Appendix A: EM proxies’ calculations

Consistent with the prior literatures, we run the following prediction model for each year within each TSE industry code at minimum of 15 observations. (Zang 2011; Brazel and Dang 2008; Paredes and Wheatley 2017 etc.)

* 1. Accrual-based earnings management proxy  
     We use the modified Jones model to calculate the accrual-based earnings management proxy. As modified Jones model, this model is a firm-specific measure based on cross-sectional estimation. According to this model, total accruals are affected by the change in sales, level of property, plant, and equipment:   
     where TA is net income from continuing operations minus operating cash flows; A is total assets; S is net sales; PPE is gross property, plant, and equipment.
  2. Real activities manipulation proxies
     1. Abnormal Production Costs (ABPROD)  
        One of the measurements of real activities manipulation as mentioned from prior studies is abnormal production costs.

where production costs (PROD) are the sum of cost of goods sold and change in inventory; A is total assets; S is net sales.

* + 1. Abnormal Discretionary Expenses (ABEXP)  
       The other measurement of real activities manipulation as mentioned from prior studies is abnormal discretionary expenses.

where discretionary expenses (EXP) are the operating expenses; A is total assets; S is net sales. Operating expenses is defined as expenses incurred by a business from its operating activities in TEJ database, which is the sum of selling expenses, administrative expenses, R&D expenses, other expenses, and expected credit losses (loss) benefit- operating expenses.

Appendix B: Variables Definition

|  |  |
| --- | --- |
| Variables | Definition |
| ABSDA | Absolute value of discretionary accruals calculated from modified Jones model |
| ABPROD | Absolute value of the difference between actual production costs and estimated normal production costs level, where production costs defined as the sum of cost of good sold and change in inventory |
| ABEXP | Absolute value of the difference between actual discretionary expenses and estimated normal discretionary expenses level multiplied by minus one so that interpretation direction of the coefficient is consistent with ABSDA |
| RM | Aggregation of ABPROD and ABEXP |
| AMhat | Fitted value from the first-stage regression model regressing ABSDA on control variables |
| RMhat | Fitted value from the first-stage regression model regressing RM on control variables |
| AMres | Residuals from the first-stage regression model regressing ABSDA on control variables |
| RMres | Residuals from the first-stage regression model regressing RM on control variables |
| POST | An indicator variable equal to 1 for the observation is during or post RPA-implementation period, 0 otherwise. |
| RPA | An indicator variable equal to 1 for the RPA adopted firms, 0 for the control firms |
| POST\_RPA | Interaction term of RPA and POST |
| LEV | Total liabilities divided by total assets |
| OCF | Operating cash flows, scaled by lagged total assets |
| MTB | Market-to-book value ratio |
| MS | The market share based on net sales of the firm among industry-year observations |
| INST | The percentage of institutional investors |
| CYCLE | Net operating cycle. Calculated as the sum of inventory period and accounts receivable period deducted by accounts payable period |
| NOA | Net operating asset divided by lagged total assets; net operating asset is calculated as (TA-C)-(TL-STD-LTD) where TA is total assets, C is cash and cash equivalents, TL is total liabilities, STD and LTD are short-term and long-term debts respectively. (Papanastasopoulos et al. 2011) |
| ZSCORE | Altman's z-score, calculated as 1.2\*A1+1.4\*A2+3.3\*A3+0.6\*A4+A5 where A1 equals to working capital divided by total assets, equals to retained earnings divided by total assets, A3 equals to earnings before interests and taxes divided by total assets, A4 equals to market value divided by total liabilities, and A5 equals to net sales divided by total assets |
| CL | Current liabilities divided by total assets |
| ADJROA | Industry median-adjusted ROA, which is calculated as ROA minus industry-year median |
| ADJROA\_sq | Square of ADJROA |
| SIZE | Natural logarithm of market value |
| BIG4 | An indicator variable with a value equal to 1 if the firm is audited by a big four accounting firm (Deloitte, KPMG, PwC, or EY) in Taiwan, and 0 otherwise. |
| RD | R&D intensity, calculated as R&D expenses divided by net sales |
| ADV | Advertising intensity, calculated as advertising expenses divided by net sales |
| YEAR | Trend variable |

Table 1 Sample Firms Descriptions  
Panel A: Selection Procedure

|  |  |
| --- | --- |
| Unique firms with searched keywords | 128 |
| Less: |  |
| Remove RPA not the abbreviation for robotic process automation | (9) |
| Financial institutions (TSE code: M2800) | (21) |
| Missing value for variables calculation or Not satisfied with minimum industry-year observations for calculation of EM proxies | (12) |
| Total | 86 |

Panel B: Distribution of RPA Adoptions by Industry

|  |  |  |
| --- | --- | --- |
| TSE Code | Industry Name | Number of Firms |
| M1300 | Plastics | 3 |
| M1400 | Textiles | 9 |
| M1500 | Electric machinery | 5 |
| M1721 | Chemical | 2 |
| M1722 | Biotechnology and medical care | 3 |
| M2200 | Automobile | 1 |
| M2324 | Semiconductor | 6 |
| M2325 | Computer and peripheral equipment | 8 |
| M2326 | Optoelectronic | 7 |
| M2327 | Communications and internet | 7 |
| M2328 | Electronic parts/components | 7 |
| M2329 | Electronic products distribution | 2 |
| M2330 | Information service | 10 |
| M2331 | other electronic | 2 |
| M2500 | Building material and construction | 1 |
| M2600 | Shipping and transportation | 4 |
| M2700 | Tourism and hospitality | 2 |
| M2900 | Trading and consumers' goods industry | 1 |
| M3700 | Sports and leisure | 2 |
| M3800 | Household | 1 |
| M9900 | Others | 3 |
| Total | | 86 |

Panel C: Distribution of RPA Adoptions by Year

|  |  |
| --- | --- |
| Adoption Year | Number of Firms |
| 2017 | 1 |
| 2018 | 14 |
| 2019 | 12 |
| 2020 | 22 |
| 2021 | 21 |
| 2022 | 16 |
| Total | 86 |

Table 2 Panel A: Descriptive Statistics for both RPA implementers and control group

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | |
| Statistic | Mean | Median | St. Dev. | Min | Max | Pctl(25) | Pctl(75) | N |
|  | | | | | | | | |
| ABSDA | 0.04996 | 0.03602 | 0.04796 | 0.00069 | 0.23237 | 0.01531 | 0.06963 | 1,032 |
| ABPROD | -0.00683 | -0.00095 | 0.09880 | -0.36252 | 0.23589 | -0.05225 | 0.04898 | 1,032 |
| ABEXP | -0.00053 | 0.01052 | 0.07413 | -0.39937 | 0.12756 | -0.02186 | 0.03893 | 1,032 |
| RM | -0.00659 | 0.00924 | 0.15162 | -0.63925 | 0.31711 | -0.06389 | 0.07783 | 1,032 |
| LEV | 0.44328 | 0.44239 | 0.17807 | 0.09798 | 0.88883 | 0.30237 | 0.55824 | 1,032 |
| OCF | 0.07572 | 0.06507 | 0.10071 | -0.17612 | 0.41902 | 0.01482 | 0.13184 | 1,032 |
| MTB | 1.90523 | 1.49253 | 1.49233 | 0.39150 | 8.32862 | 0.93816 | 2.27273 | 1,032 |
| MS | 4.40804 | 0.93211 | 8.31642 | 0.01527 | 40.81177 | 0.17259 | 4.37185 | 1,032 |
| INST | 0.45389 | 0.42875 | 0.23886 | 0.03066 | 0.92933 | 0.25023 | 0.64660 | 1,032 |
| CYCLE | 157.25250 | 89.01500 | 415.27950 | -169.96670 | 3,517.90400 | 45.57750 | 137.92000 | 1,032 |
| NOA | 0.59119 | 0.61469 | 0.21715 | 0.01470 | 1.06779 | 0.43729 | 0.74515 | 1,032 |
| ZSCORE | 4.04333 | 3.28607 | 2.72511 | 0.87366 | 14.79701 | 2.33450 | 4.58489 | 1,032 |
| CL | 0.31742 | 0.29318 | 0.16217 | 0.04460 | 0.71567 | 0.19024 | 0.44407 | 1,032 |
| ADJROA | 0.01367 | 0.00456 | 0.07713 | -0.21164 | 0.28039 | -0.02158 | 0.04640 | 1,032 |
| SIZE | 16.01808 | 15.77343 | 1.69941 | 13.08118 | 20.36145 | 14.63823 | 17.24180 | 1,032 |
| BIG4 | 0.93023 | 1 | 0.25488 | 0 | 1 | 1 | 1 | 1,032 |
| RD | 0.04717 | 0.01945 | 0.08873 | 0.00000 | 0.61879 | 0.00188 | 0.05061 | 1,032 |
| ADV | 0.06964 | 0.04026 | 0.07668 | 0.00000 | 0.36205 | 0.02367 | 0.08818 | 1,032 |

