**Appendix A: Tables of Supplementary Regression Estimations**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table A1: Relationships between External Knowledge Sources and Innovation** | | | | |
|  | (1) | (2) | (3) | (4) |
| VARIABLES | OLS-Manuf. | OLS-Service | Tobit-Manuf. | Tobit-Service |
| Trained Staff | 0.668 | 1.339\* | 6.317\*\*\* | 6.083\*\*\* |
|  | (0.595) | (0.803) | (0.640) | (0.845) |
| Firm Size | -0.251 | -0.049 | -0.705\*\*\* | -0.832\*\*\* |
|  | (0.228) | (0.299) | (0.230) | (0.316) |
| Firm Age | -0.737\*\*\* | -0.200 | -3.258\*\*\* | -0.807\*\*\* |
|  | (0.205) | (0.239) | (0.229) | (0.259) |
| Staff Education | 0.017\* | -0.009 | 0.072\*\*\* | -0.061\*\*\* |
|  | (0.009) | (0.010) | (0.009) | (0.010) |
| **Customers** | 3.849\*\* | 4.671\* | 13.408\*\*\* | 11.434\*\*\* |
|  | (1.709) | (2.477) | (1.116) | (1.628) |
| **Workshops** | 2.107 | 5.545\*\*\* | 9.713\*\*\* | 15.826\*\*\* |
|  | (1.679) | (1.910) | (1.057) | (1.647) |
| **New Employees** | 0.710 | 6.046\* | 3.401\*\*\* | 16.338\*\*\* |
|  | (1.529) | (3.386) | (1.085) | (1.670) |
| **Competitor** | -0.744 | 2.963 | -1.428 | 6.274\*\*\* |
|  | (1.681) | (2.071) | (1.057) | (1.630) |
| **Consultant** | 0.119 | -5.365\* | 1.174 | -6.758\*\*\* |
|  | (1.720) | (2.950) | (1.132) | (1.558) |
| Internal R&D | 10.614\*\*\* | 10.452\*\*\* | 37.606\*\*\* | 35.903\*\*\* |
|  | (1.295) | (1.669) | (0.669) | (0.810) |
| Export | -0.002 | -0.017 | -0.010 | -0.074\*\*\* |
|  | (0.015) | (0.014) | (0.010) | (0.016) |
| Capacity Utilisation | 0.011 |  | 0.039\*\*\* |  |
|  | (0.009) |  | (0.009) |  |
| Private Ownership | -0.017 | 0.003 | -0.077\*\*\* | 0.042\*\*\* |
|  | (0.011) | (0.009) | (0.007) | (0.008) |
| Foreign Ownership | -0.021 | -0.023\* | -0.119\*\*\* | -0.025\*\*\* |
|  | (0.016) | (0.014) | (0.007) | (0.009) |
| Constant | -0.652 | 20.454\*\*\* | -66.412\*\*\* | -8.463\*\*\* |
|  | (1.905) | (7.691) | (0.798) | (0.932) |
| Sigma |  |  | 49.705\*\*\* | 52.315\*\*\* |
|  |  |  | (0.317) | (0.429) |
| Observations | 3,735 | 3,153 | 3,735 | 3,153 |
| R-squared | 0.149 | 0.161 | 0.079 | 0.090 |
| *Note*: The estimation controls for country and industry dummies. Robust standard errors in parentheses | | | | |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 | |  |  |  |

**Table A2: Relationship between External Knowledge Sources and Internal R&D**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Model 1) |  | (Model 2) |  | dydx |  | dydx |  |
|  | Logit |  | Ivtreatreg |  | Logit |  | ivtreatreg |  |
| Firm Size | -0.000 | (0.029) | 0.005 | (0.004) | -0.001 | (0.058) | 0.103 | (0.079) |
| Firm Age | -0.033 | (0.027) | -0.001 | (0.002) | -0.077 | (0.063) | -0.038 | (0.053) |
| Staff Education | 0.001 | (0.001) | 0.000\* | (0.000) | 0.037 | (0.062) | 0.079 | (0.047) |
| Trained Staff | 0.508\*\*\* | (0.081) | -0.062 | (0.060) | 0.128\*\* | (0.021) | -0.155 | (0.150) |
| **Consultants** | **0.859\*\*\*** | **(0.135)** | **0.159\*\*\*** | **(0.017)** | **0.06\*\*** | **(0.010)** | **0.111\*\*** | **(0.012)** |
| **Customers** | **0.284\*** | **(0.147)** | **0.034\*\*** | **(0.016)** | **0.023\*\*\*** | **(0.012)** | **0.016\*** | **(0.027)** |
