**Temporal and Spatial Dependence of Inter-Regional Risk Sharing:
Evidence from Russia**

**Online Appendix**

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Table A.1 Variable Definitions and Descriptive Statistics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Label | Definition | Obs. | Mean | St. Dev. |
| *Cit* | Final household consumption per capita in logs  | 825 | 8.261 | 0.856 |
| *Yit* | Gross regional product per capita in logarithm | 825 | 11.123 | 0.852 |
| *Git* | Government expenditure as a share of GRP | 825 | 0.213  | 0.106 |
| *oilit* | Price of crude oil in dollars, Urals CIF Baltic | 750 | 47.077 | 22.701 |
| *TFIit* | Total foreign investment as a share of GRP | 866 | 1.784  | 4.008 |
| *FDIit* | Foreign direct investment as a share of GRP | 752 | 0.716 | 2.898 |
| *LPit* | Personal loans as a share of GRP | 860 | 0.067  | 0.057 |
| *LCit* | Corporate loans as a share of GRP | 860 | 0.163  | 0.189 |
| $$\tilde{C}\_{it}$$ | Consumption deviations from country average in logs  | 825 | -0.305  | 0.473 |
| $$∆\tilde{C}\_{it}$$ | Consumption deviations from average in first differences | 750 | -0.001  | 0.088 |
| $$\tilde{Y}\_{it}$$ | Output deviations from country average in logs  | 825 | -0.289 | 0.588 |
| $$∆\tilde{Y}\_{it}$$ | Output deviations from average in first differences | 750 | -0.007  | 0.087 |
| $$\tilde{Y}\_{it}×G\_{it}$$ | Interaction term of output deviation and government size | 825 | -0.079 | 0.170 |
| $$\tilde{Y}\_{it}×Oil\_{it}$$ | Interaction term of output deviations and the oil price | 750 | -14.595 | 32.536 |
| $$\tilde{Y}\_{it}×TFI\_{it}$$ | Interaction term of output deviations and TFI  | 770 | 0.209 | 2.648 |
| $$\tilde{Y}\_{it}×FDI\_{it}$$ | Interaction term of output deviations and FDI | 752 | 0.086 | 1.522 |
| $$\tilde{Y}\_{it}×LP\_{it}$$ | Interaction term of output deviations and personal loans | 750 | -0.030 | 0.055 |
| $$\tilde{Y}\_{it}×LC\_{it}$$ | Interaction term of output deviations and corporate loans  | 750 | -0.062 | 0.211 |
| $$\tilde{Y}\_{it}×Trend\_{t}$$ | Interaction term of output deviations and time trend | 825 | -0.105 | 2.048 |

All variables are calculated at the regional level.

Source: own estimation.

Table A.2 Correlation matrix for model variables

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | $$\tilde{C}\_{it}$$ | $$\tilde{Y}\_{it}$$ | *Git* | *CPIit* | *Oilit* | *TFIit* | *FDIit* | *LPit* |
| $$\tilde{Y}\_{it}$$ | 0.838 |  |  |  |  |  |  |  |
| *Git* | 0.016 | -0.166 |  |  |  |  |  |  |
| *PVit* | -0.241 | -0.215 | -0.030 |  |  |  |  |  |
| *oilit*  | 0.689 | 0.506 | 0.177 | -0.307 |  |  |  |  |
| *TFIit* | 0.197 | 0.261 | -0.111 | -0.100 | 0.059 |  |  |  |
| *FDIit* | 0.067 | 0.131 | -0.072 | -0.063 | 0.012 | 0.832 |  |  |
| *LPit* | 0.523 | 0.249 | 0.309 | -0.276 | 0.058 | -0.078 | -0.079 |  |
| *LCit* | 0.506 | 0.230 | 0.228 | -0.147 | 0.163 | -0.029 | -0.107 | 0.598 |

Source: own estimation.