Table 2 Panel B: Spearman Correlation Matrix

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | ABSDA | ABPROD | ABEXP | RM | LEV | OCF | MTB | MS | INST | CYCLE | NOA | ZSCORE | CL | ADJROA | SIZE | BIG4 | RD | ADV |
| ABSDA | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ABPROD | 0.033 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ABEXP | -0.072\* | 0.467\* \* \* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RM | 0.002 | 0.914\* \* \* | 0.747\* \* \* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LEV | 0.107\* \* \* | 0.232\* \* \* | 0.042 | 0.194\* \* \* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| OCF | -0.023 | -0.405\* \* \* | 0.034 | -0.275\* \* \* | -0.111\* \* \* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| MTB | 0.152\* \* \* | -0.244\* \* \* | -0.046 | -0.178\* \* \* | 0.011 | 0.378\* \* \* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| MS | -0.034 | 0.008 | 0.039 | 0.025 | 0.356\* \* \* | 0.105\* \* \* | -0.048 | 1 |  |  |  |  |  |  |  |  |  |  |
| INST | -0.014 | -0.088\* \* | 0.083\* \* | -0.021 | 0.201\* \* \* | 0.173\* \* \* | 0.110\* \* \* | 0.492\* \* \* | 1 |  |  |  |  |  |  |  |  |  |
| CYCLE | -0.046 | -0.034 | -0.091\* \* | -0.051 | -0.131\* \* \* | -0.189\* \* \* | -0.070\* | -0.305\* \* \* | -0.268\* \* \* | 1 |  |  |  |  |  |  |  |  |
| NOA | -0.045 | 0.103\* \* \* | 0.015 | 0.088\* \* | -0.071\* | -0.253\* \* \* | -0.213\* \* \* | 0.007 | -0.013 | 0.373\* \* \* | 1 |  |  |  |  |  |  |  |
| ZSCORE | 0.062\* | -0.347\* \* \* | -0.028 | -0.261\* \* \* | -0.537\* \* \* | 0.411\* \* \* | 0.603\* \* \* | -0.126\* \* \* | -0.015 | -0.064\* | -0.245\* \* \* | 1 |  |  |  |  |  |  |
| CL | 0.124\* \* \* | 0.165\* \* \* | -0.012 | 0.116\* \* \* | 0.729\* \* \* | -0.081\* \* | 0.109\* \* \* | 0.256\* \* \* | 0.084\* \* | -0.078\* | -0.317\* \* \* | -0.156\* \* \* | 1 |  |  |  |  |  |
| ADJROA | 0.049 | -0.430\* \* \* | -0.017 | -0.312\* \* \* | -0.178\* \* \* | 0.562\* \* \* | 0.381\* \* \* | 0.123\* \* \* | 0.168\* \* \* | -0.101\* \* | -0.065\* | 0.577\* \* \* | -0.048 | 1 |  |  |  |  |
| SIZE | -0.051 | -0.140\* \* \* | 0.071\* | -0.063\* | 0.204\* \* \* | 0.289\* \* \* | 0.189\* \* \* | 0.673\* \* \* | 0.639\* \* \* | -0.209\* \* \* | 0.068\* | 0.042 | 0.051 | 0.360\* \* \* | 1 |  |  |  |
| BIG4 | -0.007 | -0.041 | -0.021 | -0.024 | 0.014 | 0.056 | -0.005 | 0.071\* | 0.118\* \* \* | -0.011 | -0.028 | 0.076\* | 0.021 | 0.106\* \* \* | 0.215\* \* \* | 1 |  |  |
| RD | -0.03 | -0.141\* \* \* | -0.154\* \* \* | -0.176\* \* \* | -0.383\* \* \* | 0.062\* | 0.171\* \* \* | -0.402\* \* \* | -0.263\* \* \* | 0.136\* \* \* | -0.172\* \* \* | 0.266\* \* \* | -0.163\* \* \* | -0.042 | -0.161\* \* \* | -0.001 | 1 |  |
| ADV | 0.035 | -0.269\* \* \* | -0.476\* \* \* | -0.387\* \* \* | -0.140\* \* \* | -0.146\* \* \* | 0.080\* \* | -0.071\* | -0.111\* \* \* | 0.174\* \* \* | 0.033 | 0.041 | -0.092\* \* | -0.139\* \* \* | -0.240\* \* \* | -0.099\* \* | 0.113\* \* \* | 1 |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively.

Table 3 Panel A: RPA Adopters’ Pre- versus Post-Implementation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Pre-Implementation | | Post-Implementation | | Wilcox test |
|  | Mean | SD | Mean | SD | P-Value |
| ABSDA | 0.0438 | 0.0435 | 0.0590 | 0.0525 | 0.0003 |
| ABPROD | -0.0069 | 0.0966 | -0.0042 | 0.0973 | 0.8707 |
| ABEXP | -0.0034 | 0.0740 | -0.0013 | 0.0647 | 0.7425 |
| RM | -0.0108 | 0.1570 | -0.0054 | 0.1415 | 0.9797 |
| LEV | 0.4424 | 0.1689 | 0.4777 | 0.1805 | 0.0190 |
| OCF | 0.0680 | 0.0845 | 0.0829 | 0.1065 | 0.1560 |
| MTB | 1.6579 | 1.3459 | 1.9609 | 1.5697 | 0.0013 |
| MS | 4.9889 | 9.0825 | 5.4010 | 9.2484 | 0.3011 |
| INST | 0.4413 | 0.2344 | 0.4598 | 0.2528 | 0.5627 |
| CYCLE | 102.7440 | 117.4073 | 107.5462 | 115.9496 | 0.7762 |
| NOA | 0.5857 | 0.1960 | 0.5577 | 0.2215 | 0.2158 |
| ZSCORE | 3.8682 | 2.5428 | 4.0001 | 2.5515 | 0.3345 |
| CL | 0.3352 | 0.1578 | 0.3410 | 0.1553 | 0.5280 |
| ADJROA | 0.0088 | 0.0676 | 0.0148 | 0.0738 | 0.3429 |
| SIZE | 15.8662 | 1.6645 | 16.1113 | 1.6585 | 0.1165 |
| BIG4 | 1.9403 | 0.2374 | 1.9113 | 0.2849 | 0.2079 |
| RD | 0.0489 | 0.0830 | 0.0485 | 0.0930 | 0.0975 |
| ADV | 0.0629 | 0.0687 | 0.0718 | 0.0737 | 0.1009 |

Table 3 Panel B: RPA Adopters versus Control Group in the Pre-Implementation Period

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control Group | | RPA Adopters | | Wilcox test |
|  | Mean | SD | Mean | SD | P-Value |
| ABSDA | 0.0498 | 0.0504 | 0.0438 | 0.0435 | 0.2409 |
| ABPROD | -0.0119 | 0.1019 | -0.0069 | 0.0966 | 0.5325 |
| ABEXP | -0.0009 | 0.0954 | -0.0034 | 0.0740 | 0.0024 |
| RM | -0.0100 | 0.1713 | -0.0108 | 0.1570 | 0.3440 |
| LEV | 0.4137 | 0.1798 | 0.4424 | 0.1689 | 0.0502 |
| OCF | 0.0747 | 0.1001 | 0.0680 | 0.0845 | 0.6100 |
| MTB | 2.0562 | 1.5301 | 1.6579 | 1.3459 | 0.0003 |
| MS | 3.7801 | 7.8683 | 4.9889 | 9.0825 | 0.0831 |
| INST | 0.4465 | 0.2256 | 0.4413 | 0.2344 | 0.8291 |
| CYCLE | 230.5214 | 599.8960 | 102.7440 | 117.4073 | 0.3416 |
| NOA | 0.6135 | 0.2258 | 0.5857 | 0.1960 | 0.1717 |
| ZSCORE | 4.3280 | 3.0666 | 3.8682 | 2.5428 | 0.1461 |
| CL | 0.2922 | 0.1628 | 0.3352 | 0.1578 | 0.0011 |
| ADJROA | 0.0186 | 0.0851 | 0.0088 | 0.0676 | 0.0091 |
| SIZE | 16.0123 | 1.7179 | 15.8662 | 1.6645 | 0.4291 |
| BIG4 | 1.9515 | 0.2152 | 1.9403 | 0.2374 | 0.5671 |
| RD | 0.0411 | 0.0799 | 0.0489 | 0.0830 | 0.1160 |
| ADV | 0.0693 | 0.0801 | 0.0629 | 0.0687 | 0.9214 |