| **Workshop** | **0.702\*\*\*** | **(0.153)** | **0.116\*\*\*** | **(0.016)** | **0.057\*\*** | **(0.012)** | **0.094\*\*** | **(0.013)** |
| **New Employees** | **0.364\*\*** | **(0.144)** | **0.074\*\*\*** | **(0.017)** | **0.021\*** | **(0.008)** | **0.043\*\*** | **(0.010)** |
| **Competitor** | **0.207** | **(0.144)** | **0.021** | **(0.016)** | **0.016** | **(0.011)** | **0.017** | **(0.013)** |
| Private Ownership | -0.000 | (0.002) | -0.000 | (0.000) | -0.024 | (0.102) | -0.028 | (0.059) |
| Foreign Ownership | 0.003 | (0.002) | 0.000\*\* | (0.000) | 0.025 | (0.017) | 0.03\* | (0.012) |
| Export | -0.004\* | (0.002) | -0.000 | (0.000) | -0.015\*\*\* | (0.008) | -0.009 | (0.007) |
| Capacity Utilisation | 0.002\* | (0.001) | 0.000\* | (0.000) | 0.04\*\*\* | (0.024) | 0.043\*\*\* | (0.023) |
| Constant | -2.519\*\*\* | (0.241) | 0.080\*\*\* | (0.012) |  |  |  |  |
| lambda |  |  | 0.067\* | (0.036) |  |  |  |  |
|  |  |  | 0.303 |  |  |  |  |  |
| Wald X²/Prob > X² | 423.01 | 0.000 | 1509.8 | 0.000 |  |  |  |  |
| pseudo r²/rho | 0.095 |  | 0.221 |  |  |  |  |  |
| Observations | 9503 |  | 9503 |  |  |  |  |  |
| *Note*: The estimation controls for sector dummies. Standard errors are adjusted for 282 clusters in country and industry for the logit estimation in Model 1. Standard errors in parentheses\* p<0.10 \*\* p<0.05\*\*\* p<0.01 | | | | | | | | |
|  |  |  | |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Table A3: Relationship between External Knowledge Sources and Innovation (Country analysis)** | | | | | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| VARIABLES | DR Congo | Ghana | Kenya | Malawi | Namibia | Nigeria | South Sudan | Sudan | Tanzania | Uganda | Zambia |
| Firm Size | -2.247 | -3.582\*\*\* | 0.026 | -3.260 | -2.925 | -1.153 | -0.346 | -23.597\* | -2.044 | 0.884 | -2.074\* |
|  | (2.638) | (0.549) | (0.872) | (4.139) | (3.267) | (2.497) | (2.219) | (12.438) | (2.223) | (1.218) | (1.144) |
| Firm Age | -1.622 | 1.730\*\*\* | -4.845\*\*\* | -1.311 | 2.559 | -5.944\*\*\* | 3.741 | -28.390\*\* | 4.354\*\* | -3.933\*\*\* | -2.911\*\*\* |
|  | (2.764) | (0.571) | (1.017) | (2.547) | (2.677) | (1.870) | (2.662) | (13.922) | (2.110) | (1.029) | (0.873) |
| Trained Staff | 13.840\* | 1.107 | 7.886\*\* | 1.103 | 4.965 | -6.721 | 14.587\*\* | 60.206\*\*\* | 14.082\* | 1.221 | 6.544\*\* |
|  | (7.175) | (1.446) | (3.435) | (8.415) | (9.080) | (6.493) | (5.719) | (23.194) | (7.451) | (4.153) | (2.845) |
| Staff Education | -0.080 | 0.152\*\*\* | 0.164\*\*\* | 0.097 | 0.093 | 0.036 | 0.068 | -0.326 | 0.046 | -0.044 | -0.014 |
|  | (0.087) | (0.018) | (0.045) | (0.128) | (0.065) | (0.060) | (0.053) | (0.331) | (0.100) | (0.067) | (0.046) |
| **Customers** | -38.223\*\* | -4.364 | 0.480 | 38.028\*\*\* | 16.838 | 74.791\*\*\* | 12.351 | 117.092\*\*\* | 46.157\*\*\* | 14.898 | 5.400 |
|  | (14.815) | (2.675) | (4.098) | (10.411) | (15.095) | (19.632) | (15.155) | (29.858) | (9.860) | (9.333) | (5.563) |
| **Workshop** | -0.617 | 9.705\*\*\* | 12.542\*\*\* | 37.628\*\* | 20.510 | -4.978 | -8.318 | -28.925 | 0.692 | 15.869\* | 3.498 |
|  | (13.674) | (2.853) | (3.810) | (14.903) | (17.670) | (15.546) | (23.849) | (42.475) | (15.907) | (9.461) | (4.690) |
