```
Processing Australia...

Correlation Matrix for Australia:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.082657  0.820167
ln_gdp_centered_sq           0.082657            1.000000  0.295067
ln_gini                      0.820167            0.295067  1.000000
ln_unemp                    -0.708845            0.216579 -0.620345
polstab_centered            -0.774175            0.248332 -0.602403
ln_gdp_centered_lag1         0.972537            0.259428  0.850088
polstab_centered_lag1       -0.832374            0.214598 -0.662050
covid_2020_2021              0.263434            0.100448  0.219880

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.708845         -0.774175              0.972537
ln_gdp_centered_sq    0.216579          0.248332              0.259428
ln_gini              -0.620345         -0.602403              0.850088
ln_unemp              1.000000          0.786285             -0.648297
polstab_centered      0.786285          1.000000             -0.732317
ln_gdp_centered_lag1 -0.648297         -0.732317              1.000000
polstab_centered_lag1  0.850043          0.900621             -0.779947
covid_2020_2021      -0.101054         -0.294166              0.275954

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.832374         0.263434
ln_gdp_centered_sq                 0.214598         0.100448
ln_gini                           -0.662050         0.219880
ln_unemp                           0.850043        -0.101054
polstab_centered                   0.900621        -0.294166
ln_gdp_centered_lag1              -0.779947         0.275954
polstab_centered_lag1              1.000000        -0.255154
covid_2020_2021                   -0.255154         1.000000

NaN/Inf Check Before Model for Australia:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
```

```
dtype: int64

VIF Results for Australia:
             variable         VIF
0       ln_gdp_centered   47.854584
1    ln_gdp_centered_sq  196.295867
2               ln_gini  575.745199
3              ln_unemp  314.120549
4      polstab_centered    6.700387
5   ln_gdp_centered_lag1   58.527845
6  polstab_centered_lag1    9.612588
7        covid_2020_2021    1.288199
Warning for Australia: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Australia:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.916
Model:                          GLSAR   Adj. R-squared:                  0.878
Method:                 Least Squares   F-statistic:                     26.54
Date:                Tue, 03 Jun 2025   Prob (F-statistic):           1.92e-08
Time:                        11:36:18   Log-Likelihood:                 64.540
No. Observations:                  27   AIC:                            -111.1
Df Residuals:                      18   BIC:                            -99.42
Df Model:                           8
Covariance Type:                  HC3
================================================================================
=========
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.8451      3.832      4.135      0.000       8.335      23.355
ln_gdp_centered           0.0016      0.021      0.075      0.940      -0.040       0.043
ln_gdp_centered_sq       -0.0005      0.002     -0.271      0.787      -0.004       0.003
ln_gini                  -0.4311      1.098     -0.393      0.695      -2.583       1.720
ln_unemp                 -0.2750      0.057     -4.818      0.000      -0.387      -0.163
polstab_centered          0.1423      0.135      1.053      0.293      -0.123       0.407
ln_gdp_centered_lag1      0.0056      0.022      0.258      0.796      -0.037       0.048
polstab_centered_lag1     0.0620      0.164      0.378      0.705      -0.259       0.383
covid_2020_2021          -0.1232      0.037     -3.358      0.001      -0.195      -0.051
==============================================================================
Omnibus:                        1.480   Durbin-Watson:                   1.465
Prob(Omnibus):                  0.477   Jarque-Bera (JB):                1.298
Skew:                           0.497   Prob(JB):                        0.523
Kurtosis:                       2.594   Cond. No.                     3.41e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.41e+04. This might indicate that there are
strong multicollinearity or other numerical problems.
```

Standardized Residuals Check for Australia (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Australia: 0.0614

Processing Brazil...

Correlation Matrix for Brazil:

	ln_gdp_centered	ln_gdp_centered_sq	ln_gini	ln_unemp	polstab_centered	ln_gdp_centered_lag1	polstab_centered_lag1	covid_2020_2021
ln_gdp_centered	1.000000	0.226697	-0.800942	0.375935	-0.336515	0.962751	-0.328084	0.241314
ln_gdp_centered_sq	0.226697	1.000000	-0.175173	-0.371343	0.210670	0.297356	0.238308	-0.292759
ln_gini	-0.800942	-0.175173	1.000000	-0.502027	0.307380	-0.780368	0.290639	-0.240482
ln_unemp	0.375935	-0.371343	-0.502027	1.000000	-0.134617	0.368424	-0.107705	0.355961
polstab_centered	-0.336515	0.210670	0.307380	-0.134617	1.000000	-0.307218	0.699766	-0.234852
ln_gdp_centered_lag1	0.962751	0.297356	-0.780368	0.368424	-0.307218	1.000000	-0.312327	0.264210
polstab_centered_lag1	-0.328084	0.238308	0.290639	-0.107705	0.699766	-0.312327	1.000000	-0.257918
covid_2020_2021	0.241314	-0.292759	-0.240482	0.355961	-0.234852	0.264210	-0.257918	1.000000

NaN/Inf Check Before Model for Brazil:
ln_gdp_centered 0
ln_gdp_centered_sq 0
ln_gini 0
ln_unemp 0
polstab_centered 0
ln_gdp_centered_lag1 0
polstab_centered_lag1 0
covid_2020_2021 0
dtype: int64
ln_gdp_centered 0
ln_gdp_centered_sq 0

```
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64

VIF Results for Brazil:
               variable         VIF
0       ln_gdp_centered   14.961413
1    ln_gdp_centered_sq   84.880824
2               ln_gini  267.907126
3              ln_unemp   94.317976
4      polstab_centered    2.046555
5  ln_gdp_centered_lag1   17.318180
6 polstab_centered_lag1    2.157498
7       covid_2020_2021    1.414883
Warning for Brazil: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Brazil:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.753
Model:                          GLSAR   Adj. R-squared:                  0.644
Method:                 Least Squares   F-statistic:                     6.799
Date:                Tue, 03 Jun 2025   Prob (F-statistic):           0.000375
Time:                        11:36:18   Log-Likelihood:                 39.556
No. Observations:                  27   AIC:                            -61.11
Df Residuals:                      18   BIC:                            -49.45
Df Model:                           8
Covariance Type:                  HC3
================================================================================
=========
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    10.6990      3.090      3.463      0.001       4.643      16.755
ln_gdp_centered          -0.0074      0.087     -0.085      0.932      -0.178       0.163
ln_gdp_centered_sq        0.0023      0.003      0.748      0.454      -0.004       0.008
ln_gini                   0.5328      0.692      0.770      0.441      -0.823       1.889
ln_unemp                  0.1710      0.106      1.613      0.107      -0.037       0.379
polstab_centered          0.0017      0.136      0.013      0.990      -0.265       0.269
ln_gdp_centered_lag1     -0.0058      0.086     -0.068      0.946      -0.174       0.162
polstab_centered_lag1    -0.2273      0.155     -1.465      0.143      -0.531       0.077
covid_2020_2021          -0.0286      0.171     -0.167      0.867      -0.363       0.306
==============================================================================
Omnibus:                        0.046   Durbin-Watson:                   1.999
Prob(Omnibus):                  0.977   Jarque-Bera (JB):                0.216
Skew:                           0.080   Prob(JB):                        0.898
Kurtosis:                       2.592   Cond. No.                     1.04e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.04e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Brazil (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Brazil: 0.1141

Processing Canada...

Correlation Matrix for Canada:

```
                     ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered             1.000000            0.072701  0.285960
ln_gdp_centered_sq          0.072701            1.000000 -0.441352
ln_gini                     0.285960           -0.441352  1.000000
ln_unemp                   -0.588496            0.104841 -0.333966
polstab_centered           -0.490502            0.273611 -0.276144
ln_gdp_centered_lag1        0.963580            0.217636  0.238945
polstab_centered_lag1      -0.578770            0.207361 -0.371571
covid_2020_2021             0.246067            0.089915 -0.245106

                     ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.588496         -0.490502              0.963580
ln_gdp_centered_sq    0.104841          0.273611              0.217636
ln_gini              -0.333966         -0.276144              0.238945
ln_unemp              1.000000          0.538469             -0.547650
polstab_centered      0.538469          1.000000             -0.379495
ln_gdp_centered_lag1 -0.547650         -0.379495              1.000000
polstab_centered_lag1 0.533272          0.712684             -0.479863
covid_2020_2021       0.133315         -0.211886              0.255655

                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.578770         0.246067
ln_gdp_centered_sq                0.207361         0.089915
ln_gini                          -0.371571        -0.245106
ln_unemp                          0.533272         0.133315
polstab_centered                  0.712684        -0.211886
ln_gdp_centered_lag1             -0.479863         0.255655
polstab_centered_lag1             1.000000        -0.222221
covid_2020_2021                  -0.222221         1.000000
```

NaN/Inf Check Before Model for Canada:

```
ln_gdp_centered        0
ln_gdp_centered_sq     0
```

```
ln_gini                0
ln_unemp               0
polstab_centered       0
ln_gdp_centered_lag1   0
polstab_centered_lag1  0
covid_2020_2021        0
dtype: int64
ln_gdp_centered        0
ln_gdp_centered_sq     0
ln_gini                0
ln_unemp               0
polstab_centered       0
ln_gdp_centered_lag1   0
polstab_centered_lag1  0
covid_2020_2021        0
dtype: int64