Table 3 Panel C: RPA Adopters versus Control Group in the Post-Implementation Period

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Control Group | | RPA Adopters | | Wilcox test |
|  | Mean | SD | Mean | SD | P-Value |
| ABSDA | 0.0477 | 0.0440 | 0.0590 | 0.0525 | 0.0195 |
| ABPROD | -0.0039 | 0.0995 | -0.0042 | 0.0973 | 0.7429 |
| ABEXP | 0.0037 | 0.0545 | -0.0013 | 0.0647 | 0.2312 |
| RM | 0.0005 | 0.1322 | -0.0054 | 0.1415 | 0.4901 |
| LEV | 0.4417 | 0.1786 | 0.4777 | 0.1805 | 0.0235 |
| OCF | 0.0780 | 0.1111 | 0.0829 | 0.1065 | 0.8588 |
| MTB | 1.9537 | 1.4987 | 1.9609 | 1.5697 | 0.6061 |
| MS | 3.4659 | 6.6624 | 5.4010 | 9.2484 | 0.0529 |
| INST | 0.4695 | 0.2437 | 0.4598 | 0.2528 | 0.6496 |
| CYCLE | 186.6856 | 538.6020 | 107.5462 | 115.9496 | 0.6591 |
| NOA | 0.6065 | 0.2218 | 0.5577 | 0.2215 | 0.0457 |
| ZSCORE | 3.9682 | 2.6840 | 4.0001 | 2.5515 | 0.6641 |
| CL | 0.3020 | 0.1681 | 0.3410 | 0.1553 | 0.0038 |
| ADJROA | 0.0125 | 0.0810 | 0.0148 | 0.0738 | 0.5822 |
| SIZE | 16.0953 | 1.7548 | 16.1113 | 1.6585 | 0.8014 |
| BIG4 | 1.9153 | 0.2790 | 1.9113 | 0.2849 | 0.8733 |
| RD | 0.0504 | 0.0990 | 0.0485 | 0.0930 | 0.4830 |
| ADV | 0.0752 | 0.0836 | 0.0718 | 0.0737 | 0.4159 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 4: First stage equations: Pre- versus Post-Implementation for Adopters Sample | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| POST | 0.012\*\* | 0.039\*\*\* | 0.016\*\* | 0.024\*\* |
|  | (0.005) | (0.014) | (0.007) | (0.009) |
|  | t = 2.293 | t = 2.807 | t = 2.390 | t = 2.570 |
|  | p = 0.022 | p = 0.006 | p = 0.017 | p = 0.011 |
|  |  |  |  |  |
| LEV | -0.021 | 0.056 | 0.049 | 0.006 |
|  | (0.025) | (0.067) | (0.033) | (0.040) |
|  | t = -0.816 | t = 0.835 | t = 1.485 | t = 0.152 |
|  | p = 0.415 | p = 0.404 | p = 0.138 | p = 0.880 |
|  |  |  |  |  |
| OCF | -0.016 | -0.243\*\*\* | -0.052 | -0.179\*\*\* |
|  | (0.044) | (0.076) | (0.035) | (0.056) |
|  | t = -0.365 | t = -3.178 | t = -1.473 | t = -3.216 |
|  | p = 0.716 | p = 0.002 | p = 0.141 | p = 0.002 |
|  |  |  |  |  |
| MTB | 0.007\*\*\* | -0.011\*\* | -0.007\*\* | -0.005 |
|  | (0.002) | (0.005) | (0.003) | (0.004) |
|  | t = 3.787 | t = -2.189 | t = -2.182 | t = -1.514 |
|  | p = 0.0002 | p = 0.029 | p = 0.030 | p = 0.130 |
|  |  |  |  |  |
| MS | 0.0003 | -0.00002 | -0.00004 | 0.00003 |
|  | (0.0003) | (0.001) | (0.0004) | (0.0004) |
|  | t = 1.032 | t = -0.020 | t = -0.089 | t = 0.076 |
|  | p = 0.303 | p = 0.984 | p = 0.929 | p = 0.940 |
|  |  |  |  |  |
| INST | 0.009 | -0.005 | 0.005 | -0.008 |
|  | (0.011) | (0.033) | (0.016) | (0.021) |
|  | t = 0.781 | t = -0.139 | t = 0.328 | t = -0.366 |
|  | p = 0.435 | p = 0.890 | p = 0.743 | p = 0.715 |
|  |  |  |  |  |
| CYCLE | -0.00001 | -0.0002\*\*\* | -0.00005\*\* | -0.0002\*\*\* |
|  | (0.00002) | (0.00005) | (0.00002) | (0.00003) |
|  | t = -0.301 | t = -4.298 | t = -2.282 | t = -4.693 |
|  | p = 0.764 | p = 0.00002 | p = 0.023 | p = 0.00001 |
|  |  |  |  |  |
| NOA | 0.005 | 0.095\*\*\* | 0.021 | 0.079\*\*\* |
|  | (0.012) | (0.030) | (0.014) | (0.022) |
|  | t = 0.410 | t = 3.159 | t = 1.447 | t = 3.615 |
|  | p = 0.682 | p = 0.002 | p = 0.148 | p = 0.0004 |
|  |  |  |  |  |
| ZSCORE | -0.002\* | 0.014\*\*\* | 0.011\*\*\* | 0.004 |
|  | (0.001) | (0.004) | (0.002) | (0.003) |
|  | t = -1.729 | t = 3.668 | t = 5.728 | t = 1.397 |
|  | p = 0.084 | p = 0.0003 | p = 0.000 | p = 0.163 |
|  |  |  |  |  |
| CL | 0.041\* | -0.042 | -0.085\*\*\* | 0.047 |
|  | (0.024) | (0.062) | (0.030) | (0.037) |
|  | t = 1.746 | t = -0.688 | t = -2.801 | t = 1.255 |
|  | p = 0.081 | p = 0.492 | p = 0.006 | p = 0.210 |
|  |  |  |  |  |
| ADJROA | 0.032 | -0.863\*\*\* | -0.276\*\*\* | -0.591\*\*\* |
|  | (0.068) | (0.114) | (0.051) | (0.083) |
|  | t = 0.465 | t = -7.586 | t = -5.458 | t = -7.138 |
|  | p = 0.642 | p = 0.000 | p = 0.00000 | p = 0.000 |
|  |  |  |  |  |
| ADJROA\_sq | 1.255\*\*\* | 0.192 | 0.125 | 0.309 |
|  | (0.332) | (0.673) | (0.258) | (0.496) |
|  | t = 3.774 | t = 0.285 | t = 0.485 | t = 0.622 |
|  | p = 0.0002 | p = 0.776 | p = 0.628 | p = 0.534 |
|  |  |  |  |  |
| SIZE | -0.006\*\*\* | -0.004 | -0.001 | -0.002 |
|  | (0.002) | (0.005) | (0.003) | (0.003) |
|  | t = -2.947 | t = -0.711 | t = -0.514 | t = -0.725 |
|  | p = 0.004 | p = 0.478 | p = 0.608 | p = 0.469 |
|  |  |  |  |  |
| BIG4 | 0.008 |  |  |  |
|  | (0.008) |  |  |  |
|  | t = 0.982 |  |  |  |
|  | p = 0.327 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.143\*\*\* | -0.639\*\*\* | -0.512\*\*\* |
|  |  | (0.116) | (0.057) | (0.071) |
|  |  | t = -9.852 | t = -11.188 | t = -7.183 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.143 | -0.074 | -0.069 |
|  |  | (0.091) | (0.051) | (0.053) |
|  |  | t = -1.569 | t = -1.447 | t = -1.310 |
|  |  | p = 0.117 | p = 0.148 | p = 0.191 |
|  |  |  |  |  |
| YEAR | 0.001 | -0.004 | -0.002 | -0.003 |
|  | (0.002) | (0.004) | (0.002) | (0.003) |
|  | t = 0.607 | t = -1.129 | t = -1.193 | t = -1.019 |
|  | p = 0.545 | p = 0.259 | p = 0.233 | p = 0.309 |
|  |  |  |  |  |
| Constant | -1.814 | 9.108 | 4.310 | 5.463 |
|  | (3.169) | (8.002) | (3.581) | (5.329) |
|  | t = -0.572 | t = 1.138 | t = 1.203 | t = 1.025 |
|  | p = 0.568 | p = 0.256 | p = 0.229 | p = 0.306 |
|  |  |  |  |  |
|  | | | | |
| Observations | 516 | 516 | 516 | 516 |
| R2 | 0.185 | 0.446 | 0.449 | 0.410 |
| Adjusted R2 | 0.161 | 0.428 | 0.432 | 0.391 |
| F Statistic | 7.567\*\*\* | 25.061\*\*\* | 25.444\*\*\* | 21.654\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.