| **New Employees** | 23.157\*\*\* | 13.400\*\*\* | -3.013 | 11.352 | 18.983 | 40.443\*\*\* | 13.127 | 30.308 | 15.145 | -7.328 | 8.762\*\* |
|  | (6.935) | (2.794) | (5.024) | (16.689) | (14.039) | (14.784) | (21.797) | (61.103) | (14.232) | (4.855) | (3.785) |
| **Competitors** | 21.577\*\* | -19.024\*\*\* | 13.595\*\*\* | 2.506 | -9.604 | -2.553 | -8.647 | -8.360 | -23.931 | 14.456\*\* | -1.801 |
|  | (10.691) | (2.862) | (2.796) | (12.989) | (22.207) | (13.674) | (18.336) | (79.109) | (15.814) | (5.758) | (6.858) |
| **Consultants** | -1.262 | 28.310\*\*\* | 0.505 | -39.743\*\*\* | -7.749 | -10.340 | 7.087 | -61.188 | -18.158 | -11.584 | 2.255 |
|  | (12.426) | (2.367) | (4.667) | (14.776) | (16.124) | (16.115) | (24.276) | (45.616) | (16.152) | (12.186) | (3.182) |
| Internal R&D | 52.343\*\*\* | 42.653\*\*\* | 37.232\*\*\* | 52.140\*\*\* | 48.693\*\*\* | 104.545\*\*\* | 16.442\* | 131.625\*\*\* | 25.897\*\*\* | 32.445\*\*\* | 15.319\*\*\* |
|  | (9.930) | (1.504) | (3.499) | (8.318) | (7.606) | (9.116) | (8.777) | (27.642) | (6.230) | (5.649) | (3.753) |
| Export | -1.081\* | -0.293\*\*\* | 0.083 | -0.117 | -0.037 | -0.271\* | 0.203 | -0.500 | -0.434 | -0.097 | 0.007 |
|  | (0.554) | (0.021) | (0.065) | (0.274) | (0.342) | (0.145) | (0.261) | (0.811) | (0.471) | (0.122) | (0.050) |
| Capacity Utilisation | -0.044 | -0.117\*\*\* | -0.040 | -0.041 | 0.198 | 0.273\*\* | 0.012 | 0.292 | -0.201\* | 0.071 | 0.002 |
|  | (0.088) | (0.024) | (0.066) | (0.130) | (0.196) | (0.115) | (0.160) | (1.056) | (0.115) | (0.056) | (0.046) |
| Private Ownership | 0.043 | 23.567\*\*\* | -0.108 | -0.195\*\* | 0.023 | 0.148\* | 0.323\*\*\* | 0.118 | 0.145 | -0.032 | -0.055 |
|  | (0.069) | (0.017) | (0.078) | (0.093) | (0.120) | (0.076) | (0.071) | (0.211) | (0.153) | (0.126) | (0.070) |
| Foreign Ownership | -0.161 | 23.431\*\*\* | -0.154 | -0.357\*\* | -0.201 | -0.197 | 0.319\*\*\* | -47.656 | 0.074 | -0.055 | -0.058 |
|  | (0.125) | (0.012) | (0.095) | (0.166) | (0.162) | (0.245) | (0.065) | (0.000) | (0.180) | (0.140) | (0.080) |
| Constant | -38.769\*\*\* | -2,409.50\*\*\* | -21.938\*\* | -61.942\*\*\* | -72.504\*\*\* | -101.757\*\*\* | -60.568\*\*\* | -92.350\* | -120.794\*\*\* | -11.498 | 5.081 |
|  | (9.934) | (1.723) | (8.914) | (11.979) | (13.527) | (13.257) | (7.425) | (50.655) | (15.811) | (14.464) | (9.802) |
| Sigma | 46.773\*\*\* | 45.329\*\*\* | 38.234\*\*\* | 59.178\*\*\* | 69.840\*\*\* | 77.294\*\*\* | 49.733\*\*\* | 123.429\*\*\* | 72.064\*\*\* | 38.262\*\*\* | 29.374\*\*\* |
|  | (2.889) | (0.835) | (4.496) | (3.332) | (3.277) | (3.805) | (1.889) | (8.928) | (6.707) | (1.737) | (1.441) |
| Pseudo R-Squared | 0.050 | 0.046 | 0.056 | 0.081 | 0.025 | 0.089 | 0.013 | 0.088 | 0.019 | 0.034 | 0.015 |
| log-likelihood | -847.723 | -825.371 | -1345.870 | -657.103 | -897.858 | -2166.752 | -1824.581 | -334.430 | -649.661 | -1389.441 | -1743.260 |
| Observations | 529 | 720 | 781 | 523 | 580 | 2,675 | 738 | 662 | 813 | 762 | 720 |