Table A.3 Consumption Risk Sharing, Difference GMM

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $$\tilde{C}\_{it-1}$$ | 0.771\*\*\* | 0.718\*\*\* | 0.705\*\*\* | 0.689\*\*\* | 0.840\*\*\* | 0.818\*\*\* | 0.567\*\*\* | 0.499\*\*\* |
|  | (0.126) | (0.122) | (0.117) | (0.111) | (0.094) | (0.099) | (0.158) | (0.072) |
| $$\tilde{Y}\_{it}$$ | 0.131\* | 0.078 | 0.165\*\* | 0.112 | 0.186\*\* | 0.149 | -0.080 | 0.128 |
|  | (0.079) | (0.084) | (0.069) | (0.076) | (0.076) | (0.095) | (0.151) | (0.234) |
| $$\tilde{Y}\_{it}×G\_{it}$$ |  | 0.018 |  |  |  |  |  |  |
|  |  | (0.108) |  |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Oil\_{it}$$ |  |  | -0.001\*\* |  |  |  |  |  |
|  |  |  | (0.000) |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Trend\_{t}$$ |  |  |  | -0.007\*\* |  |  |  |  |
|  |  |  |  | (0.003) |  |  |  |  |
| $$\tilde{Y}\_{it}×TFI\_{it}$$ |  |  |  |  | -0.008\*\* |  |  |  |
|  |  |  |  |  | (0.004) |  |  |  |
| $$\tilde{Y}\_{it}×FDI\_{it}$$ |  |  |  |  |  | -0.015\*\* |  |  |
|  |  |  |  |  |  | (0.006) |  |  |
| $$\tilde{Y}\_{it}×LP\_{it}$$ |  |  |  |  |  |  | -1.369\*\* |  |
|  |  |  |  |  |  |  | (0.644) |  |
| $$\tilde{Y}\_{it}×LC\_{it}$$ |  |  |  |  |  |  |  | -0.499\*\*\* |
|  |  |  |  |  |  |  |  | (0.182) |
| No. of obs. | 675 | 675 | 675 | 675 | 620 | 599 | 675 | 675 |
| No. of regions  | 75 | 75 | 75 | 75 | 73 | 72 | 75 | 75 |
| Hansen *p*-value | 0.636 | 0.900 | 0.796 | 0.647 | 0.972 | 0.614 | 0.145 | 0.242 |
| AR(1) *p*-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| AR(2) *p*-value | 0.186 | 0.199 | 0.165 | 0.187 | 0.561 | 0.491 | 0.272 | 0.734 |
| Implied risk sharing | 86.9% | 92.6% | 78.8% | 88.9% | 80.0% | 84.0% | 98.9% | 79.1% |

Notes: \*, \*\* and \*\*\* indicate statistical significance at the 10 per cent level, 5 per cent level, and 1 per cent level. Robust standard errors are given in parentheses. Time and region effects as well as the control variables without interaction are included in the estimations but not reported. The endogenous variables include risk sharing, income deviations and income interacted with the control variables. The instruments include between 1 and 6 lags depending on specification.

Table A.4 Consumption Risk Sharing, Han-Phillips-Estimator

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $$\tilde{C}\_{it-1}$$ | 0.859\*\*\* | 0.852\*\*\* | 0.890\*\*\* | 0.855\*\*\* | 0.932\*\*\* | 0.934\*\*\* | 0.957\*\*\* | 0.977\*\*\* |
|  | (0.116) | (0.121) | (0.120) | (0.116) | (0.118) | (0.117) | (0.131) | (0.122) |
| $$\tilde{Y}\_{it}$$ | 0.101\*\* | 0.096\*\* | 0.118\*\* | 0.101\*\* | 0.124\*\*\* | 0.118\*\*\* | 0.103\*\* | 0.097\*\* |
|  | (0.039) | (0.048) | (0.049) | (0.039) | (0.043) | (0.044) | (0.049) | (0.044) |
| $$\tilde{Y}\_{it}×G\_{it}$$ |  | 0.126 |  |  |  |  |  |  |
|  |  | (0.096) |  |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Oil\_{it}$$ |  |  | 0.000 |  |  |  |  |  |
|  |  |  | (0.000) |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Trend\_{t}$$ |  |  |  | -0.001 |  |  |  |  |
|  |  |  |  | (0.008) |  |  |  |  |
| $$\tilde{Y}\_{it}×TFI\_{it}$$ |  |  |  |  | 0.002 |  |  |  |
|  |  |  |  |  | (0.003) |  |  |  |
| $$\tilde{Y}\_{it}×FDI\_{it}$$ |  |  |  |  |  | 0.002 |  |  |
|  |  |  |  |  |  | (0.005) |  |  |
| $$\tilde{Y}\_{it}×LP\_{it}$$ |  |  |  |  |  |  | 0.385 |  |
|  |  |  |  |  |  |  | (0.438) |  |
| $$\tilde{Y}\_{it}×LC\_{it}$$ |  |  |  |  |  |  |  | 0.131\* |
|  |  |  |  |  |  |  |  | (0.079) |
| No. of obs. | 750 | 750 | 750 | 750 | 699 | 683 | 750 | 750 |
| No. of regions  | 75 | 75 | 75 | 75 | 74 | 74 | 75 | 75 |
| Log-Likelihood  | 849.293 | 847.663 | 835.766 | 852.736 | 814.441 | 797.676 | 744.627 | 801.863 |
| Implied risk sharing | 89.9% | 93.1% | 86.2% | 89.9% | 87.9% | 88.4% | 92.3% | 92.4% |