Table 5: First stage equations: Pre- versus Post-Implementation for Adopters and Control Sample

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| POST | -0.006 | 0.022\* | 0.015\*\* | 0.010 |
|  | (0.005) | (0.012) | (0.007) | (0.008) |
|  | t = -1.265 | t = 1.811 | t = 2.130 | t = 1.319 |
|  | p = 0.206 | p = 0.071 | p = 0.034 | p = 0.188 |
|  |  |  |  |  |
| RPA | -0.004 | -0.014 | -0.004 | -0.006 |
|  | (0.004) | (0.010) | (0.006) | (0.006) |
|  | t = -0.986 | t = -1.355 | t = -0.787 | t = -0.974 |
|  | p = 0.325 | p = 0.176 | p = 0.432 | p = 0.331 |
|  |  |  |  |  |
| POST\_RPA | 0.015\*\*\* | 0.011 | 0.001 | 0.007 |
|  | (0.006) | (0.014) | (0.007) | (0.009) |
|  | t = 2.693 | t = 0.758 | t = 0.197 | t = 0.746 |
|  | p = 0.008 | p = 0.449 | p = 0.844 | p = 0.456 |
|  |  |  |  |  |
| LEV | 0.019 | -0.039 | -0.031 | -0.025 |
|  | (0.017) | (0.049) | (0.027) | (0.028) |
|  | t = 1.089 | t = -0.800 | t = -1.165 | t = -0.876 |
|  | p = 0.277 | p = 0.424 | p = 0.245 | p = 0.382 |
|  |  |  |  |  |
| OCF | -0.079\*\* | -0.295\*\*\* | -0.027 | -0.264\*\*\* |
|  | (0.032) | (0.063) | (0.035) | (0.041) |
|  | t = -2.459 | t = -4.718 | t = -0.779 | t = -6.376 |
|  | p = 0.014 | p = 0.00001 | p = 0.436 | p = 0.000 |
|  |  |  |  |  |
| MTB | 0.006\*\*\* | -0.006 | -0.004 | -0.001 |
|  | (0.002) | (0.004) | (0.003) | (0.003) |
|  | t = 3.578 | t = -1.286 | t = -1.484 | t = -0.430 |
|  | p = 0.0004 | p = 0.199 | p = 0.138 | p = 0.668 |
|  |  |  |  |  |
| MS | 0.00002 | -0.0002 | 0.00001 | -0.0002 |
|  | (0.0002) | (0.001) | (0.0004) | (0.0003) |
|  | t = 0.107 | t = -0.442 | t = 0.029 | t = -0.575 |
|  | p = 0.915 | p = 0.659 | p = 0.978 | p = 0.566 |
|  |  |  |  |  |
| INST | 0.006 | 0.013 | 0.014 | -0.001 |
|  | (0.008) | (0.023) | (0.012) | (0.014) |
|  | t = 0.694 | t = 0.575 | t = 1.166 | t = -0.094 |
|  | p = 0.488 | p = 0.566 | p = 0.244 | p = 0.926 |
|  |  |  |  |  |
| CYCLE | -0.00001\* | 0.00000 | 0.00001\*\*\* | -0.00001 |
|  | (0.00000) | (0.00001) | (0.00000) | (0.00001) |
|  | t = -1.739 | t = 0.509 | t = 2.638 | t = -0.881 |
|  | p = 0.083 | p = 0.612 | p = 0.009 | p = 0.379 |
|  |  |  |  |  |
| NOA | 0.008 | 0.063\*\*\* | 0.023 | 0.035\*\* |
|  | (0.008) | (0.023) | (0.014) | (0.015) |
|  | t = 1.008 | t = 2.693 | t = 1.645 | t = 2.424 |
|  | p = 0.314 | p = 0.008 | p = 0.101 | p = 0.016 |
|  |  |  |  |  |
| ZSCORE | -0.003\*\*\* | 0.002 | 0.003\* | -0.002 |
|  | (0.001) | (0.003) | (0.002) | (0.002) |
|  | t = -2.694 | t = 0.553 | t = 1.792 | t = -1.174 |
|  | p = 0.008 | p = 0.581 | p = 0.074 | p = 0.241 |
|  |  |  |  |  |
| CL | 0.011 | 0.027 | -0.018 | 0.052\*\* |
|  | (0.015) | (0.040) | (0.021) | (0.024) |
|  | t = 0.683 | t = 0.665 | t = -0.849 | t = 2.140 |
|  | p = 0.495 | p = 0.507 | p = 0.396 | p = 0.033 |
|  |  |  |  |  |
| ADJROA | 0.108\*\*\* | -0.558\*\*\* | -0.163\*\*\* | -0.408\*\*\* |
|  | (0.039) | (0.088) | (0.053) | (0.056) |
|  | t = 2.800 | t = -6.312 | t = -3.088 | t = -7.269 |
|  | p = 0.006 | p = 0.000 | p = 0.003 | p = 0.000 |
|  |  |  |  |  |
| ADJROA\_sq | 0.950\*\*\* | -0.535 | -0.362 | -0.041 |
|  | (0.176) | (0.416) | (0.241) | (0.283) |
|  | t = 5.385 | t = -1.286 | t = -1.505 | t = -0.146 |
|  | p = 0.00000 | p = 0.199 | p = 0.133 | p = 0.884 |
|  |  |  |  |  |
| SIZE | -0.005\*\*\* | -0.001 | 0.00001 | -0.001 |
|  | (0.001) | (0.004) | (0.002) | (0.002) |
|  | t = -3.266 | t = -0.280 | t = 0.005 | t = -0.317 |
|  | p = 0.002 | p = 0.780 | p = 0.996 | p = 0.752 |
|  |  |  |  |  |
| BIG4 | 0.003 |  |  |  |
|  | (0.006) |  |  |  |
|  | t = 0.491 |  |  |  |
|  | p = 0.624 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.001\*\*\* | -0.546\*\*\* | -0.483\*\*\* |
|  |  | (0.076) | (0.049) | (0.043) |
|  |  | t = -13.080 | t = -11.048 | t = -11.306 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.147\*\* | -0.084\*\* | -0.056 |
|  |  | (0.063) | (0.041) | (0.035) |
|  |  | t = -2.320 | t = -2.027 | t = -1.610 |
|  |  | p = 0.021 | p = 0.043 | p = 0.108 |
|  |  |  |  |  |
| YEAR | 0.002\* | -0.003 | -0.002 | -0.001 |
|  | (0.001) | (0.003) | (0.001) | (0.002) |
|  | t = 1.923 | t = -0.901 | t = -1.523 | t = -0.299 |
|  | p = 0.055 | p = 0.368 | p = 0.128 | p = 0.766 |
|  |  |  |  |  |
| Constant | -4.238\* | 5.420 | 4.475 | 1.182 |
|  | (2.257) | (5.914) | (2.912) | (3.786) |
|  | t = -1.878 | t = 0.916 | t = 1.537 | t = 0.312 |
|  | p = 0.061 | p = 0.360 | p = 0.125 | p = 0.755 |
|  |  |  |  |  |
|  | | | | |
| Observations | 1,032 | 1,032 | 1,032 | 1,032 |
| R2 | 0.148 | 0.426 | 0.359 | 0.431 |
| Adjusted R2 | 0.134 | 0.416 | 0.348 | 0.421 |
| F Statistic | 10.394\*\*\* | 41.730\*\*\* | 31.577\*\*\* | 42.584\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.

