**Annexes**

|  |
| --- |
| **Table S1.** Determinants of persistent R&D investors by the technological cluster of activity.Base outcome: persistent non-innovators. |
| **Variable**  | (1) High-tech manufactures | (2) Low-tech manufactures | (3) KISS | (4) Non-KISS |
| **Exporting only to the EU** | -0.731\*\*\* (0.138) | -0.077 (0.104) | -0.211 (0.303) | -0.177 (0.354) |
| **Exporting only outside the EU** | -0.080 (0.223) | -0.068 (0.200) | 0.188 (0.487) | 0.497 (0.780) |
| **Exporting inside and outside the EU** | 0.186 (0.141) | 0.496\*\*\* (0.106) | 0.023 (0.324) | 0.848\* (0.435) |
| **Consecutive years exporting** | 0.060\*\*\* (0.017) | 0.088\*\*\* (0.013) | 0.175\*\*\* (0.050) | 0.180\*\*\* (0.069) |
| **Sales per employee (Logs)** | -0.173\*\*\* (0.050) | 0.139\*\*\* (0.035) | -0.477\*\*\* (0.100) | -0.164\*\* (0.063) |
| **Size (Logs)** | 0.228\*\*\* (0.035) | 0.238\*\*\* (0.025) | -0.235\*\*\* (0.053) | 0.158\*\*\* (0.048) |
| **Human capital (Logs)** | 0.491\*\*\* (0.027) | 0.488\*\*\* (0.023) | 0.510\*\*\* (0.054) | 0.220\*\*\* (0.053) |
| **Age (Logs)** | 0.104\* (0.062) | -0.283\*\*\* (0.046) | 0.269 (0.210) | -0.259\*\* (0.105) |
| **Physical investment (Logs)** | -0.097\*\*\* (0.016) | -0.044\*\*\* (0.013) | -0.044 (0.037) | -0.095\*\*\* (0.033) |
| **Public financing**  | 1.613\*\*\* (0.125) | 1.421\*\*\* (0.083) | 2.900\*\*\* (0.341) | 2.033\*\*\* (0.202) |
| **Cooperation**  | 0.896\*\*\* (0.111) | 1.225\*\*\* (0.084) | 1.214\*\*\* (0.278) | 0.791\*\*\* (0.157) |
| **Lead** | 1.070\*\*\* (0.254) | 0.558\*\*\* (0.114) | 2.293\*\*\* (0.746) | -0.495\*\* (0.222) |
| **Subsidiary** | -0.930\*\*\* (0.093) | -0.014 (0.066) | 0.416\*\* (0.205) | -0.820\*\*\* (0.183) |
| **Time dummies** | Yes | Yes | Yes | Yes |
| **Joint significance of time dummies** | (0.000)\*\*\* | (0.000)\*\*\* | (0.000)\*\*\* | (0.000)\*\*\* |
| **Observations** | 16,693 | 21,140 | 5,557 | 3,676 |
| **LR test** | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* |
| **Pseudo R2** | 0.172 | 0.168 | 0.236 | 0.174 |
| \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. All values show coefficient estimates (Std. Error).  |

|  |
| --- |
| **Table S2.** Random effects probit for stopping innovation activities. Only persistent innovators and firms transitioning to stop innovation activities are considered. |
|   | R&D investment | Innovation |
| **Variable**  | (1) | (2) | (3)  | (4)  |
| **Exporting only to the EU** |  | -0.036 (0.049) |  | 0.063 (0.056) |
| **Exporting only outside the EU** |  | -0.278\*\*\* (0.048) |  | -0.235\*\*\* (0.065) |
| **Exporting inside and outside the EU** |  | -0.147\*\*\* (0.038) |  | 0.000 (0.044) |
| **Consecutive years exporting** | -0.029\*\*\* (0.005) |  | -0.006 (0.006) |  |
| **Sales per employee (Logs)** | 0.026 (0.018) | 0.020 (0.016) | 0.017 (0.020) | -0.006 (0.019) |
| **Size (Logs)** | -0.153\*\*\* (0.013) | -0.159\*\*\* (0.012) | -0.107\*\*\* (0.014) | -0.106\*\*\* (0.014) |
| **Human capital (Logs)** | -0.085\*\*\* (0.011) | -0.108\*\*\* (0.011) | 0.007 (0.013) | -0.005 (0.013) |
| **Age (Logs)** | -0.001 (0.025) | -0.001 (0.022) | 0.055\* (0.032) | 0.036 (0.029) |