VIF Results for Canada:
                variable         VIF
0        ln_gdp_centered   23.522055
1     ln_gdp_centered_sq  137.932300
2                ln_gini  457.391169
3               ln_unemp  396.196198
4       polstab_centered    2.479797
5   ln_gdp_centered_lag1   22.639649
6  polstab_centered_lag1    2.549305
7        covid_2020_2021    1.518040
Warning for Canada: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Canada:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:        ln_net_migration   R-squared:                       0.802
Model:                           GLSAR   Adj. R-squared:                  0.714
Method:                  Least Squares   F-statistic:                     7.027
Date:                 Tue, 03 Jun 2025   Prob (F-statistic):           0.000306
Time:                         11:36:19   Log-Likelihood:                 54.504
No. Observations:                   27   AIC:                            -91.01
Df Residuals:                       18   BIC:                            -79.34
Df Model:                            8
Covariance Type:                   HC3
==============================================================================
=========
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.3512      1.805      8.503      0.000      11.813      18.890
ln_gdp_centered           0.0046      0.032      0.141      0.888      -0.059       0.068
ln_gdp_centered_sq       -0.0004      0.003     -0.165      0.869      -0.005       0.005
ln_gini                  -0.2337      0.485     -0.482      0.630      -1.184       0.716
ln_unemp                 -0.3280      0.120     -2.725      0.006      -0.564      -0.092
polstab_centered          0.0319      0.129      0.247      0.805      -0.221       0.285
```

```
ln_gdp_centered_lag1    -0.0002     0.032    -0.005     0.996    -0.063     0.062
polstab_centered_lag1    0.3363     0.156     2.156     0.031     0.031     0.642
covid_2020_2021          0.1267     0.151     0.841     0.401    -0.169     0.422
==============================================================================
Omnibus:                        2.331   Durbin-Watson:                   1.916
Prob(Omnibus):                  0.312   Jarque-Bera (JB):                1.060
Skew:                          -0.069   Prob(JB):                        0.589
Kurtosis:                       3.961   Cond. No.                     1.64e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.64e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Canada (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Canada: 0.0685
```

```
Processing Germany...

Correlation Matrix for Germany:
                       ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered               1.000000           -0.027365  0.874938
ln_gdp_centered_sq           -0.027365            1.000000  0.059994
ln_gini                       0.874938            0.059994  1.000000
ln_unemp                     -0.467197           -0.591458 -0.620183
polstab_centered             -0.824320            0.134973 -0.821480
ln_gdp_centered_lag1          0.973885            0.161030  0.860167
polstab_centered_lag1        -0.895031            0.195125 -0.863527
covid_2020_2021               0.249840            0.179849  0.399758

                       ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       -0.467197         -0.824320              0.973885
ln_gdp_centered_sq    -0.591458          0.134973              0.161030
ln_gini               -0.620183         -0.821480              0.860167
ln_unemp               1.000000          0.495117             -0.540758
polstab_centered       0.495117          1.000000             -0.771322
ln_gdp_centered_lag1  -0.540758         -0.771322              1.000000
polstab_centered_lag1  0.489760          0.905323             -0.823685
covid_2020_2021       -0.350472         -0.262897              0.259990

                       polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                    -0.895031         0.249840
```

```
ln_gdp_centered_sq              0.195125        0.179849
ln_gini                        -0.863527        0.399758
ln_unemp                        0.489760       -0.350472
polstab_centered                0.905323       -0.262897
ln_gdp_centered_lag1           -0.823685        0.259990
polstab_centered_lag1           1.000000       -0.357990
covid_2020_2021                -0.357990        1.000000

NaN/Inf Check Before Model for Germany:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Germany:
                variable         VIF
0        ln_gdp_centered   83.713654
1     ln_gdp_centered_sq  200.997314
2                ln_gini  628.863832
3               ln_unemp  173.166715
4       polstab_centered    5.946657
5   ln_gdp_centered_lag1   69.979524
6  polstab_centered_lag1   16.980140
7        covid_2020_2021    1.482752
Warning for Germany: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Germany:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.201
Model:                          GLSAR   Adj. R-squared:                 -0.154
Method:                 Least Squares   F-statistic:                    0.3221
Date:                Tue, 03 Jun 2025   Prob (F-statistic):              0.947
Time:                        11:36:19   Log-Likelihood:                -61.472
No. Observations:                  27   AIC:                             140.9
Df Residuals:                      18   BIC:                             152.6
Df Model:                           8
```

```
Covariance Type:                  HC3
==========================================================================================
=========
                       coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------------------
const               -111.2973    219.108     -0.508      0.611    -540.740     318.146
ln_gdp_centered         0.3282      1.970      0.167      0.868      -3.532       4.189
ln_gdp_centered_sq     -0.0018      0.043     -0.042      0.967      -0.087       0.083
ln_gini               38.2635     63.151      0.606      0.545     -85.509     162.036
ln_unemp              -3.4529      3.478     -0.993      0.321     -10.270       3.364
polstab_centered        3.9256     11.504      0.341      0.733     -18.622      26.473
ln_gdp_centered_lag1    -0.2967      1.934     -0.153      0.878      -4.087       3.493
polstab_centered_lag1    2.1088      8.156      0.259      0.796     -13.877      18.094
covid_2020_2021        -1.8483      2.804     -0.659      0.510      -7.345       3.648
==========================================================================================
Omnibus:                    48.717   Durbin-Watson:                  2.187
Prob(Omnibus):                0.000   Jarque-Bera (JB):              262.808
Skew:                        -3.386   Prob(JB):                   8.55e-58
Kurtosis:                    16.703   Cond. No.                   1.96e+04
==========================================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.96e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Germany (absolute values > 3):
124   -4.564583
dtype: float64

Test RMSE for Germany: 1.6290




Processing Ireland...

Correlation Matrix for Ireland:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000           -0.116271 -0.800401
ln_gdp_centered_sq          -0.116271            1.000000 -0.076156
ln_gini                     -0.800401           -0.076156  1.000000
ln_unemp                    -0.292928            0.111478  0.612485
polstab_centered            -0.867589           -0.083243  0.635234
ln_gdp_centered_lag1         0.963815           -0.022750 -0.808284
polstab_centered_lag1       -0.831454           -0.195486  0.625490
covid_2020_2021              0.257469            0.368789 -0.370080

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.292928         -0.867589              0.963815
ln_gdp_centered_sq    0.111478         -0.083243             -0.022750
```

```
ln_gini              0.612485         0.635234           -0.808284
ln_unemp             1.000000        -0.054714           -0.223953
polstab_centered    -0.054714         1.000000           -0.863932
ln_gdp_centered_lag1  -0.223953       -0.863932            1.000000
polstab_centered_lag1 -0.080333        0.937720           -0.862796
covid_2020_2021     -0.170214        -0.322156            0.266749

                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.831454        0.257469
ln_gdp_centered_sq               -0.195486        0.368789
ln_gini                           0.625490       -0.370080
ln_unemp                         -0.080333       -0.170214
polstab_centered                  0.937720       -0.322156
ln_gdp_centered_lag1             -0.862796        0.266749
polstab_centered_lag1             1.000000       -0.280097
covid_2020_2021                  -0.280097        1.000000

NaN/Inf Check Before Model for Ireland:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Ireland:
                variable         VIF
0        ln_gdp_centered   27.965598
1     ln_gdp_centered_sq   90.254748
2                ln_gini  206.353332
3               ln_unemp   67.288284
4       polstab_centered   13.691475
5   ln_gdp_centered_lag1   18.581795
6  polstab_centered_lag1   13.004286
7        covid_2020_2021    1.528316
Warning for Ireland: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Ireland:
                           GLSAR Regression Results
```

```
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.879
Model:                         GLSAR   Adj. R-squared:                  0.825
Method:                Least Squares   F-statistic:                     10.39
Date:               Tue, 03 Jun 2025   Prob (F-statistic):           2.34e-05
Time:                       11:36:19   Log-Likelihood:                 74.829
No. Observations:                 27   AIC:                            -131.7
Df Residuals:                     18   BIC:                            -120.0
Df Model:                          8
Covariance Type:                 HC3
========================================================================================
                           coef    std err          z      P>|z|      [0.025      0.975]
----------------------------------------------------------------------------------------
const                   11.6959      0.806     14.515      0.000      10.117      13.275
ln_gdp_centered          0.0024      0.009      0.285      0.776      -0.014       0.019
ln_gdp_centered_sq       0.0013      0.001      2.264      0.024       0.000       0.002
ln_gini                  0.5604      0.239      2.345      0.019       0.092       1.029
ln_unemp                -0.1069      0.023     -4.577      0.000      -0.153      -0.061
polstab_centered         0.0421      0.087      0.484      0.629      -0.129       0.213
ln_gdp_centered_lag1     0.0020      0.009      0.230      0.818      -0.015       0.019
polstab_centered_lag1    0.0194      0.089      0.219      0.827      -0.154       0.193
covid_2020_2021         -0.0318      0.028     -1.156      0.248      -0.086       0.022
==============================================================================
Omnibus:                        1.322   Durbin-Watson:                   1.716
Prob(Omnibus):                  0.516   Jarque-Bera (JB):                1.242
Skew:                           0.441   Prob(JB):                        0.537
Kurtosis:                       2.430   Cond. No.                     1.79e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.79e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Ireland (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Ireland: 0.0274




Processing Japan...