Table 6: Endogeneity Test: Pre- versus Post-Implementation for Adopters Sample

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
|  | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| RMres | 0.079\*\* |  |  |  |
|  | (0.037) |  |  |  |
|  | t = 2.127 |  |  |  |
|  | p = 0.034 |  |  |  |
|  |  |  |  |  |
| RM | -0.057\* |  |  |  |
|  | (0.032) |  |  |  |
|  | t = -1.748 |  |  |  |
|  | p = 0.081 |  |  |  |
|  |  |  |  |  |
| ABSDA |  | -7.372\*\*\* | -4.506\*\*\* | -2.921\* |
|  |  | (2.373) | (0.942) | (1.744) |
|  |  | t = -3.106 | t = -4.784 | t = -1.675 |
|  |  | p = 0.002 | p = 0.00001 | p = 0.094 |
|  |  |  |  |  |
| AMres |  | 7.514\*\*\* | 4.485\*\*\* | 3.071\* |
|  |  | (2.373) | (0.940) | (1.751) |
|  |  | t = 3.167 | t = 4.773 | t = 1.754 |
|  |  | p = 0.002 | p = 0.00001 | p = 0.080 |
|  |  |  |  |  |
| POST | 0.013\*\* | 0.124\*\*\* | 0.068\*\*\* | 0.058\*\* |
|  | (0.005) | (0.031) | (0.013) | (0.022) |
|  | t = 2.486 | t = 3.966 | t = 5.340 | t = 2.576 |
|  | p = 0.013 | p = 0.0001 | p = 0.00000 | p = 0.011 |
|  |  |  |  |  |
| LEV | -0.013 | -0.118 | -0.057 | -0.063 |
|  | (0.026) | (0.097) | (0.045) | (0.061) |
|  | t = -0.507 | t = -1.220 | t = -1.264 | t = -1.043 |
|  | p = 0.612 | p = 0.223 | p = 0.207 | p = 0.297 |
|  |  |  |  |  |
| OCF | -0.025 | -0.349\*\*\* | -0.116\*\*\* | -0.222\*\*\* |
|  | (0.044) | (0.080) | (0.037) | (0.060) |
|  | t = -0.562 | t = -4.345 | t = -3.171 | t = -3.722 |
|  | p = 0.575 | p = 0.00002 | p = 0.002 | p = 0.0002 |
|  |  |  |  |  |
| MTB | 0.006\*\*\* | 0.043\*\* | 0.026\*\*\* | 0.016 |
|  | (0.002) | (0.018) | (0.007) | (0.013) |
|  | t = 2.754 | t = 2.336 | t = 3.500 | t = 1.196 |
|  | p = 0.006 | p = 0.020 | p = 0.0005 | p = 0.232 |
|  |  |  |  |  |
| MS | 0.00005 | 0.002\*\* | 0.001\*\* | 0.001 |
|  | (0.0003) | (0.001) | (0.0005) | (0.001) |
|  | t = 0.166 | t = 2.055 | t = 2.403 | t = 1.316 |
|  | p = 0.869 | p = 0.040 | p = 0.017 | p = 0.189 |
|  |  |  |  |  |
| INST | 0.009 | 0.071\* | 0.052\*\*\* | 0.022 |
|  | (0.011) | (0.041) | (0.019) | (0.028) |
|  | t = 0.786 | t = 1.737 | t = 2.762 | t = 0.811 |
|  | p = 0.432 | p = 0.083 | p = 0.006 | p = 0.418 |
|  |  |  |  |  |
| CYCLE | -0.00002 | -0.0002\*\*\* | -0.0001\*\*\* | -0.0002\*\*\* |
|  | (0.00002) | (0.00005) | (0.00002) | (0.00004) |
|  | t = -1.026 | t = -4.940 | t = -3.557 | t = -4.860 |
|  | p = 0.306 | p = 0.00000 | p = 0.0004 | p = 0.00001 |
|  |  |  |  |  |
| NOA | 0.011 | 0.144\*\*\* | 0.051\*\*\* | 0.099\*\*\* |
|  | (0.012) | (0.036) | (0.016) | (0.026) |
|  | t = 0.898 | t = 4.023 | t = 3.089 | t = 3.823 |
|  | p = 0.370 | p = 0.0001 | p = 0.003 | p = 0.0002 |
|  |  |  |  |  |
| ZSCORE | -0.002 | -0.003 | -0.0001 | -0.003 |
|  | (0.001) | (0.007) | (0.003) | (0.005) |
|  | t = -1.287 | t = -0.477 | t = -0.020 | t = -0.634 |
|  | p = 0.198 | p = 0.634 | p = 0.985 | p = 0.527 |
|  |  |  |  |  |
| CL | 0.044\* | 0.297\*\* | 0.123\*\* | 0.181\*\* |
|  | (0.023) | (0.138) | (0.061) | (0.092) |
|  | t = 1.863 | t = 2.158 | t = 2.005 | t = 1.962 |
|  | p = 0.063 | p = 0.031 | p = 0.046 | p = 0.050 |
|  |  |  |  |  |
| ADJROA | -0.001 | -0.655\*\*\* | -0.147\*\*\* | -0.512\*\*\* |
|  | (0.067) | (0.127) | (0.056) | (0.094) |
|  | t = -0.020 | t = -5.172 | t = -2.641 | t = -5.471 |
|  | p = 0.984 | p = 0.00000 | p = 0.009 | p = 0.00000 |
|  |  |  |  |  |
| ADJROA\_sq | 1.238\*\*\* | 9.426\*\*\* | 5.764\*\*\* | 3.973\* |
|  | (0.340) | (3.000) | (1.191) | (2.203) |
|  | t = 3.642 | t = 3.142 | t = 4.838 | t = 1.803 |
|  | p = 0.0003 | p = 0.002 | p = 0.00001 | p = 0.072 |
|  |  |  |  |  |
| SIZE | -0.005\*\* | -0.045\*\*\* | -0.027\*\*\* | -0.019\* |
|  | (0.002) | (0.014) | (0.006) | (0.010) |
|  | t = -2.461 | t = -3.287 | t = -4.787 | t = -1.854 |
|  | p = 0.014 | p = 0.002 | p = 0.00001 | p = 0.064 |
|  |  |  |  |  |
| BIG4 | 0.009 |  |  |  |
|  | (0.008) |  |  |  |
|  | t = 1.160 |  |  |  |
|  | p = 0.247 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.156\*\*\* | -0.641\*\*\* | -0.523\*\*\* |
|  |  | (0.116) | (0.057) | (0.072) |
|  |  | t = -9.986 | t = -11.192 | t = -7.307 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.137 | -0.068 | -0.069 |
|  |  | (0.093) | (0.051) | (0.053) |
|  |  | t = -1.473 | t = -1.317 | t = -1.292 |
|  |  | p = 0.141 | p = 0.188 | p = 0.197 |
|  |  |  |  |  |
| YEAR | 0.001 | 0.003 | 0.002 | 0.0002 |
|  | (0.002) | (0.005) | (0.002) | (0.003) |
|  | t = 0.619 | t = 0.593 | t = 1.125 | t = 0.051 |
|  | p = 0.536 | p = 0.554 | p = 0.261 | p = 0.960 |
|  |  |  |  |  |
| Constant | -1.854 | -4.724 | -4.200 | 0.030 |
|  | (3.138) | (9.326) | (4.149) | (6.325) |
|  | t = -0.591 | t = -0.507 | t = -1.012 | t = 0.005 |
|  | p = 0.555 | p = 0.613 | p = 0.312 | p = 0.997 |
|  |  |  |  |  |
|  | | | | |
| Observations | 516 | 516 | 516 | 516 |
| R2 | 0.195 | 0.456 | 0.465 | 0.418 |
| Adjusted R2 | 0.167 | 0.437 | 0.446 | 0.397 |
| F Statistic | 7.080\*\*\* | 23.177\*\*\* | 24.009\*\*\* | 19.809\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 7: Endogeneity Test: Pre- versus Post-Implementation for Adopters and Control Sample | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| RMres | 0.052\*\* |  |  |  |
|  | (0.025) |  |  |  |