| **Physical investment (Logs)** | 0.029\*\*\* (0.007) | 0.032\*\*\* (0.006) | 0.013\* (0.008) | 0.017\*\* (0.007) |
| **Public financing**  | -0.476\*\*\* (0.037) | -0.473\*\*\* (0.034) | -0.055 (0.047) | -0.068 (0.044) |
| **Cooperation**  | -0.286\*\*\* (0.036) | -0.296\*\*\* (0.033) | -0.336\*\*\* (0.051) | -0.349\*\*\* (0.048) |
| **Lead** | 0.044 (0.058) | 0.064 (0.055) | -0.005 (0.069) | 0.019 (0.066) |
| **Subsidiary** | 0.129\*\*\* (0.036) | 0.126\*\*\* (0.034) | 0.061 (0.042) | 0.050 (0.040) |
| **Technological cluster (High-tech manufactures)** | -0.169\*\*\* (0.033) | -0.185\*\*\* (0.031) | -0.004 (0.039) | -0.016 (0.037) |
| **Technological cluster (KISS)** | -0.053 (0.055) | -0.069 (0.050) | 0.239\*\* (0.064) | 0.220\*\*\* (0.059) |
| **Technological cluster (Non Kiss)** | 0.381\*\*\* (0.062) | 0.385\*\*\* (0.055) | -0.008 (0.068) | 0.036 (0.063) |
| **Time dummies** | Yes | Yes | Yes | Yes |
| **Joint significance of time dummies** | (0.000)\*\*\* | (0.000)\*\*\* | (0.000)\*\*\* | (0.000)\*\*\* |
| **Observations** | 24,777 | 27,393 | 24,521 | 27,115 |
| **Number of firms** | 3,050 | 3,066 | 3,020 | 3,034 |
| **Wald test for zero slopes** | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* |
| **Log likelihood** | -4,499.051 | -5,303.268 | -3,427.336 | -3,821.343 |
| \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. All values show coefficient estimates (Std. Error). |

|  |
| --- |
| **Table S3**. Random effects probit for starting innovation activities. Only persistent non-innovators and firms transitioning to start innovating are considered. |
|   | R&D investment | Innovation |
| **Variable**  | (1) | (2) | (3)  | (4)  |
| **Exporting only to the EU** |  | 0.000 (0.080) |  | -0.035 (0.070) |
| **Exporting only outside the EU** |  | 0.208\*\*\* (0.080) |  | -0.114 (0.071) |
| **Exporting inside and outside the EU** |  | 0.077 (0.063) |  | -0.100\* (0.054) |
| **Consecutive years exporting** | -0.032\*\*\* (0.009) |  | -0.022\*\*\* (0.007) |  |
| **Sales per employee (Logs)** | 0.002 (0.030) | -0.006 (0.028) | 0.005 (0.025) | 0.007 (0.024) |
| **Size (Logs)** | 0.001 (0.020) | -0.004 (0.019) | -0.037\*\* (0.018) | -0.038\*\* (0.017) |
| **Human capital (Logs)** | 0.057\*\*\* (0.020) | 0.066\*\*\* (0.019) | -0.007 (0.017) | -0.004 (0.016) |
| **Age (Logs)** | -0.027 (0.040) | -0.031 (0.037) | -0.028 (0.035) | -0.016 (0.032) |
| **Physical investment (Logs)** | -0.014 (0.011) | -0.009 (0.010) | -0.041\*\*\* (0.010) | -0.041\*\*\* (0.009) |
| **Public financing**  | 0.243\*\*\* (0.050) | 0.230\*\*\* (0.048) | 0.008 (0.045) | 0.000 (0.042) |
| **Cooperation**  | 0.064 (0.052) | 0.062 (0.049) | -0.022 (0.045) | -0.026 (0.043) |
| **Lead** | 0.066 (0.089) | 0.088 (0.058) | 0.031 (0.077) | 0.057 (0.074) |
| **Subsidiary** | -0.038 (0.061) | -0.035 (0.058) | 0.037 (0.051) | 0.030 (0.048) |
| **Technological cluster (High-tech manufactures)** | 0.106\* (0.054) | 0.085 (0.052) | -0.037 (0.048) | -0.037 (0.046) |
| **Technological cluster (KISS)** | 0.266\*\*\* (0.086) | 0.283\*\*\* (0.081) | 0.013 (0.074) | 0.065 (0.069) |
| **Technological cluster (Non Kiss)** | -0.392\*\*\* (0.104) | -0.269\*\*\* (0.098) | -0.016 (0.088) | 0.018 (0.083) |
