**SUPPLEMENTARY**

To further evaluate the potential impact of homemade organic fertilizer application on this study, we added "whether the household uses homemade organic fertilizers: 0 = No, 1 = Yes" as a control variable in the baseline regression. The results in Table 1 indicate that even after controlling for this factor, the negative effect of the absence of male offspring on long-term agricultural investment behavior remains significant and robust.

**Table 1** Regression results for the impact of offspring gender composition on long-term investment behavior

|  |  |
| --- | --- |
| Variable | Dependent variable：Long-Term Investment Behavior |
| （1） | （2） |
| Coeff. | Std. Err. | Coeff. | Std. Err. |
| Absence of Male Offspring | -0.387\*\*\* | 0.057 | -0.397\*\*\* | 0.056 |
| Homemade Organic Fertilizers |  |  | 0.825\*\*\* | 0.115 |
| Age | -0.009\*\*\* | 0.003 | -0.009\*\*\* | 0.003 |
| Education | 0.011 | 0.008 | 0.013\* | 0.008 |
| Political Status | 0.195\*\* | 0.078 | 0.158\*\* | 0.077 |
| Health | 0.006 | 0.027 | 0.011 | 0.027 |
| Agricultural Labor Stock | -0.053\*\* | 0.023 | -0.063\*\*\* | 0.023 |
| Household Income | -0.001 | 0.026 | 0.000 | 0.026 |
| Household Savings Rate | -0.001 | 0.001 | 0.000 | 0.001 |
| Hukou Migration | -0.146\*\*\* | 0.056 | -0.133\*\* | 0.055 |
| Cooperative Participation | 0.271\*\*\* | 0.080 | 0.286\*\*\* | 0.078 |
| Field Area | -0.008\*\*\* | 0.002 | -0.008\*\*\* | 0.002 |
| Field Plots | -0.004\*\*\* | 0.001 | -0.003\*\*\* | 0.001 |
| Soil Fertility | 0.012 | 0.041 | 0.013 | 0.040 |
| Distance from Residence to Field | -0.331\*\*\* | 0.054 | -0.381\*\*\* | 0.055 |
| Land Tenure Certification | 0.249\*\*\* | 0.071 | 0.231\*\*\* | 0.071 |
| Village Farmland Consolidation | 0.316\*\*\* | 0.083 | 0.284\*\*\* | 0.081 |
| Village Economic Level | -0.285\*\*\* | 0.106 | -0.251\*\* | 0.104 |
| Regional Fixed Effects | YES | YES |
| Temporal Fixed Effects | YES | YES |
| R2 | 0.079 | 0.099 |
| Observations | 4090 | 4090 |

**Note:** \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10%, respectively.

Additionally, we conducted a comparative analysis between households without any offspring and those without male offspring. As shown in Table 2, the results indicate no statistically significant difference between the two groups (*p* = 0.450).

**Table 2**  The comparative analysis results between no male offspring and no offspring

|  |  |
| --- | --- |
| Variable | Dependent variable：Long-Term Investment Behavior |
| No male offspring | No offspring |
| Absence of Male Offspring | -0.387\*\*\*(0.064) |  |
| Absence of Offspring |  | -0.365\*\*\*(0.052) |
| Control variables | YES | YES |
| Regional Fixed Effects | YES | YES |
| Temporal Fixed Effects | YES | YES |
| Observations | 4090 | 4549 |
| R2 | 0.079 | 0.068 |

**Note**: \*\*\*, \*\*, and \* are significant at the level of 1%, 5%, and 10%, respectively; Control variables are the same as in Table 3 in the manuscript.

To further address the reviewer's concerns, we have included supplementary analyses adopting 2SLS as the primary approach to explore the mechanisms through which offspring gender composition affects long-term investment behavior. As shown in Table 3, the results suggest that the significance of the coefficients remains broadly consistent when comparing OLS and 2SLS estimations.

**Table 3** Mediation analysis of the effects of offspring gender composition on long-term investment behavior

|  |  |  |
| --- | --- | --- |
| Variable | Time Preference | Social Capital |
| (1)OLS | (2)2SLS | (3)OLS | (4)2SLS |
| Absence of Male Offspring | 0.168\*\*\*（0.016） | 0.160\*\*\*（0.028） | -0.005\*\*\*（0.000） | -0.005\*\*\*（0.001） |
| Control variables | YES | YES | YES | YES |
| Regional Fixed Effects | YES | YES | YES | YES |
| Temporal Fixed Effects | YES | YES | YES | YES |
| Observations | 4090 | 4090 | 4090 | 4090 |
| R2 | 0.100 | 0.099 | 0.481 | 0.481 |

**Note**: \*\*\*, \*\*, and \* are significant at 1%, 5%, and 10%, respectively; standard errors are in brackets; Control variables are the same as in Table 3 in the manuscript.