|  | t = 2.088 |  |  |  |
|  | p = 0.037 |  |  |  |
|  |  |  |  |  |
| RM | -0.045\*\* |  |  |  |
|  | (0.023) |  |  |  |
|  | t = -1.974 |  |  |  |
|  | p = 0.049 |  |  |  |
|  |  |  |  |  |
| ABSDA |  | -8.959\*\* | -6.300\*\*\* | -3.023 |
|  |  | (4.364) | (2.405) | (2.936) |
|  |  | t = -2.053 | t = -2.620 | t = -1.030 |
|  |  | p = 0.041 | p = 0.009 | p = 0.304 |
|  |  |  |  |  |
| AMres |  | 9.006\*\* | 6.186\*\*\* | 3.146 |
|  |  | (4.360) | (2.401) | (2.936) |
|  |  | t = 2.065 | t = 2.577 | t = 1.072 |
|  |  | p = 0.039 | p = 0.010 | p = 0.284 |
|  |  |  |  |  |
| POST | -0.006 | -0.035 | -0.026 | -0.009 |
|  | (0.005) | (0.031) | (0.017) | (0.020) |
|  | t = -1.272 | t = -1.134 | t = -1.500 | t = -0.436 |
|  | p = 0.204 | p = 0.257 | p = 0.134 | p = 0.664 |
|  |  |  |  |  |
| RPA | -0.004 | -0.047\*\* | -0.028\*\* | -0.017 |
|  | (0.004) | (0.020) | (0.011) | (0.013) |
|  | t = -1.177 | t = -2.382 | t = -2.570 | t = -1.352 |
|  | p = 0.240 | p = 0.018 | p = 0.011 | p = 0.177 |
|  |  |  |  |  |
| POST\_RPA | 0.016\*\*\* | 0.146\*\* | 0.097\*\*\* | 0.053 |
|  | (0.006) | (0.068) | (0.037) | (0.046) |
|  | t = 2.795 | t = 2.147 | t = 2.596 | t = 1.148 |
|  | p = 0.006 | p = 0.032 | p = 0.010 | p = 0.251 |
|  |  |  |  |  |
| LEV | 0.021 | 0.131 | 0.089\* | 0.032 |
|  | (0.017) | (0.089) | (0.046) | (0.060) |
|  | t = 1.235 | t = 1.472 | t = 1.933 | t = 0.531 |
|  | p = 0.217 | p = 0.142 | p = 0.054 | p = 0.596 |
|  |  |  |  |  |
| OCF | -0.087\*\*\* | -1.006\*\*\* | -0.527\*\*\* | -0.504\*\* |
|  | (0.032) | (0.350) | (0.193) | (0.236) |
|  | t = -2.747 | t = -2.874 | t = -2.724 | t = -2.132 |
|  | p = 0.007 | p = 0.005 | p = 0.007 | p = 0.034 |
|  |  |  |  |  |
| MTB | 0.005\*\*\* | 0.046\* | 0.032\*\* | 0.016 |
|  | (0.002) | (0.026) | (0.014) | (0.017) |
|  | t = 2.919 | t = 1.792 | t = 2.272 | t = 0.948 |
|  | p = 0.004 | p = 0.074 | p = 0.024 | p = 0.344 |
|  |  |  |  |  |
| MS | -0.0001 | -0.0001 | 0.0001 | -0.0001 |
|  | (0.0002) | (0.001) | (0.0003) | (0.0003) |
|  | t = -0.429 | t = -0.103 | t = 0.363 | t = -0.340 |
|  | p = 0.669 | p = 0.918 | p = 0.717 | p = 0.734 |
|  |  |  |  |  |
| INST | 0.006 | 0.065\* | 0.050\*\*\* | 0.016 |
|  | (0.008) | (0.034) | (0.018) | (0.022) |
|  | t = 0.726 | t = 1.926 | t = 2.787 | t = 0.735 |
|  | p = 0.468 | p = 0.055 | p = 0.006 | p = 0.463 |
|  |  |  |  |  |
| CYCLE | -0.00001\*\* | -0.00004\* | -0.00002\* | -0.00002 |
|  | (0.00000) | (0.00003) | (0.00001) | (0.00002) |
|  | t = -2.082 | t = -1.742 | t = -1.674 | t = -1.263 |
|  | p = 0.038 | p = 0.082 | p = 0.095 | p = 0.207 |
|  |  |  |  |  |
| NOA | 0.013 | 0.136\*\*\* | 0.074\*\*\* | 0.060\*\* |
|  | (0.008) | (0.044) | (0.025) | (0.028) |
|  | t = 1.519 | t = 3.102 | t = 2.961 | t = 2.108 |
|  | p = 0.129 | p = 0.002 | p = 0.004 | p = 0.036 |
|  |  |  |  |  |
| ZSCORE | -0.003\*\*\* | -0.021\* | -0.013\* | -0.010 |
|  | (0.001) | (0.012) | (0.007) | (0.008) |
|  | t = -2.630 | t = -1.779 | t = -1.944 | t = -1.275 |
|  | p = 0.009 | p = 0.076 | p = 0.052 | p = 0.203 |
|  |  |  |  |  |
| CL | 0.014 | 0.122\* | 0.049 | 0.084\*\* |
|  | (0.015) | (0.066) | (0.038) | (0.041) |
|  | t = 0.943 | t = 1.847 | t = 1.306 | t = 2.060 |
|  | p = 0.346 | p = 0.065 | p = 0.192 | p = 0.040 |
|  |  |  |  |  |
| ADJROA | 0.095\*\* | 0.415 | 0.523\*\* | -0.081 |
|  | (0.039) | (0.468) | (0.249) | (0.319) |
|  | t = 2.456 | t = 0.887 | t = 2.095 | t = -0.252 |
|  | p = 0.015 | p = 0.376 | p = 0.037 | p = 0.801 |
|  |  |  |  |  |
| ADJROA\_sq | 0.897\*\*\* | 7.946\* | 5.598\*\* | 2.824 |
|  | (0.185) | (4.191) | (2.365) | (2.779) |
|  | t = 4.858 | t = 1.896 | t = 2.367 | t = 1.016 |
|  | p = 0.00001 | p = 0.058 | p = 0.018 | p = 0.310 |
|  |  |  |  |  |
| SIZE | -0.004\*\*\* | -0.043\*\* | -0.029\*\*\* | -0.015 |
|  | (0.001) | (0.020) | (0.011) | (0.014) |
|  | t = -2.868 | t = -2.116 | t = -2.658 | t = -1.084 |
|  | p = 0.005 | p = 0.035 | p = 0.008 | p = 0.279 |
|  |  |  |  |  |
| BIG4 | 0.004 |  |  |  |
|  | (0.006) |  |  |  |
|  | t = 0.586 |  |  |  |
|  | p = 0.559 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.005\*\*\* | -0.542\*\*\* | -0.489\*\*\* |
|  |  | (0.076) | (0.049) | (0.043) |
|  |  | t = -13.217 | t = -11.037 | t = -11.490 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.149\*\* | -0.084\*\* | -0.058 |
|  |  | (0.065) | (0.042) | (0.036) |
|  |  | t = -2.307 | t = -2.017 | t = -1.622 |
|  |  | p = 0.022 | p = 0.044 | p = 0.105 |
|  |  |  |  |  |
| YEAR | 0.002\*\* | 0.017\* | 0.011\*\* | 0.006 |
|  | (0.001) | (0.010) | (0.006) | (0.007) |
|  | t = 1.969 | t = 1.663 | t = 2.071 | t = 0.890 |
|  | p = 0.049 | p = 0.097 | p = 0.039 | p = 0.374 |
|  |  |  |  |  |
| Constant | -4.352\* | -32.904\* | -22.529\*\* | -11.712 |
|  | (2.256) | (19.964) | (10.971) | (13.273) |
|  | t = -1.929 | t = -1.648 | t = -2.054 | t = -0.882 |
|  | p = 0.054 | p = 0.100 | p = 0.041 | p = 0.378 |
|  |  |  |  |  |
|  | | | | |
| Observations | 1,032 | 1,032 | 1,032 | 1,032 |
| R2 | 0.153 | 0.428 | 0.368 | 0.434 |
| Adjusted R2 | 0.137 | 0.417 | 0.355 | 0.423 |
| F Statistic | 9.624\*\*\* | 37.797\*\*\* | 29.420\*\*\* | 38.799\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.