| ***Note*: The estimation controls for the manufacturing and service sector, respectively. Standard errors are clustered at the level of country and industry. Robust standard errors in parentheses\*\*\* p<0.01, \*\* p<0.05, \* p<0.1**  **Table A4: Correlation Matrix of Estimation Variables**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | | 1 | % of Prod&Serv. | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 2 | ProdInno | 0.18 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 3 | ProcInno | 0.1 | 0.55 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 4 | MarkInno | 0.09 | 0.44 | 0.49 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 5 | OrgaInno | 0.07 | 0.39 | 0.45 | 0.51 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 6 | Trained Staff | 0.04 | 0.21 | 0.24 | 0.23 | 0.26 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 7 | Staff Education | 0.03 | 0.07 | 0.05 | 0.07 | 0.05 | 0.12 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 8 | Customers | 0.16 | 0.07 | 0.1 | 0.09 | 0.11 | 0.09 | 0.05 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 9 | Workshops | 0.15 | 0.1 | 0.12 | 0.11 | 0.15 | 0.12 | 0.07 | 0.63 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | 10 | New Employees | 0.16 | 0.07 | 0.1 | 0.09 | 0.1 | 0.1 | 0.04 | 0.6 | 0.54 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  | | 11 | Competitors | 0.13 | 0.07 | 0.09 | 0.09 | 0.11 | 0.09 | 0.03 | 0.63 | 0.62 | 0.56 | 1 |  |  |  |  |  |  |  |  |  |  |  |  | | 12 | Consultants | 0.11 | 0.08 | 0.1 | 0.09 | 0.12 | 0.12 | 0.05 | 0.56 | 0.61 | 0.54 | 0.6 | 1 |  |  |  |  |  |  |  |  |  |  |  | | 13 | Internal R&D | 0.23 | 0.1 | 0.12 | 0.12 | 0.11 | 0.11 | 0.04 | 0.22 | 0.25 | 0.22 | 0.22 | 0.26 | 1 |  |  |  |  |  |  |  |  |  |  | | 14 | Firm Size | 0 | 0.16 | 0.16 | 0.15 | 0.17 | 0.22 | 0.21 | 0.2 | 0.23 | 0.16 | 0.19 | 0.19 | 0.08 | 1 |  |  |  |  |  |  |  |  |  | | 15 | Firm Age | -0.08 | 0 | 0.03 | 0 | 0.04 | 0.05 | -0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.04 | 0 | 0.14 | 1 |  |  |  |  |  |  |  |  | | 16 | % Sales (Export) | -0.02 | 0.06 | 0.06 | 0.08 | 0.06 | 0.07 | -0.06 | 0.05 | 0.08 | 0.06 | 0.06 | 0.06 | 0.01 | 0.1 | 0.03 | 1 |  |  |  |  |  |  |  | | 17 | Capacity Util. | 0.03 | 0.1 | 0.14 | 0.08 | 0.05 | 0.05 | 0.05 | 0.06 | 0.09 | 0.06 | 0.08 | 0.06 | 0.06 | 0.19 | 0.02 | 0.03 | 1 |  |  |  |  |  |  | | 18 | Manufacturing | 0.02 | 0.04 | 0.12 | 0.04 | 0.02 | 0.03 | -0.05 | 0.07 | 0.09 | 0.06 | 0.08 | 0.07 | 0.05 | 0.13 | 0.09 | 0.06 | 0.73 | 1 |  |  |  |  |  | | 19 | Retail | 0.01 | -0.04 | -0.1 | -0.03 | -0.04 | -0.06 | 0.01 | -0.05 | -0.07 | -0.05 | -0.07 | -0.06 | -0.02 | -0.15 | -0.08 | -0.07 | -0.34 | -0.46 | 1 |  |  |  |  | | 20 | Services | -0.02 | -0.01 | -0 | -0.01 | 0.02 | 0.02 | 0.05 | -0.02 | -0.03 | -0.02 | -0.03 | -0.02 | -0.03 | 0 | -0.02 | 0 | -0.45 | -0.62 | -0.41 | 1 |  |  |  | | 21 | Patent | 0.23 | 0.07 | 0.09 | 0.09 | 0.07 | 0.01 | 0 | 0.15 | 0.14 | 0.14 | 0.12 | 0.13 | 0.18 | 0.04 | -0.04 | -0.01 | 0 | -0.01 | 0 | 0.01 | 1 |  |  | | 22 | Labour Regulation | -0.01 | -0.03 | 0 | -0.03 | -0.02 | 0.02 | 0.03 | -0.01 | -0.02 | -0.01 | -0.03 | -0.02 | -0.01 | -0.01 | -0.04 | -0.01 | -0.03 | -0.04 | 0.04 | 0 | 0.03 | 1 |  | | 23 | Political Instability | 0.02 | 0.01 | -0 | 0.01 | 0.03 | -0.01 | 0 | -0.01 | 0 | -0.01 | -0.01 | -0.01 | 0 | 0.01 | -0.03 | 0 | -0.03 | -0.07 | 0 | 0.08 | 0 | -0.09 | 1 | | | | | | | | | | | | |