Correlation Matrix for Japan:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.044427  0.349759
```

```
ln_gdp_centered_sq        0.044427         1.000000  0.063260
ln_gini                   0.349759         0.063260  1.000000
ln_unemp                  0.226274        -0.220761 -0.112535
polstab_centered         -0.514793        -0.154376 -0.584492
ln_gdp_centered_lag1      0.533441         0.008855  0.195072
polstab_centered_lag1    -0.486870        -0.185660 -0.457133
covid_2020_2021           0.209906         0.046103  0.218683

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.226274         -0.514793              0.533441
ln_gdp_centered_sq   -0.220761         -0.154376              0.008855
ln_gini              -0.112535         -0.584492              0.195072
ln_unemp              1.000000         -0.228097              0.203102
polstab_centered     -0.228097          1.000000             -0.333393
ln_gdp_centered_lag1  0.203102         -0.333393              1.000000
polstab_centered_lag1 -0.161895         0.787102             -0.555556
covid_2020_2021      -0.170609         -0.159280              0.211085

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.486870         0.209906
ln_gdp_centered_sq                -0.185660         0.046103
ln_gini                           -0.457133         0.218683
ln_unemp                          -0.161895        -0.170609
polstab_centered                   0.787102        -0.159280
ln_gdp_centered_lag1              -0.555556         0.211085
polstab_centered_lag1              1.000000        -0.162183
covid_2020_2021                   -0.162183         1.000000

NaN/Inf Check Before Model for Japan:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Japan:
              variable        VIF
0      ln_gdp_centered   1.795154
1   ln_gdp_centered_sq  17.259796
```

```
2              ln_gini  85.722686
3             ln_unemp  55.227098
4      polstab_centered   3.226998
5   ln_gdp_centered_lag1   1.993844
6  polstab_centered_lag1   3.662021
7       covid_2020_2021   1.209393
Warning for Japan: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Japan:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.570
Model:                          GLSAR   Adj. R-squared:                  0.379
Method:                 Least Squares   F-statistic:                     1.699
Date:                Tue, 03 Jun 2025   Prob (F-statistic):              0.167
Time:                        11:36:19   Log-Likelihood:                 38.330
No. Observations:                  27   AIC:                            -58.66
Df Residuals:                      18   BIC:                            -47.00
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                     8.0774      9.639      0.838      0.402     -10.814      26.969
ln_gdp_centered           0.0015      0.003      0.517      0.605      -0.004       0.007
ln_gdp_centered_sq       -0.0016      0.001     -2.212      0.027      -0.003      -0.000
ln_gini                   1.7038      2.744      0.621      0.535      -3.675       7.083
ln_unemp                 -0.1784      0.098     -1.825      0.068      -0.370       0.013
polstab_centered         -0.2575      0.267     -0.966      0.334      -0.780       0.265
ln_gdp_centered_lag1     -0.0020      0.004     -0.535      0.593      -0.010       0.005
polstab_centered_lag1    -0.1980      0.259     -0.766      0.444      -0.705       0.309
covid_2020_2021          -0.2192      0.100     -2.194      0.028      -0.415      -0.023
==============================================================================
Omnibus:                        0.461   Durbin-Watson:                   1.367
Prob(Omnibus):                  0.794   Jarque-Bera (JB):                0.508
Skew:                          -0.271   Prob(JB):                        0.776
Kurtosis:                       2.604   Cond. No.                     3.59e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.59e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Japan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Japan: 0.0940
```

```
Processing Kazakhstan...

Correlation Matrix for Kazakhstan:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.213523 -0.941382
ln_gdp_centered_sq           0.213523            1.000000 -0.129878
ln_gini                     -0.941382           -0.129878  1.000000
ln_unemp                     0.128980           -0.092382 -0.144887
polstab_centered             0.150426           -0.486356 -0.174493
ln_gdp_centered_lag1         0.967586            0.319133 -0.925696
polstab_centered_lag1        0.264901           -0.353828 -0.307411
covid_2020_2021              0.271352            0.071352 -0.192468

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.128980          0.150426              0.967586
ln_gdp_centered_sq   -0.092382         -0.486356              0.319133
ln_gini              -0.144887         -0.174493             -0.925696
ln_unemp              1.000000          0.483525              0.102452
polstab_centered      0.483525          1.000000              0.055979
ln_gdp_centered_lag1  0.102452          0.055979              1.000000
polstab_centered_lag1 0.431145          0.809010              0.218135
covid_2020_2021       0.010879         -0.140470              0.286189

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                    0.264901         0.271352
ln_gdp_centered_sq                -0.353828         0.071352
ln_gini                           -0.307411        -0.192468
ln_unemp                           0.431145         0.010879
polstab_centered                   0.809010        -0.140470
ln_gdp_centered_lag1               0.218135         0.286189
polstab_centered_lag1              1.000000        -0.120857
covid_2020_2021                   -0.120857         1.000000

NaN/Inf Check Before Model for Kazakhstan:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
```

```
ln_gini                0
ln_unemp               0
polstab_centered       0
ln_gdp_centered_lag1   0
polstab_centered_lag1  0
covid_2020_2021        0
dtype: int64

VIF Results for Kazakhstan:
              variable         VIF
0        ln_gdp_centered   20.084914
1     ln_gdp_centered_sq  103.462951
2                ln_gini  105.409160
3               ln_unemp    7.499532
4       polstab_centered    4.032467
5   ln_gdp_centered_lag1   22.987692
6  polstab_centered_lag1    3.359198
7        covid_2020_2021    1.244807
Warning for Kazakhstan: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Kazakhstan:
                          GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.594
Model:                          GLSAR   Adj. R-squared:                  0.413
Method:                 Least Squares   F-statistic:                     2.148
Date:                Tue, 03 Jun 2025   Prob (F-statistic):             0.0849
Time:                        11:36:19   Log-Likelihood:                0.89785
No. Observations:                  27   AIC:                             16.20
Df Residuals:                      18   BIC:                             27.87
Df Model:                           8
Covariance Type:                  HC3
================================================================================
=========
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.1711     18.021      0.842      0.400     -20.149      50.491
ln_gdp_centered           0.0063      0.108      0.058      0.954      -0.205       0.218
ln_gdp_centered_sq       -0.0053      0.018     -0.297      0.767      -0.040       0.030
ln_gini                  -0.2985      5.456     -0.055      0.956     -10.992      10.395
ln_unemp                 -0.2710      0.102     -2.651      0.008      -0.471      -0.071
polstab_centered          0.1951      0.428      0.456      0.648      -0.644       1.034
ln_gdp_centered_lag1      0.0109      0.113      0.097      0.923      -0.210       0.231
polstab_centered_lag1     0.3672      0.315      1.165      0.244      -0.250       0.985
covid_2020_2021           0.1640      0.269      0.610      0.542      -0.363       0.691
==============================================================================
Omnibus:                        0.014   Durbin-Watson:                   2.399
Prob(Omnibus):                  0.993   Jarque-Bera (JB):                0.160
Skew:                          -0.047   Prob(JB):                        0.923
Kurtosis:                       2.634   Cond. No.                     6.36e+03
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 6.36e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Kazakhstan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Kazakhstan: 0.3324

Processing Korea Rep....