| **Time dummies** | Yes | Yes | Yes | Yes |
| **Joint significance of time dummies** | (0.004)\*\*\* | (0.002)\*\*\* | (0.000)\*\*\* | (0.000)\*\*\* |
| **Observations** | 6,718 | 7,613 | 6,473 | 7,117 |
| **Number of firms** | 1,185 | 1,247 | 1,073 | 1,086 |
| **Wald test for zero slopes** | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* | 0.000\*\*\* |
| **Log likelihood** | -1,809.040 | -1,988.626 | -2,408.463 | -2,688.192 |
| \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. All values show coefficient estimates (Std. Error). |

|  |
| --- |
| **Table S4.** Correlation matrix |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) | (24) | (25) | (26) | (27) | (28) | (29) | (30) |
| **(1)** Persistently investing | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(2)** Persistently not investing | -0.18 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(3)** Diverse change of status (R&D) | -0.13 | -0.16 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(4)** Transitioning to start investing | -0.24 | -0.28 | -0.21 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(5)** Transitioning to stop investing | -0.26 | -0.31 | -0.23 | -0.42 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(6)** Persistently innovating | 0.12 | 0.02 | 0.02 | 0.05 | -0.16 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(7)** Persistently not innovating | -0.10 | 0.46 | -0.09 | -0.09 | -0.16 | -0.14 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(8)** Diverse change of status (Inn.) | 0.08 | -0.09 | 0.23 | -0.08 | -0.06 | -0.21 | -0.12 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(9)** Transitioning to start innovating | -0.03 | 0.04 | -0.12 | 0.34 | -0.26 | -0.27 | -0.16 | -0.25 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(10)** Transitioning to stop innovating | -0.08 | -0.24 | -0.03 | -0.24 | 0.50 | -0.34 | -0.20 | -0.31 | -0.41 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(11)** Undertake R&D | 0.19 | -0.07 | 0.17 | -0.09 | -0.11 | 0.03 | -0.04 | 0.07 | -0.03 | -0.03 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(12)** Stop R&D | 0.12 | -0.09 | -0.07 | 0.19 | -0.15 | 0.04 | -0.04 | 0.00 | 0.07 | -0.07 | -0.03 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(13)** Undertake innovation | 0.04 | -0.01 | 0.05 | 0.00 | -0.06 | 0.17 | -0.05 | 0.16 | -0.11 | -0.14 | 0.17 | 0.03 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(14)** Stop innovation | 0.01 | 0.02 | -0.02 | 0.09 | -0.09 | 0.14 | -0.05 | -0.09 | 0.15 | -0.15 | 0.01 | 0.06 | -0.04 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(15)** Consecutive years exporting | -0.01 | -0.16 | 0.02 | -0.10 | 0.21 | -0.07 | -0.11 | -0.01 | -0.10 | 0.20 | 0.00 | -0.01 | 0.00 | 0.00 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(16)** Non exporter | 0.01 | 0.14 | -0.04 | 0.05 | -0.15 | 0.07 | 0.09 | -0.02 | 0.05 | -0.14 | 0.01 | 0.02 | 0.02 | 0.05 | -0.63 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(17)** Exporting only to the EU | 0.01 | 0.00 | 0.01 | 0.02 | -0.03 | 0.03 | -0.02 | 0.00 | 0.00 | -0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | -0.18 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(18)** Exporting only outside the EU | 0.00 | -0.06 | 0.00 | -0.02 | 0.07 | -0.02 | -0.05 | 0.00 | -0.03 | 0.07 | -0.01 | -0.02 | -0.02 | -0.05 | -0.08 | -0.19 | -0.11 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |  |