Table 8: Second stage equations: Pre- versus Post-Implementation for Adopters Sample

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| RMhat | -0.057\* |  |  |  |
|  | (0.032) |  |  |  |
|  | t = -1.768 |  |  |  |
|  | p = 0.078 |  |  |  |
|  |  |  |  |  |
| AMhat |  | -7.375\*\*\* | -4.505\*\*\* | -2.925\* |
|  |  | (2.396) | (0.940) | (1.769) |
|  |  | t = -3.079 | t = -4.793 | t = -1.653 |
|  |  | p = 0.003 | p = 0.00001 | p = 0.099 |
|  |  |  |  |  |
| POST | 0.013\*\* | 0.124\*\*\* | 0.068\*\*\* | 0.058\*\* |
|  | (0.005) | (0.032) | (0.013) | (0.023) |
|  | t = 2.463 | t = 3.925 | t = 5.351 | t = 2.534 |
|  | p = 0.014 | p = 0.0001 | p = 0.00000 | p = 0.012 |
|  |  |  |  |  |
| LEV | -0.014 | -0.118 | -0.058 | -0.063 |
|  | (0.026) | (0.098) | (0.045) | (0.062) |
|  | t = -0.525 | t = -1.205 | t = -1.267 | t = -1.021 |
|  | p = 0.600 | p = 0.229 | p = 0.206 | p = 0.308 |
|  |  |  |  |  |
| OCF | -0.024 | -0.348\*\*\* | -0.116\*\*\* | -0.221\*\*\* |
|  | (0.044) | (0.081) | (0.037) | (0.060) |
|  | t = -0.553 | t = -4.305 | t = -3.177 | t = -3.680 |
|  | p = 0.581 | p = 0.00002 | p = 0.002 | p = 0.0003 |
|  |  |  |  |  |
| MTB | 0.006\*\*\* | 0.043\*\* | 0.026\*\*\* | 0.016 |
|  | (0.002) | (0.019) | (0.007) | (0.014) |
|  | t = 2.768 | t = 2.307 | t = 3.510 | t = 1.172 |
|  | p = 0.006 | p = 0.022 | p = 0.0005 | p = 0.242 |
|  |  |  |  |  |
| MS | 0.00004 | 0.002\*\* | 0.001\*\* | 0.001 |
|  | (0.0003) | (0.001) | (0.0005) | (0.001) |
|  | t = 0.162 | t = 2.029 | t = 2.415 | t = 1.271 |
|  | p = 0.872 | p = 0.043 | p = 0.016 | p = 0.204 |
|  |  |  |  |  |
| INST | 0.009 | 0.072\* | 0.052\*\*\* | 0.023 |
|  | (0.012) | (0.041) | (0.019) | (0.028) |
|  | t = 0.800 | t = 1.734 | t = 2.764 | t = 0.813 |
|  | p = 0.424 | p = 0.083 | p = 0.006 | p = 0.417 |
|  |  |  |  |  |
| CYCLE | -0.00002 | -0.0002\*\*\* | -0.0001\*\*\* | -0.0002\*\*\* |
|  | (0.00002) | (0.00005) | (0.00002) | (0.00003) |
|  | t = -1.028 | t = -4.970 | t = -3.553 | t = -4.890 |
|  | p = 0.305 | p = 0.00000 | p = 0.0004 | p = 0.00001 |
|  |  |  |  |  |
| NOA | 0.011 | 0.144\*\*\* | 0.051\*\*\* | 0.099\*\*\* |
|  | (0.012) | (0.036) | (0.016) | (0.026) |
|  | t = 0.923 | t = 4.035 | t = 3.088 | t = 3.840 |
|  | p = 0.357 | p = 0.0001 | p = 0.003 | p = 0.0002 |
|  |  |  |  |  |
| ZSCORE | -0.002 | -0.004 | -0.00005 | -0.003 |
|  | (0.001) | (0.007) | (0.003) | (0.005) |
|  | t = -1.283 | t = -0.485 | t = -0.016 | t = -0.642 |
|  | p = 0.200 | p = 0.628 | p = 0.988 | p = 0.522 |
|  |  |  |  |  |
| CL | 0.044\* | 0.298\*\* | 0.123\*\* | 0.182\* |
|  | (0.023) | (0.139) | (0.061) | (0.094) |
|  | t = 1.896 | t = 2.147 | t = 2.007 | t = 1.943 |
|  | p = 0.058 | p = 0.032 | p = 0.045 | p = 0.053 |
|  |  |  |  |  |
| ADJROA | -0.002 | -0.652\*\*\* | -0.147\*\*\* | -0.508\*\*\* |
|  | (0.067) | (0.124) | (0.056) | (0.091) |
|  | t = -0.030 | t = -5.248 | t = -2.630 | t = -5.561 |
|  | p = 0.977 | p = 0.00000 | p = 0.009 | p = 0.00000 |
|  |  |  |  |  |
| ADJROA\_sq | 1.237\*\*\* | 9.424\*\*\* | 5.765\*\*\* | 3.970\* |
|  | (0.337) | (3.025) | (1.190) | (2.232) |
|  | t = 3.673 | t = 3.115 | t = 4.846 | t = 1.779 |
|  | p = 0.0003 | p = 0.002 | p = 0.00001 | p = 0.076 |
|  |  |  |  |  |
| SIZE | -0.005\*\* | -0.045\*\*\* | -0.027\*\*\* | -0.019\* |
|  | (0.002) | (0.014) | (0.006) | (0.010) |
|  | t = -2.452 | t = -3.247 | t = -4.803 | t = -1.820 |
|  | p = 0.015 | p = 0.002 | p = 0.00001 | p = 0.069 |
|  |  |  |  |  |
| BIG4 | 0.008 |  |  |  |
|  | (0.008) |  |  |  |
|  | t = 0.996 |  |  |  |
|  | p = 0.320 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.148\*\*\* | -0.642\*\*\* | -0.514\*\*\* |
|  |  | (0.115) | (0.057) | (0.071) |
|  |  | t = -9.978 | t = -11.201 | t = -7.287 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.133 | -0.068 | -0.065 |
|  |  | (0.092) | (0.052) | (0.053) |
|  |  | t = -1.457 | t = -1.319 | t = -1.237 |
|  |  | p = 0.146 | p = 0.188 | p = 0.216 |
|  |  |  |  |  |
| YEAR | 0.001 | 0.003 | 0.002 | 0.0002 |
|  | (0.002) | (0.005) | (0.002) | (0.003) |
|  | t = 0.620 | t = 0.596 | t = 1.124 | t = 0.063 |
|  | p = 0.536 | p = 0.551 | p = 0.261 | p = 0.951 |
|  |  |  |  |  |
| Constant | -1.866 | -4.805 | -4.188 | -0.054 |
|  | (3.153) | (9.393) | (4.143) | (6.416) |
|  | t = -0.592 | t = -0.511 | t = -1.011 | t = -0.008 |
|  | p = 0.554 | p = 0.610 | p = 0.313 | p = 0.994 |
|  |  |  |  |  |
|  | | | | |
| Observations | 516 | 516 | 516 | 516 |
| R2 | 0.192 | 0.455 | 0.465 | 0.413 |
| Adjusted R2 | 0.166 | 0.436 | 0.447 | 0.393 |
| F Statistic | 7.415\*\*\* | 24.419\*\*\* | 25.456\*\*\* | 20.627\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 9: Second stage equations: Pre- versus Post-Implementation for Adopters and Control Sample | | | | |
|  | *Dependent variable:* | | | |
|  |  | | | |
|  | ABSDA | RM | ABEXP | ABPROD |
|  | (1) | (2) | (3) | (4) |
|  | | | | |
| RMhat | -0.045\*\* |  |  |  |
|  | (0.023) |  |  |  |
|  | t = -1.976 |  |  |  |
|  | p = 0.049 |  |  |  |
|  |  |  |  |  |
| AMhat |  | -8.953\*\* | -6.315\*\*\* | -3.008 |