Correlation Matrix for Korea Rep.:

```
                     ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered             1.000000            0.025775  0.554023
ln_gdp_centered_sq          0.025775            1.000000  0.354704
ln_gini                     0.554023            0.354704  1.000000
ln_unemp                    0.139316            0.029402  0.171500
polstab_centered           -0.279518            0.223398 -0.387665
ln_gdp_centered_lag1        0.963367            0.138548  0.582733
polstab_centered_lag1      -0.347097            0.184068 -0.411025
covid_2020_2021             0.262622            0.277701  0.205915

                     ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      0.139316         -0.279518              0.963367
ln_gdp_centered_sq   0.029402          0.223398              0.138548
ln_gini              0.171500         -0.387665              0.582733
ln_unemp             1.000000         -0.156074              0.129486
polstab_centered    -0.156074          1.000000             -0.284872
ln_gdp_centered_lag1  0.129486        -0.284872              1.000000
polstab_centered_lag1 -0.186423        0.802727             -0.331552
covid_2020_2021      0.162115          0.280450              0.274720

                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.347097         0.262622
ln_gdp_centered_sq                0.184068         0.277701
ln_gini                          -0.411025         0.205915
ln_unemp                         -0.186423         0.162115
polstab_centered                  0.802727         0.280450
ln_gdp_centered_lag1             -0.331552         0.274720
polstab_centered_lag1             1.000000         0.213396
covid_2020_2021                   0.213396         1.000000
```

```
NaN/Inf Check Before Model for Korea Rep.:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Korea Rep.:
                variable         VIF
0        ln_gdp_centered   17.435293
1     ln_gdp_centered_sq   67.777529
2                ln_gini  124.469961
3               ln_unemp   60.764816
4       polstab_centered    3.083142
5   ln_gdp_centered_lag1   17.836048
6  polstab_centered_lag1    3.010081
7        covid_2020_2021    1.448981
Warning for Korea Rep.: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for Korea Rep.:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.430
Model:                          GLSAR   Adj. R-squared:                  0.176
Method:                 Least Squares   F-statistic:                     1.685
Date:                Tue, 03 Jun 2025   Prob (F-statistic):              0.170
Time:                        11:36:19   Log-Likelihood:                 9.8801
No. Observations:                  27   AIC:                            -1.760
Df Residuals:                      18   BIC:                             9.902
Df Model:                           8
Covariance Type:                  HC3
================================================================================
=========
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    18.2561      7.267      2.512      0.012       4.014      32.499
ln_gdp_centered           0.0134      0.064      0.208      0.836      -0.113       0.140
ln_gdp_centered_sq        0.0077      0.006      1.254      0.210      -0.004       0.020
```

```
ln_gini              -1.5077      2.152     -0.701      0.484     -5.726       2.710
ln_unemp             -0.0254      0.236     -0.108      0.914     -0.487       0.437
polstab_centered     -0.3734      0.471     -0.794      0.427     -1.296       0.549
ln_gdp_centered_lag1    -0.0009      0.066     -0.014      0.989     -0.130       0.128
polstab_centered_lag1   -0.3052      0.598     -0.510      0.610     -1.477       0.867
covid_2020_2021      -0.0499      0.163     -0.307      0.759     -0.369       0.269
==============================================================================
Omnibus:                       0.298   Durbin-Watson:                   1.642
Prob(Omnibus):                 0.862   Jarque-Bera (JB):                0.321
Skew:                         -0.216   Prob(JB):                        0.852
Kurtosis:                      2.686   Cond. No.                     1.77e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.77e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Korea Rep. (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Korea Rep.: 0.0650

Processing United Kingdom...

Correlation Matrix for United Kingdom:

```
                       ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered               1.000000           -0.055803 -0.602144
ln_gdp_centered_sq           -0.055803            1.000000 -0.313445
ln_gini                      -0.602144           -0.313445  1.000000
ln_unemp                     -0.559414            0.368797  0.181691
polstab_centered             -0.899136            0.245921  0.494768
ln_gdp_centered_lag1          0.962193            0.099857 -0.610717
polstab_centered_lag1        -0.913028            0.054089  0.538532
covid_2020_2021               0.219500            0.033955 -0.339612

                       ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       -0.559414         -0.899136              0.962193
ln_gdp_centered_sq     0.368797          0.245921              0.099857
ln_gini                0.181691          0.494768             -0.610717
ln_unemp               1.000000          0.539639             -0.507813
polstab_centered       0.539639          1.000000             -0.835385
ln_gdp_centered_lag1  -0.507813         -0.835385              1.000000
polstab_centered_lag1  0.509728          0.838743             -0.905969
```

```
covid_2020_2021      -0.243646        -0.120497            0.227520

                    polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                 -0.913028         0.219500
ln_gdp_centered_sq               0.054089         0.033955
ln_gini                          0.538532        -0.339612
ln_unemp                         0.509728        -0.243646
polstab_centered                 0.838743        -0.120497
ln_gdp_centered_lag1            -0.905969         0.227520
polstab_centered_lag1            1.000000        -0.114225
covid_2020_2021                 -0.114225         1.000000

NaN/Inf Check Before Model for United Kingdom:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for United Kingdom:
                variable         VIF
0        ln_gdp_centered   25.719946
1     ln_gdp_centered_sq  151.306006
2                ln_gini  148.433517
3               ln_unemp  112.931380
4       polstab_centered    6.769341
5   ln_gdp_centered_lag1   22.124737
6  polstab_centered_lag1    7.059510
7        covid_2020_2021    1.236815
Warning for United Kingdom: High VIF detected, potential multicollinearity


Prais-Winsten Model Summary for United Kingdom:
                           GLSAR Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.848
Model:                          GLSAR   Adj. R-squared:                  0.780
Method:                 Least Squares   F-statistic:                     15.88
Date:                Tue, 03 Jun 2025   Prob (F-statistic):           1.08e-06
```

```
Time:                    11:36:20   Log-Likelihood:               41.031
No. Observations:              27   AIC:                         -64.06
Df Residuals:                  18   BIC:                         -52.40
Df Model:                       8
Covariance Type:              HC3
=========================================================================================
                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                  12.8715      2.015      6.386      0.000       8.921      16.822
ln_gdp_centered         0.0396      0.079      0.500      0.617      -0.116       0.195
ln_gdp_centered_sq     -0.0006      0.003     -0.200      0.841      -0.007       0.005
ln_gini                 0.3377      0.499      0.677      0.499      -0.641       1.316
ln_unemp               -0.1455      0.089     -1.629      0.103      -0.321       0.030
polstab_centered       -0.0260      0.147     -0.177      0.860      -0.313       0.262
ln_gdp_centered_lag1   -0.0254      0.081     -0.313      0.754      -0.185       0.134
polstab_centered_lag1   0.1075      0.113      0.951      0.342      -0.114       0.329
covid_2020_2021        -0.0154      0.243     -0.063      0.949      -0.492       0.461
==============================================================================
Omnibus:                        4.617   Durbin-Watson:                   1.773
Prob(Omnibus):                  0.099   Jarque-Bera (JB):                4.072
Skew:                           0.034   Prob(JB):                        0.131
Kurtosis:                       4.901   Cond. No.                     1.36e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.36e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for United Kingdom (absolute values > 3):
Series([], dtype: float64)

Test RMSE for United Kingdom: 0.1905

Processing United States...

Correlation Matrix for United States:

```
                       ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered               1.000000            0.041627  0.628053
ln_gdp_centered_sq            0.041627            1.000000 -0.318295
ln_gini                       0.628053           -0.318295  1.000000
ln_unemp                      0.061186           -0.117042 -0.240686
polstab_centered             -0.611922            0.282983 -0.491471
ln_gdp_centered_lag1          0.969244            0.149519  0.593417
polstab_centered_lag1        -0.711435            0.262362 -0.502760
covid_2020_2021               0.264391            0.288228 -0.100627

                       ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered        0.061186         -0.611922              0.969244
```

ln_gdp_centered_sq	-0.117042	0.282983	0.149519
ln_gini	-0.240686	-0.491471	0.593417
ln_unemp	1.000000	0.080932	0.084732
polstab_centered	0.080932	1.000000	-0.530548
ln_gdp_centered_lag1	0.084732	-0.530548	1.000000
polstab_centered_lag1	0.087249	0.883524	-0.604595
covid_2020_2021	0.147216	-0.391622	0.277284

	polstab_centered_lag1	covid_2020_2021
ln_gdp_centered	-0.711435	0.264391
ln_gdp_centered_sq	0.262362	0.288228
ln_gini	-0.502760	-0.100627
ln_unemp	0.087249	0.147216
polstab_centered	0.883524	-0.391622
ln_gdp_centered_lag1	-0.604595	0.277284
polstab_centered_lag1	1.000000	-0.372740
covid_2020_2021	-0.372740	1.000000

NaN/Inf Check Before Model for United States:

```
ln_gdp_centered         0
ln_gdp_centered_sq      0
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64
ln_gdp_centered         0
ln_gdp_centered_sq      0
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64
```

VIF Results for United States:

	variable	VIF
0	ln_gdp_centered	30.958025
1	ln_gdp_centered_sq	69.109817
2	ln_gini	210.909976
3	ln_unemp	94.560328
4	polstab_centered	5.053493
5	ln_gdp_centered_lag1	25.187658
6	polstab_centered_lag1	7.497052
7	covid_2020_2021	1.901795

Warning for United States: High VIF detected, potential multicollinearity

Prais-Winsten Model Summary for United States:

GLSAR Regression Results

Dep. Variable:	ln_net_migration	R-squared:	0.777
Model:	GLSAR	Adj. R-squared:	0.677
Method:	Least Squares	F-statistic:	5.254
Date:	Tue, 03 Jun 2025	Prob (F-statistic):	0.00168
Time:	11:36:20	Log-Likelihood:	20.291
No. Observations:	27	AIC:	-22.58
Df Residuals:	18	BIC:	-10.92
Df Model:	8		
Covariance Type:	HC3		

	coef	std err	z	P>|z|	[0.025	0.975]
const	-6.1391	6.193	-0.991	0.322	-18.276	5.998
ln_gdp_centered	-0.0013	0.226	-0.006	0.995	-0.444	0.441
ln_gdp_centered_sq	0.0037	0.003	1.094	0.274	-0.003	0.010
ln_gini	5.3651	1.602	3.349	0.001	2.225	8.505
ln_unemp	0.2170	0.176	1.234	0.217	-0.128	0.562
polstab_centered	-0.1982	0.132	-1.503	0.133	-0.457	0.060
ln_gdp_centered_lag1	0.0022	0.222	0.010	0.992	-0.433	0.438
polstab_centered_lag1	0.0420	0.274	0.153	0.878	-0.495	0.579
covid_2020_2021	-0.6336	0.301	-2.107	0.035	-1.223	-0.044