| **(19)** Exporting inside and outside the EU | 0.01 | -0.15 | 0.02 | -0.10 | 0.20 | -0.05 | -0.11 | 0.00 | -0.09 | 0.18 | 0.03 | 0.00 | 0.01 | 0.01 | 0.70 | -0.42 | -0.23 | -0.25 | 1.00 |  |  |  |  |  |  |  |  |  |  |  |
| **(20)** Sales per employee (logs) | 0.02 | -0.07 | 0.03 | -0.03 | 0.05 | -0.03 | -0.11 | 0.00 | -0.06 | 0.13 | 0.01 | -0.01 | -0.01 | -0.02 | 0.24 | -0.24 | 0.02 | 0.06 | 0.20 | 1.00 |  |  |  |  |  |  |  |  |  |  |
| **(21)** Size (logs) | -0.04 | 0.02 | 0.03 | -0.18 | 0.16 | -0.08 | -0.03 | 0.03 | -0.16 | 0.20 | -0.01 | -0.07 | -0.02 | -0.07 | 0.16 | -0.13 | -0.03 | 0.05 | 0.13 | 0.24 | 1.00 |  |  |  |  |  |  |  |  |  |
| **(22)** Human capital | -0.02 | -0.24 | 0.06 | -0.05 | 0.21 | -0.02 | -0.15 | 0.04 | -0.06 | 0.11 | 0.02 | -0.03 | 0.01 | -0.01 | 0.08 | -0.07 | 0.00 | 0.01 | 0.06 | -0.03 | -0.10 | 1.00 |  |  |  |  |  |  |  |  |
| **(23)** Age (logs) | -0.01 | 0.06 | -0.01 | -0.06 | 0.03 | -0.06 | 0.00 | -0.03 | -0.01 | 0.08 | 0.01 | -0.01 | -0.01 | 0.01 | 0.25 | -0.08 | 0.00 | -0.02 | 0.23 | 0.23 | 0.33 | -0.12 | 1.00 |  |  |  |  |  |  |  |
| **(24)** Physical investment (logs) | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | -0.07 | -0.01 | 0.02 | -0.02 | 1.00 |  |  |  |  |  |  |
| **(25)** Public financing | -0.02 | -0.26 | 0.06 | -0.17 | 0.33 | -0.07 | -0.15 | 0.03 | -0.14 | 0.23 | 0.04 | -0.09 | -0.01 | -0.08 | 0.07 | -0.13 | -0.02 | 0.05 | 0.07 | -0.01 | 0.10 | 0.20 | -0.08 | 0.01 | 1.00 |  |  |  |  |  |
| **(26)** Cooperation | -0.01 | -0.22 | 0.03 | -0.17 | 0.33 | -0.09 | -0.17 | 0.03 | -0.16 | 0.29 | 0.03 | -0.06 | 0.01 | -0.09 | 0.10 | -0.06 | 0.01 | 0.05 | 0.12 | 0.07 | 0.19 | 0.17 | 0.00 | 0.00 | 0.41 | 1.00 |  |  |  |  |
| **(27)** Group | -0.02 | -0.03 | 0.01 | -0.09 | 0.12 | -0.03 | -0.06 | 0.02 | -0.11 | 0.13 | 0.00 | -0.02 | 0.00 | -0.03 | 0.15 | -0.09 | 0.01 | 0.02 | 0.11 | 0.33 | 0.49 | 0.02 | 0.12 | 0.00 | 0.06 | 0.18 | 1.00 |  |  |  |
| **(28)** Low-tech manufactures | -0.02 | -0.15 | -0.01 | -0.04 | 0.18 | -0.05 | -0.08 | 0.00 | -0.06 | 0.14 | -0.01 | -0.02 | -0.01 | -0.03 | 0.19 | -0.19 | 0.00 | 0.07 | 0.16 | 0.13 | -0.02 | 0.07 | 0.07 | 0.00 | 0.06 | 0.04 | 0.05 | 1.00 |  |  |
| **(29)** High-tech manufactures | 0.05 | 0.09 | 0.00 | 0.06 | -0.16 | 0.03 | 0.03 | -0.03 | 0.06 | -0.07 | 0.01 | 0.02 | -0.01 | 0.01 | 0.06 | -0.09 | 0.03 | 0.00 | 0.05 | 0.14 | 0.02 | -0.31 | 0.10 | 0.00 | -0.09 | -0.09 | -0.03 | -0.65 | 1.00 |  |
| **(30)** KIS sectors | -0.02 | -0.12 | 0.04 | -0.03 | 0.11 | 0.02 | -0.04 | 0.05 | -0.02 | -0.01 | 0.01 | -0.01 | 0.02 | 0.00 | -0.16 | 0.16 | 0.00 | -0.03 | -0.14 | -0.32 | -0.14 | 0.34 | -0.30 | 0.00 | 0.17 | 0.12 | -0.06 | -0.27 | -0.34 | 1.00 |
| **(31)** Non-Kis sectors | -0.03 | 0.23 | -0.03 | 0.00 | -0.15 | 0.01 | 0.13 | 0.00 | 0.02 | -0.10 | -0.01 | 0.01 | 0.00 | 0.01 | -0.25 | 0.31 | -0.05 | -0.09 | -0.21 | -0.09 | 0.17 | 0.02 | 0.07 | 0.01 | -0.14 | -0.05 | 0.05 | -0.22 | -0.28 | -0.11 |