Notes: \*, \*\* and \*\*\* indicate statistical significance at the 10 per cent level, 5 per cent level, and 1 per cent level. Standard errors are given in parentheses. Time and region effects as well as the control variables without interaction are included in the estimations but not reported.

Table A.5 Consumption Risk Sharing in Levels, Dynamic Spatial Lag Model

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| $$\tilde{C}\_{it-1}$$ | -0.075\* | -0.079\* | -0.076\* | -0.078\* | -0.041 | -0.046 | -0.076\* | -0.102\* |
|  | (0.045) | (0.045) | (0.045) | (0.045) | (0.053) | (0.053) | (0.044) | (0.054) |
| $$\tilde{Y}\_{it}$$ | 0.071 | 0.049 | 0.012 | 0.063 | 0.067 | 0.070 | 0.050 | 0.110\*\* |
|  | (0.044) | (0.071) | (0.108) | (0.048) | (0.050) | (0.048) | (0.088) | (0.051) |
| $$\tilde{Y}\_{it}×G\_{it}$$ |  | 0.119 |  |  |  |  |  |  |
|  |  | (0.263) |  |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Oil\_{it}$$ |  |  | 0.001 |  |  |  |  |  |
|  |  |  | (0.002) |  |  |  |  |  |
| $$\tilde{Y}\_{it}×Trend\_{t}$$ |  |  |  | 0.017 |  |  |  |  |
|  |  |  |  | (0.017) |  |  |  |  |
| $$\tilde{Y}\_{it}×TFI\_{it}$$ |  |  |  |  | 0.004 |  |  |  |
|  |  |  |  |  | (0.007) |  |  |  |
| $$\tilde{Y}\_{it}×FDI\_{it}$$ |  |  |  |  |  | -0.000 |  |  |
|  |  |  |  |  |  | (0.005) |  |  |
| $$\tilde{Y}\_{it}×LP\_{it}$$ |  |  |  |  |  |  | 0.298 |  |
|  |  |  |  |  |  |  | (0.899) |  |
| $$\tilde{Y}\_{it}×LC\_{it}$$ |  |  |  |  |  |  |  | -0.023 |
|  |  |  |  |  |  |  |  | (0.147) |
| rho | 0.122\*\*\* | 0.123\*\*\* | 0.119\*\*\* | 0.116\*\*\* | 0.082\* | 0.075\* | 0.117\*\*\* | 0.108\*\* |
|  | (0.040) | (0.040) | (0.040) | (0.040) | (0.045) | (0.044) | (0.043) | (0.043) |
| sigma | 0.007\*\*\* | 0.007\*\*\* | 0.007\*\*\* | 0.007\*\*\* | 0.006\*\*\* | 0.006\*\*\* | 0.007\*\*\* | 0.007\*\*\* |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| No of obs. | 648 | 648 | 648 | 648 | 549 | 549 | 648 | 648 |
| No of cross sections | 72 | 72 | 72 | 72 | 61 | 61 | 72 | 72 |
| Log-Likelihood | 710.4 | 710.9 | 710.6 | 711.2 | 650.2 | 651.9 | 710.9 | 721.2 |
| Implied risk sharing | 92.9% | 97.6% | 103.5% | 93.5% | 94.0% | 93.0% | 97.0% | 88.6% |

*Notes:* \*, \*\* and \*\*\* indicate statistical significance at the 10 per cent level, 5 per cent level, and 1 per cent level. Robust standard errors are given in parentheses. Weight matrix is defined for three closest neighbors. Time effects, regional fixed effects, and control variables without interaction are included in the estimations but not reported.

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