Omnibus:	0.758	Durbin-Watson:	2.054
Prob(Omnibus):	0.684	Jarque-Bera (JB):	0.086
Skew:	0.011	Prob(JB):	0.958
Kurtosis:	3.276	Cond. No.	2.10e+04

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 2.1e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for United States (absolute values > 3):
Series([], dtype: float64)

Test RMSE for United States: 0.1185

PanelOLS Estimation Summary

Dep. Variable:	ln_net_migration	R-squared:	0.0330
Estimator:	PanelOLS	R-squared (Between):	0.4227
No. Observations:	360	R-squared (Within):	0.0330
Date:	Sun, May 25 2025	R-squared (Overall):	0.4215
Time:	19:42:27	Log-likelihood	-399.16
Cov. Estimator:	Robust		
		F-statistic:	1.4573

Entities: 10 P-value 0.1717
Avg Obs: 36.000 Distribution: F(8,342)
Min Obs: 36.000
Max Obs: 36.000 F-statistic (robust): 3.3458
P-value 0.0011
Time periods: 36 Distribution: F(8,342)
Avg Obs: 10.0000
Min Obs: 10.0000
Max Obs: 10.0000

Parameter Estimates

===

	Parameter	Std. Err.	T-stat	P-value	Lower CI	Upper CI
ln_gdp_centered	0.0092	0.0052	1.7512	0.0808	-0.0011	0.0194
ln_gdp_centered_sq	0.0002	0.0011	0.1390	0.8895	-0.0020	0.0023
ln_gini	1.0378	1.1470	0.9048	0.3662	-1.2182	3.2938
ln_unemp	-0.2307	0.0853	-2.7039	0.0072	-0.3985	-0.0629
polstab_centered	-0.0781	0.0941	-0.8308	0.4066	-0.2631	0.1069
ln_gdp_centered_lag1	0.0045	0.0023	1.9404	0.0532	-6.093e-05	0.0090
polstab_centered_lag1	0.2456	0.0927	2.6503	0.0084	0.0633	0.4278
covid_2020_2021	-0.0804	0.0494	-1.6274	0.1046	-0.1776	0.0168

===

F-test for Poolability: 5.8842
P-value: 0.0000
Distribution: F(9,342)

Included effects: Entity

Processing Australia...

Correlation Matrix for Australia:

```
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.082657  0.820167
ln_gdp_centered_sq           0.082657            1.000000  0.295067
ln_gini                      0.820167            0.295067  1.000000
ln_unemp                    -0.708845            0.216579 -0.620345
polstab_centered            -0.774175            0.248332 -0.602403
ln_gdp_centered_lag1         0.972537            0.259428  0.850088
polstab_centered_lag1       -0.832374            0.214598 -0.662050
covid_2020_2021              0.263434            0.100448  0.219880

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.708845         -0.774175              0.972537
ln_gdp_centered_sq    0.216579          0.248332              0.259428
ln_gini              -0.620345         -0.602403              0.850088
ln_unemp              1.000000          0.786285             -0.648297
polstab_centered      0.786285          1.000000             -0.732317
ln_gdp_centered_lag1  -0.648297         -0.732317              1.000000
polstab_centered_lag1  0.850043          0.900621             -0.779947
covid_2020_2021      -0.101054         -0.294166              0.275954

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.832374         0.263434
ln_gdp_centered_sq                 0.214598         0.100448
ln_gini                           -0.662050         0.219880
ln_unemp                           0.850043        -0.101054
polstab_centered                   0.900621        -0.294166
ln_gdp_centered_lag1              -0.779947         0.275954
polstab_centered_lag1              1.000000        -0.255154
covid_2020_2021                   -0.255154         1.000000

NaN/Inf Check Before Model for Australia:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Australia:
               variable         VIF
```

```
0       ln_gdp_centered   47.854584
1    ln_gdp_centered_sq  196.295867
2               ln_gini  575.745199
3              ln_unemp  314.120549
4      polstab_centered    6.700387
5   ln_gdp_centered_lag1   58.527845
6  polstab_centered_lag1    9.612588
7       covid_2020_2021    1.288199
Warning for Australia: High VIF detected, potential multicollinearity
```

```
OLS Model Summary for Australia:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.916
Model:                            OLS   Adj. R-squared:                  0.881
Method:                 Least Squares   F-statistic:                     28.79
Date:                Fri, 06 Jun 2025   Prob (F-statistic):           4.86e-09
Time:                        08:33:26   Log-Likelihood:                 67.153
No. Observations:                  28   AIC:                            -116.3
Df Residuals:                      19   BIC:                            -104.3
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.5919      3.544      4.399      0.000       8.645      22.539
ln_gdp_centered           0.0017      0.021      0.081      0.936      -0.039       0.043
ln_gdp_centered_sq       -0.0005      0.002     -0.272      0.785      -0.004       0.003
ln_gini                  -0.3607      1.017     -0.355      0.723      -2.353       1.632
ln_unemp                 -0.2742      0.055     -5.004      0.000      -0.382      -0.167
polstab_centered          0.1345      0.133      1.014      0.310      -0.125       0.394
ln_gdp_centered_lag1      0.0054      0.021      0.253      0.800      -0.036       0.047
polstab_centered_lag1     0.0646      0.161      0.402      0.688      -0.250       0.379
covid_2020_2021          -0.1239      0.037     -3.391      0.001      -0.196      -0.052
==============================================================================
Omnibus:                        1.888   Durbin-Watson:                   1.442
Prob(Omnibus):                  0.389   Jarque-Bera (JB):                1.512
Skew:                           0.555   Prob(JB):                        0.470
Kurtosis:                       2.747   Cond. No.                     3.39e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.39e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Australia (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Australia: 0.0609
```

Test RMSE for OLS in Australia: 0.0609

Quadratic Model Summary for Australia:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.916
Model:                           OLS   Adj. R-squared:                  0.881
Method:                Least Squares   F-statistic:                     28.79
Date:               Fri, 06 Jun 2025   Prob (F-statistic):           4.86e-09
Time:                       08:33:26   Log-Likelihood:                 67.153
No. Observations:                 28   AIC:                            -116.3
Df Residuals:                     19   BIC:                            -104.3
Df Model:                          8
Covariance Type:                 HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.5919      3.544      4.399      0.000       8.645      22.539
ln_gdp_centered           0.0017      0.021      0.081      0.936      -0.039       0.043
ln_gdp_centered_sq       -0.0005      0.002     -0.272      0.785      -0.004       0.003
ln_gini                  -0.3607      1.017     -0.355      0.723      -2.353       1.632
ln_unemp                 -0.2742      0.055     -5.004      0.000      -0.382      -0.167
polstab_centered          0.1345      0.133      1.014      0.310      -0.125       0.394
ln_gdp_centered_lag1      0.0054      0.021      0.253      0.800      -0.036       0.047
polstab_centered_lag1     0.0646      0.161      0.402      0.688      -0.250       0.379
covid_2020_2021          -0.1239      0.037     -3.391      0.001      -0.196      -0.052
==============================================================================
Omnibus:                        1.888   Durbin-Watson:                   1.442
Prob(Omnibus):                  0.389   Jarque-Bera (JB):                1.512
Skew:                           0.555   Prob(JB):                        0.470
Kurtosis:                       2.747   Cond. No.                     3.39e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.39e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Australia (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Australia: 0.0609

2SLS Model Summary for Australia:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.894
Model:                        IV2SLS   Adj. R-squared:                  0.864
Method:                    Two Stage   F-statistic:                     29.76
                       Least Squares   Prob (F-statistic):           3.18e-09
```

```
Date:                Fri, 06 Jun 2025
Time:                        08:33:26
No. Observations:                  28
Df Residuals:                      21
Df Model:                           6
==============================================================================
======
                      coef    std err          t      P>|t|      [0.025      0.975]
-------------------------------------------------------------------------------------
const                16.0249      1.910      8.390      0.000      12.053      19.997
ln_gdp_centered_sq    0.0002      0.001      0.404      0.690      -0.001       0.002
ln_gini              -0.5036      0.541     -0.931      0.362      -1.628       0.621
ln_unemp             -0.2713      0.051     -5.273      0.000      -0.378      -0.164
covid_2020_2021      -0.1226      0.025     -4.842      0.000      -0.175      -0.070
ln_gdp_centered       0.0073      0.002      4.067      0.001       0.004       0.011
polstab_centered      0.2029      0.100      2.023      0.056      -0.006       0.412
==============================================================================
Omnibus:                        1.808   Durbin-Watson:                   1.364
Prob(Omnibus):                  0.405   Jarque-Bera (JB):                1.437
Skew:                           0.541   Prob(JB):                        0.487
Kurtosis:                       2.756   Cond. No.                     3.33e+04
==============================================================================

Standardized Residuals Check for 2SLS in Australia (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Australia: 0.0691

Test RMSE for 2SLS in Australia: 0.0691
Predictions saved to country_results/Australia_predictions.csv

Processing Brazil...