|  |  | (4.373) | (2.395) | (2.961) |
|  |  | t = -2.047 | t = -2.636 | t = -1.016 |
|  |  | p = 0.041 | p = 0.009 | p = 0.310 |
|  |  |  |  |  |
| POST | -0.006 | -0.035 | -0.026 | -0.009 |
|  | (0.005) | (0.031) | (0.017) | (0.021) |
|  | t = -1.276 | t = -1.132 | t = -1.503 | t = -0.434 |
|  | p = 0.202 | p = 0.258 | p = 0.133 | p = 0.665 |
|  |  |  |  |  |
| RPA | -0.004 | -0.047\*\* | -0.028\*\*\* | -0.017 |
|  | (0.004) | (0.020) | (0.011) | (0.013) |
|  | t = -1.178 | t = -2.378 | t = -2.583 | t = -1.341 |
|  | p = 0.239 | p = 0.018 | p = 0.010 | p = 0.180 |
|  |  |  |  |  |
| POST\_RPA | 0.016\*\*\* | 0.146\*\* | 0.097\*\*\* | 0.052 |
|  | (0.006) | (0.068) | (0.037) | (0.046) |
|  | t = 2.793 | t = 2.141 | t = 2.615 | t = 1.134 |
|  | p = 0.006 | p = 0.033 | p = 0.009 | p = 0.257 |
|  |  |  |  |  |
| LEV | 0.021 | 0.131 | 0.089\* | 0.032 |
|  | (0.017) | (0.089) | (0.046) | (0.061) |
|  | t = 1.237 | t = 1.472 | t = 1.927 | t = 0.533 |
|  | p = 0.217 | p = 0.142 | p = 0.054 | p = 0.595 |
|  |  |  |  |  |
| OCF | -0.087\*\*\* | -1.006\*\*\* | -0.528\*\*\* | -0.502\*\* |
|  | (0.032) | (0.351) | (0.193) | (0.238) |
|  | t = -2.743 | t = -2.867 | t = -2.737 | t = -2.109 |
|  | p = 0.007 | p = 0.005 | p = 0.007 | p = 0.035 |
|  |  |  |  |  |
| MTB | 0.005\*\*\* | 0.046\* | 0.032\*\* | 0.016 |
|  | (0.002) | (0.026) | (0.014) | (0.017) |
|  | t = 2.925 | t = 1.786 | t = 2.290 | t = 0.931 |
|  | p = 0.004 | p = 0.075 | p = 0.023 | p = 0.353 |
|  |  |  |  |  |
| MS | -0.0001 | -0.0001 | 0.0001 | -0.0001 |
|  | (0.0002) | (0.001) | (0.0004) | (0.0003) |
|  | t = -0.431 | t = -0.113 | t = 0.389 | t = -0.380 |
|  | p = 0.667 | p = 0.911 | p = 0.698 | p = 0.704 |
|  |  |  |  |  |
| INST | 0.006 | 0.065\* | 0.050\*\*\* | 0.016 |
|  | (0.008) | (0.034) | (0.018) | (0.022) |
|  | t = 0.724 | t = 1.922 | t = 2.801 | t = 0.724 |
|  | p = 0.469 | p = 0.055 | p = 0.006 | p = 0.470 |
|  |  |  |  |  |
| CYCLE | -0.00001\*\* | -0.00004\* | -0.00002\* | -0.00002 |
|  | (0.00000) | (0.00003) | (0.00001) | (0.00002) |
|  | t = -2.075 | t = -1.741 | t = -1.676 | t = -1.260 |
|  | p = 0.038 | p = 0.082 | p = 0.094 | p = 0.208 |
|  |  |  |  |  |
| NOA | 0.013 | 0.136\*\*\* | 0.074\*\*\* | 0.060\*\* |
|  | (0.008) | (0.044) | (0.025) | (0.028) |
|  | t = 1.521 | t = 3.100 | t = 2.963 | t = 2.102 |
|  | p = 0.129 | p = 0.002 | p = 0.004 | p = 0.036 |
|  |  |  |  |  |
| ZSCORE | -0.003\*\*\* | -0.021\* | -0.013\* | -0.010 |
|  | (0.001) | (0.012) | (0.007) | (0.008) |
|  | t = -2.634 | t = -1.775 | t = -1.954 | t = -1.260 |
|  | p = 0.009 | p = 0.076 | p = 0.051 | p = 0.208 |
|  |  |  |  |  |
| CL | 0.014 | 0.122\* | 0.049 | 0.084\*\* |
|  | (0.015) | (0.066) | (0.037) | (0.041) |
|  | t = 0.942 | t = 1.845 | t = 1.306 | t = 2.042 |
|  | p = 0.347 | p = 0.066 | p = 0.192 | p = 0.042 |
|  |  |  |  |  |
| ADJROA | 0.095\*\* | 0.415 | 0.523\*\* | -0.081 |
|  | (0.039) | (0.469) | (0.249) | (0.322) |
|  | t = 2.449 | t = 0.885 | t = 2.103 | t = -0.251 |
|  | p = 0.015 | p = 0.377 | p = 0.036 | p = 0.802 |
|  |  |  |  |  |
| ADJROA\_sq | 0.896\*\*\* | 7.939\* | 5.615\*\* | 2.805 |
|  | (0.185) | (4.200) | (2.356) | (2.803) |
|  | t = 4.858 | t = 1.890 | t = 2.384 | t = 1.001 |
|  | p = 0.00001 | p = 0.059 | p = 0.018 | p = 0.317 |
|  |  |  |  |  |
| SIZE | -0.004\*\*\* | -0.043\*\* | -0.029\*\*\* | -0.015 |
|  | (0.001) | (0.020) | (0.011) | (0.014) |
|  | t = -2.865 | t = -2.110 | t = -2.679 | t = -1.065 |
|  | p = 0.005 | p = 0.035 | p = 0.008 | p = 0.287 |
|  |  |  |  |  |
| BIG4 | 0.003 |  |  |  |
|  | (0.006) |  |  |  |
|  | t = 0.555 |  |  |  |
|  | p = 0.579 |  |  |  |
|  |  |  |  |  |
| ADV |  | -1.003\*\*\* | -0.547\*\*\* | -0.484\*\*\* |
|  |  | (0.077) | (0.050) | (0.043) |
|  |  | t = -13.099 | t = -11.054 | t = -11.354 |
|  |  | p = 0.000 | p = 0.000 | p = 0.000 |
|  |  |  |  |  |
| RD |  | -0.149\*\* | -0.085\*\* | -0.057 |
|  |  | (0.064) | (0.042) | (0.035) |
|  |  | t = -2.307 | t = -2.014 | t = -1.615 |
|  |  | p = 0.022 | p = 0.045 | p = 0.107 |
|  |  |  |  |  |
| YEAR | 0.002\*\* | 0.017\* | 0.012\*\* | 0.006 |
|  | (0.001) | (0.010) | (0.006) | (0.007) |
|  | t = 1.972 | t = 1.661 | t = 2.078 | t = 0.883 |
|  | p = 0.049 | p = 0.097 | p = 0.038 | p = 0.378 |
|  |  |  |  |  |
| Constant | -4.354\* | -32.895\* | -22.549\*\* | -11.690 |
|  | (2.254) | (19.991) | (10.947) | (13.363) |
|  | t = -1.932 | t = -1.645 | t = -2.060 | t = -0.875 |
|  | p = 0.054 | p = 0.100 | p = 0.040 | p = 0.382 |
|  |  |  |  |  |
|  | | | | |
| Observations | 1,032 | 1,032 | 1,032 | 1,032 |
| R2 | 0.153 | 0.428 | 0.363 | 0.431 |
| Adjusted R2 | 0.138 | 0.417 | 0.351 | 0.421 |
| F Statistic | 10.147\*\*\* | 39.795\*\*\* | 30.389\*\*\* | 40.384\*\*\* |
|  | | | | |

\*, \*\*, \*\*\* p \_ 0.10, p \_ 0.05, and p \_ 0.01, respectively. All standard errors and significance levels reported in the regression results have been adjusted using the HC0 method, as proposed by White, to account for potential heteroskedasticity. The definition of all the variables above can see appendix B.