Correlation Matrix for Brazil:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.226697 -0.800942
ln_gdp_centered_sq           0.226697            1.000000 -0.175173
ln_gini                     -0.800942           -0.175173  1.000000
ln_unemp                     0.375935           -0.371343 -0.502027
polstab_centered            -0.336515            0.210670  0.307380
ln_gdp_centered_lag1         0.962751            0.297356 -0.780368
polstab_centered_lag1       -0.328084            0.238308  0.290639
covid_2020_2021              0.241314           -0.292759 -0.240482

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.375935         -0.336515              0.962751
ln_gdp_centered_sq   -0.371343          0.210670              0.297356
ln_gini              -0.502027          0.307380             -0.780368
ln_unemp              1.000000         -0.134617              0.368424
polstab_centered     -0.134617          1.000000             -0.307218
ln_gdp_centered_lag1  0.368424         -0.307218              1.000000
polstab_centered_lag1 -0.107705         0.699766             -0.312327
```

```
covid_2020_2021       0.355961        -0.234852            0.264210

                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.328084         0.241314
ln_gdp_centered_sq                0.238308        -0.292759
ln_gini                           0.290639        -0.240482
ln_unemp                         -0.107705         0.355961
polstab_centered                  0.699766        -0.234852
ln_gdp_centered_lag1             -0.312327         0.264210
polstab_centered_lag1             1.000000        -0.257918
covid_2020_2021                  -0.257918         1.000000
```

NaN/Inf Check Before Model for Brazil:

```
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
```

VIF Results for Brazil:

```
                variable         VIF
0        ln_gdp_centered   14.961413
1     ln_gdp_centered_sq   84.880824
2                ln_gini  267.907126
3               ln_unemp   94.317976
4       polstab_centered    2.046555
5   ln_gdp_centered_lag1   17.318180
6  polstab_centered_lag1    2.157498
7        covid_2020_2021    1.414883
```

Warning for Brazil: High VIF detected, potential multicollinearity

OLS Model Summary for Brazil:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.755
Model:                           OLS   Adj. R-squared:                  0.652
Method:                Least Squares   F-statistic:                     6.878
Date:               Fri, 06 Jun 2025   Prob (F-statistic):           0.000280
```

```
Time:                    08:33:26   Log-Likelihood:                 41.502
No. Observations:              28   AIC:                            -65.00
Df Residuals:                  19   BIC:                            -53.01
Df Model:                       8
Covariance Type:              HC3
=======================================================================================
                          coef    std err          z      P>|z|      [0.025      0.975]
---------------------------------------------------------------------------------------
const                  10.6610      3.100      3.439      0.001       4.586      16.736
ln_gdp_centered        -0.0073      0.086     -0.085      0.932      -0.175       0.161
ln_gdp_centered_sq      0.0023      0.003      0.766      0.444      -0.004       0.008
ln_gini                 0.5399      0.693      0.779      0.436      -0.818       1.898
ln_unemp                0.1731      0.107      1.614      0.107      -0.037       0.383
polstab_centered        0.0007      0.134      0.005      0.996      -0.263       0.264
ln_gdp_centered_lag1   -0.0059      0.084     -0.070      0.944      -0.171       0.159
polstab_centered_lag1  -0.2273      0.154     -1.478      0.139      -0.529       0.074
covid_2020_2021        -0.0282      0.171     -0.165      0.869      -0.363       0.307
==============================================================================
Omnibus:                        0.056   Durbin-Watson:                   1.993
Prob(Omnibus):                  0.972   Jarque-Bera (JB):                0.149
Skew:                           0.089   Prob(JB):                        0.928
Kurtosis:                       2.691   Cond. No.                     1.05e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.05e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Brazil (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Brazil: 0.1144

Test RMSE for OLS in Brazil: 0.1144

Quadratic Model Summary for Brazil:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.755
Model:                            OLS   Adj. R-squared:                  0.652
Method:                 Least Squares   F-statistic:                     6.878
Date:                Fri, 06 Jun 2025   Prob (F-statistic):           0.000280
Time:                        08:33:27   Log-Likelihood:                 41.502
No. Observations:                  28   AIC:                            -65.00
Df Residuals:                      19   BIC:                            -53.01
Df Model:                           8
Covariance Type:                  HC3
=======================================================================================
                          coef    std err          z      P>|z|      [0.025      0.975]
```

```
-------------------------------------------------------------------------------------------
const                10.6610      3.100      3.439      0.001      4.586      16.736
ln_gdp_centered         -0.0073      0.086     -0.085      0.932     -0.175       0.161
ln_gdp_centered_sq       0.0023      0.003      0.766      0.444     -0.004       0.008
ln_gini                 0.5399      0.693      0.779      0.436     -0.818       1.898
ln_unemp                0.1731      0.107      1.614      0.107     -0.037       0.383
polstab_centered         0.0007      0.134      0.005      0.996     -0.263       0.264
ln_gdp_centered_lag1    -0.0059      0.084     -0.070      0.944     -0.171       0.159
polstab_centered_lag1   -0.2273      0.154     -1.478      0.139     -0.529       0.074
covid_2020_2021         -0.0282      0.171     -0.165      0.869     -0.363       0.307
==============================================================================
Omnibus:                        0.056   Durbin-Watson:                   1.993
Prob(Omnibus):                  0.972   Jarque-Bera (JB):                0.149
Skew:                           0.089   Prob(JB):                        0.928
Kurtosis:                       2.691   Cond. No.                     1.05e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.05e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Brazil (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Brazil: 0.1144

2SLS Model Summary for Brazil:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.645
Model:                        IV2SLS   Adj. R-squared:                  0.543
Method:                    Two Stage   F-statistic:                     7.232
                       Least Squares   Prob (F-statistic):           0.000276
Date:                 Fri, 06 Jun 2025
Time:                         08:33:27
No. Observations:                  28
Df Residuals:                      21
Df Model:                           6
======================================================================================
                         coef    std err          t      P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------------
const                 11.1121      2.464      4.510      0.000       5.988      16.236
ln_gdp_centered_sq     0.0029      0.003      1.142      0.266      -0.002       0.008
ln_gini                0.4102      0.551      0.744      0.465      -0.736       1.556
ln_unemp               0.1881      0.102      1.848      0.079      -0.024       0.400
covid_2020_2021       -0.0361      0.067     -0.535      0.598      -0.176       0.104
ln_gdp_centered       -0.0153      0.004     -4.331      0.000      -0.023      -0.008
polstab_centered      -0.3289      0.149     -2.214      0.038      -0.638      -0.020
==============================================================================
Omnibus:                        0.512   Durbin-Watson:                   2.266
```

```
Prob(Omnibus):                0.774   Jarque-Bera (JB):               0.601
Skew:                        -0.065   Prob(JB):                       0.741
Kurtosis:                     2.294   Cond. No.                    9.79e+03
==============================================================================
```

Standardized Residuals Check for 2SLS in Brazil (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Brazil: 0.1589

Test RMSE for 2SLS in Brazil: 0.1589
Predictions saved to country_results/Brazil_predictions.csv

Processing Canada...

Correlation Matrix for Canada:

```
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.072701  0.285960
ln_gdp_centered_sq           0.072701            1.000000 -0.441352
ln_gini                      0.285960           -0.441352  1.000000
ln_unemp                    -0.588496            0.104841 -0.333966
polstab_centered            -0.490502            0.273611 -0.276144
ln_gdp_centered_lag1         0.963580            0.217636  0.238945
polstab_centered_lag1       -0.578770            0.207361 -0.371571
covid_2020_2021              0.246067            0.089915 -0.245106

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.588496         -0.490502              0.963580
ln_gdp_centered_sq    0.104841          0.273611              0.217636
ln_gini              -0.333966         -0.276144              0.238945
ln_unemp              1.000000          0.538469             -0.547650
polstab_centered      0.538469          1.000000             -0.379495
ln_gdp_centered_lag1 -0.547650         -0.379495              1.000000
polstab_centered_lag1  0.533272         0.712684             -0.479863
covid_2020_2021       0.133315         -0.211886              0.255655

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.578770         0.246067
ln_gdp_centered_sq                 0.207361         0.089915
ln_gini                           -0.371571        -0.245106
ln_unemp                           0.533272         0.133315
polstab_centered                   0.712684        -0.211886
ln_gdp_centered_lag1              -0.479863         0.255655
polstab_centered_lag1              1.000000        -0.222221
covid_2020_2021                   -0.222221         1.000000
```

NaN/Inf Check Before Model for Canada:

```
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
```

```
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Canada:
                variable         VIF
0        ln_gdp_centered   23.522055
1     ln_gdp_centered_sq  137.932300
2                ln_gini  457.391169
3               ln_unemp  396.196198
4       polstab_centered    2.479797
5   ln_gdp_centered_lag1   22.639649
6  polstab_centered_lag1    2.549305
7        covid_2020_2021    1.518040
Warning for Canada: High VIF detected, potential multicollinearity


OLS Model Summary for Canada:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.806
Model:                            OLS   Adj. R-squared:                  0.725
Method:                 Least Squares   F-statistic:                     7.203
Date:                Fri, 06 Jun 2025   Prob (F-statistic):           0.000208
Time:                        08:33:27   Log-Likelihood:                 56.945
No. Observations:                  28   AIC:                            -95.89
Df Residuals:                      19   BIC:                            -83.90
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                    15.2908      1.763      8.671      0.000      11.834      18.747
ln_gdp_centered           0.0045      0.032      0.143      0.886      -0.058       0.067
ln_gdp_centered_sq       -0.0004      0.003     -0.160      0.873      -0.005       0.005
ln_gini                  -0.2161      0.472     -0.458      0.647      -1.142       0.709
ln_unemp                 -0.3296      0.119     -2.761      0.006      -0.564      -0.096
polstab_centered          0.0307      0.128      0.240      0.810      -0.220       0.281
ln_gdp_centered_lag1     -0.0002      0.031     -0.005      0.996      -0.061       0.061
polstab_centered_lag1     0.3370      0.156      2.163      0.031       0.032       0.642
covid_2020_2021           0.1277      0.150      0.852      0.394      -0.166       0.422
```

```
==============================================================================
Omnibus:                        2.465   Durbin-Watson:                   1.954
Prob(Omnibus):                  0.292   Jarque-Bera (JB):                1.219
Skew:                          -0.057   Prob(JB):                        0.544
Kurtosis:                       4.016   Cond. No.                     1.66e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.66e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Canada (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Canada: 0.0686

Test RMSE for OLS in Canada: 0.0686

Quadratic Model Summary for Canada:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.806
Model:                            OLS   Adj. R-squared:                  0.725
Method:                 Least Squares   F-statistic:                     7.203
Date:                Fri, 06 Jun 2025   Prob (F-statistic):           0.000208
Time:                        08:33:27   Log-Likelihood:                 56.945
No. Observations:                  28   AIC:                            -95.89
Df Residuals:                      19   BIC:                            -83.90
Df Model:                           8
Covariance Type:                  HC3
=======================================================================================
                           coef    std err          z      P>|z|      [0.025      0.975]
---------------------------------------------------------------------------------------
const                   15.2908      1.763      8.671      0.000      11.834      18.747
ln_gdp_centered          0.0045      0.032      0.143      0.886      -0.058       0.067
ln_gdp_centered_sq      -0.0004      0.003     -0.160      0.873      -0.005       0.005
ln_gini                 -0.2161      0.472     -0.458      0.647      -1.142       0.709
ln_unemp                -0.3296      0.119     -2.761      0.006      -0.564      -0.096
polstab_centered         0.0307      0.128      0.240      0.810      -0.220       0.281
ln_gdp_centered_lag1    -0.0002      0.031     -0.005      0.996      -0.061       0.061
polstab_centered_lag1    0.3370      0.156      2.163      0.031       0.032       0.642
covid_2020_2021          0.1277      0.150      0.852      0.394      -0.166       0.422
==============================================================================
Omnibus:                        2.465   Durbin-Watson:                   1.954
Prob(Omnibus):                  0.292   Jarque-Bera (JB):                1.219
Skew:                          -0.057   Prob(JB):                        0.544
Kurtosis:                       4.016   Cond. No.                     1.66e+04
==============================================================================
```

Notes:

[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.66e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Canada (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Canada: 0.0686

2SLS Model Summary for Canada:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.587
Model:                        IV2SLS   Adj. R-squared:                  0.469
Method:                    Two Stage   F-statistic:                     6.697
                       Least Squares   Prob (F-statistic):           0.000451
Date:               Fri, 06 Jun 2025
Time:                       08:33:27
No. Observations:                 28
Df Residuals:                     21
Df Model:                          6
====================================================================================
                         coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const                 14.3748      1.809      7.946      0.000      10.613      18.137
ln_gdp_centered_sq    -0.0015      0.002     -0.970      0.343      -0.005       0.002
ln_gini                0.0907      0.507      0.179      0.860      -0.963       1.145
ln_unemp              -0.3617      0.095     -3.813      0.001      -0.559      -0.164
covid_2020_2021        0.1845      0.060      3.097      0.005       0.061       0.308
ln_gdp_centered        0.0027      0.002      1.497      0.149      -0.001       0.006
polstab_centered       0.4845      0.186      2.600      0.017       0.097       0.872
==============================================================================
Omnibus:                        0.988   Durbin-Watson:                   2.281
Prob(Omnibus):                  0.610   Jarque-Bera (JB):                0.403
Skew:                           0.288   Prob(JB):                        0.817
Kurtosis:                       3.117   Cond. No.                     1.57e+04
==============================================================================
```

Standardized Residuals Check for 2SLS in Canada (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Canada: 0.1170

Test RMSE for 2SLS in Canada: 0.1170
Predictions saved to country_results/Canada_predictions.csv

Processing Germany...

Correlation Matrix for Germany:

```
                 ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered         1.000000           -0.027365  0.874938
```

```
ln_gdp_centered_sq       -0.027365          1.000000  0.059994
ln_gini                   0.874938          0.059994  1.000000
ln_unemp                 -0.467197         -0.591458 -0.620183
polstab_centered         -0.824320          0.134973 -0.821480
ln_gdp_centered_lag1      0.973885          0.161030  0.860167
polstab_centered_lag1    -0.895031          0.195125 -0.863527
covid_2020_2021           0.249840          0.179849  0.399758

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.467197         -0.824320              0.973885
ln_gdp_centered_sq   -0.591458          0.134973              0.161030
ln_gini              -0.620183         -0.821480              0.860167
ln_unemp              1.000000          0.495117             -0.540758
polstab_centered      0.495117          1.000000             -0.771322
ln_gdp_centered_lag1 -0.540758         -0.771322              1.000000
polstab_centered_lag1  0.489760          0.905323             -0.823685
covid_2020_2021      -0.350472         -0.262897              0.259990

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.895031         0.249840
ln_gdp_centered_sq                 0.195125         0.179849
ln_gini                           -0.863527         0.399758
ln_unemp                           0.489760        -0.350472
polstab_centered                   0.905323        -0.262897
ln_gdp_centered_lag1              -0.823685         0.259990
polstab_centered_lag1              1.000000        -0.357990
covid_2020_2021                   -0.357990         1.000000

NaN/Inf Check Before Model for Germany:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Germany:
              variable         VIF
0      ln_gdp_centered   83.713654
1   ln_gdp_centered_sq  200.997314
```

```
2              ln_gini  628.863832
3             ln_unemp  173.166715
4      polstab_centered    5.946657
5   ln_gdp_centered_lag1   69.979524
6  polstab_centered_lag1   16.980140
7       covid_2020_2021    1.482752
Warning for Germany: High VIF detected, potential multicollinearity


OLS Model Summary for Germany:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.197
Model:                            OLS   Adj. R-squared:                 -0.142
Method:                 Least Squares   F-statistic:                    0.2888
Date:                Fri, 06 Jun 2025   Prob (F-statistic):              0.961
Time:                        08:33:27   Log-Likelihood:                -63.343
No. Observations:                  28   AIC:                             144.7
Df Residuals:                      19   BIC:                             156.7
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                   -95.5633    168.022     -0.569      0.570    -424.880     233.753
ln_gdp_centered           0.2960      1.368      0.216      0.829      -2.385       2.977
ln_gdp_centered_sq       -0.0249      0.043     -0.580      0.562      -0.109       0.059
ln_gini                  34.6904     50.176      0.691      0.489     -63.652     133.033
ln_unemp                 -4.2244      3.630     -1.164      0.245     -11.340       2.891
polstab_centered          4.2521      9.443      0.450      0.652     -14.256      22.760
ln_gdp_centered_lag1     -0.2375      1.353     -0.176      0.861      -2.889       2.414
polstab_centered_lag1     3.0136      5.864      0.514      0.607      -8.480      14.507
covid_2020_2021          -1.4898      1.978     -0.753      0.451      -5.366       2.386
==============================================================================
Omnibus:                       51.220   Durbin-Watson:                   2.155
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              306.575
Skew:                          -3.521   Prob(JB):                     2.68e-67
Kurtosis:                      17.601   Cond. No.                     1.87e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.87e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Germany (absolute values > 3):
124   -4.612578
dtype: float64

Test RMSE for OLS in Germany: 1.6357
```

Test RMSE for OLS in Germany: 1.6357

Quadratic Model Summary for Germany:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.197
Model:                           OLS   Adj. R-squared:                 -0.142
Method:                Least Squares   F-statistic:                    0.2888
Date:               Fri, 06 Jun 2025   Prob (F-statistic):              0.961
Time:                       08:33:28   Log-Likelihood:                -63.343
No. Observations:                 28   AIC:                             144.7
Df Residuals:                     19   BIC:                             156.7
Df Model:                          8
Covariance Type:                 HC3
=======================================================================================
                          coef    std err          z      P>|z|      [0.025      0.975]
---------------------------------------------------------------------------------------
const                 -95.5633    168.022     -0.569      0.570    -424.880     233.753
ln_gdp_centered         0.2960      1.368      0.216      0.829      -2.385       2.977
ln_gdp_centered_sq     -0.0249      0.043     -0.580      0.562      -0.109       0.059
ln_gini                34.6904     50.176      0.691      0.489     -63.652     133.033
ln_unemp               -4.2244      3.630     -1.164      0.245     -11.340       2.891
polstab_centered        4.2521      9.443      0.450      0.652     -14.256      22.760
ln_gdp_centered_lag1   -0.2375      1.353     -0.176      0.861      -2.889       2.414
polstab_centered_lag1   3.0136      5.864      0.514      0.607      -8.480      14.507
covid_2020_2021        -1.4898      1.978     -0.753      0.451      -5.366       2.386
==============================================================================
Omnibus:                       51.220   Durbin-Watson:                   2.155
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              306.575
Skew:                          -3.521   Prob(JB):                     2.68e-67
Kurtosis:                      17.601   Cond. No.                     1.87e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.87e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Germany (absolute values > 3):
124   -4.612578
dtype: float64

Test RMSE for Quadratic in Germany: 1.6357

2SLS Model Summary for Germany:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.178
Model:                        IV2SLS   Adj. R-squared:                 -0.056
Method:                    Two Stage   F-statistic:                    0.7538
                       Least Squares   Prob (F-statistic):              0.614
```

```
Date:              Fri, 06 Jun 2025
Time:                  08:33:28
No. Observations:            28
Df Residuals:              21
Df Model:                  6
==============================================================================
======
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const             -99.2308    114.239     -0.869      0.395    -336.805     138.343
ln_gdp_centered_sq    -0.0495      0.074     -0.665      0.513      -0.204       0.105
ln_gini             36.6311     31.859      1.150      0.263     -29.623     102.885
ln_unemp            -4.6299      4.755     -0.974      0.341     -14.518       5.258
covid_2020_2021      -1.8437      2.491     -0.740      0.467      -7.025       3.337
ln_gdp_centered       0.0230      0.272      0.084      0.933      -0.543       0.589
polstab_centered      6.5359     11.384      0.574      0.572     -17.138      30.210
==============================================================================
Omnibus:                     50.302   Durbin-Watson:                   2.074
Prob(Omnibus):                0.000   Jarque-Bera (JB):              287.625
Skew:                        -3.462   Prob(JB):                     3.49e-63
Kurtosis:                    17.093   Cond. No.                     1.85e+04
==============================================================================
```

Standardized Residuals Check for 2SLS in Germany (absolute values > 3):
124   -4.580275
dtype: float64

Test RMSE for 2SLS in Germany: 1.8695

Test RMSE for 2SLS in Germany: 1.8695
Predictions saved to country_results/Germany_predictions.csv

Processing Ireland...

Correlation Matrix for Ireland:

```
                    ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered             1.000000           -0.116271 -0.800401
ln_gdp_centered_sq         -0.116271            1.000000 -0.076156
ln_gini                    -0.800401           -0.076156  1.000000
ln_unemp                   -0.292928            0.111478  0.612485
polstab_centered           -0.867589           -0.083243  0.635234
ln_gdp_centered_lag1        0.963815           -0.022750 -0.808284
polstab_centered_lag1      -0.831454           -0.195486  0.625490
covid_2020_2021             0.257469            0.368789 -0.370080

                    ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.292928         -0.867589              0.963815
ln_gdp_centered_sq    0.111478         -0.083243             -0.022750
ln_gini               0.612485          0.635234             -0.808284
ln_unemp              1.000000         -0.054714             -0.223953
polstab_centered     -0.054714          1.000000             -0.863932
ln_gdp_centered_lag1  -0.223953         -0.863932              1.000000
```

```
polstab_centered_lag1 -0.080333         0.937720            -0.862796
covid_2020_2021       -0.170214        -0.322156             0.266749

                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.831454        0.257469
ln_gdp_centered_sq               -0.195486        0.368789
ln_gini                           0.625490       -0.370080
ln_unemp                         -0.080333       -0.170214
polstab_centered                  0.937720       -0.322156
ln_gdp_centered_lag1             -0.862796        0.266749
polstab_centered_lag1             1.000000       -0.280097
covid_2020_2021                  -0.280097        1.000000

NaN/Inf Check Before Model for Ireland:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Ireland:
                variable         VIF
0        ln_gdp_centered   27.965598
1     ln_gdp_centered_sq   90.254748
2                ln_gini  206.353332
3               ln_unemp   67.288284
4       polstab_centered   13.691475
5   ln_gdp_centered_lag1   18.581795
6  polstab_centered_lag1   13.004286
7        covid_2020_2021    1.528316
Warning for Ireland: High VIF detected, potential multicollinearity


OLS Model Summary for Ireland:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.878
Model:                            OLS   Adj. R-squared:                  0.827
Method:                 Least Squares   F-statistic:                     10.62
```

```
Date:               Fri, 06 Jun 2025   Prob (F-statistic):          1.42e-05
Time:                       08:33:28   Log-Likelihood:              78.058
No. Observations:                 28   AIC:                         -138.1
Df Residuals:                     19   BIC:                         -126.1
Df Model:                          8
Covariance Type:                 HC3
==================================================================================
=========
                          coef    std err          z      P>|z|      [0.025      0.975]
---------------------------------------------------------------------------------------
const                  11.7600      0.685     17.172      0.000      10.418      13.102
ln_gdp_centered         0.0025      0.009      0.292      0.770      -0.014       0.020
ln_gdp_centered_sq      0.0013      0.001      2.275      0.023       0.000       0.002
ln_gini                 0.5411      0.202      2.676      0.007       0.145       0.937
ln_unemp               -0.1051      0.021     -5.050      0.000      -0.146      -0.064
polstab_centered        0.0453      0.082      0.553      0.580      -0.115       0.206
ln_gdp_centered_lag1    0.0019      0.009      0.217      0.828      -0.015       0.019
polstab_centered_lag1   0.0201      0.087      0.231      0.817      -0.150       0.190
covid_2020_2021        -0.0318      0.028     -1.151      0.250      -0.086       0.022
==============================================================================
Omnibus:                        1.441   Durbin-Watson:                   1.702
Prob(Omnibus):                  0.486   Jarque-Bera (JB):                1.325
Skew:                           0.474   Prob(JB):                        0.516
Kurtosis:                       2.512   Cond. No.                     1.68e+04
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.68e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Ireland (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Ireland: 0.0275

Test RMSE for OLS in Ireland: 0.0275

Quadratic Model Summary for Ireland:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.878
Model:                            OLS   Adj. R-squared:                  0.827
Method:                 Least Squares   F-statistic:                     10.62
Date:               Fri, 06 Jun 2025   Prob (F-statistic):          1.42e-05
Time:                       08:33:28   Log-Likelihood:              78.058
No. Observations:                 28   AIC:                         -138.1
Df Residuals:                     19   BIC:                         -126.1
Df Model:                          8
Covariance Type:                 HC3
==================================================================================
=========
```

```
                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                 11.7600      0.685     17.172      0.000      10.418      13.102
ln_gdp_centered         0.0025      0.009      0.292      0.770      -0.014      0.020
ln_gdp_centered_sq      0.0013      0.001      2.275      0.023      0.000      0.002
ln_gini                0.5411      0.202      2.676      0.007      0.145      0.937
ln_unemp              -0.1051      0.021     -5.050      0.000      -0.146      -0.064
polstab_centered        0.0453      0.082      0.553      0.580      -0.115      0.206
ln_gdp_centered_lag1     0.0019      0.009      0.217      0.828      -0.015      0.019
polstab_centered_lag1    0.0201      0.087      0.231      0.817      -0.150      0.190
covid_2020_2021        -0.0318      0.028     -1.151      0.250      -0.086      0.022
==============================================================================
Omnibus:                    1.441   Durbin-Watson:                  1.702
Prob(Omnibus):                0.486   Jarque-Bera (JB):               1.325
Skew:                       0.474   Prob(JB):                     0.516
Kurtosis:                   2.512   Cond. No.                  1.68e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.68e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Ireland (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Ireland: 0.0275

2SLS Model Summary for Ireland:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.846
Model:                         IV2SLS   Adj. R-squared:                  0.802
Method:                     Two Stage   F-statistic:                     19.76
                        Least Squares   Prob (F-statistic):           1.23e-07
Date:                Fri, 06 Jun 2025
Time:                        08:33:28
No. Observations:                  28
Df Residuals:                      21
Df Model:                           6
==============================================================================
======
                        coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const               11.8236      0.615     19.237      0.000      10.545      13.102
ln_gdp_centered_sq     0.0018      0.001      2.681      0.014      0.000      0.003
ln_gini              0.4909      0.173      2.840      0.010      0.131      0.850
ln_unemp            -0.0805      0.028     -2.893      0.009      -0.138      -0.023
covid_2020_2021      -0.0324      0.021     -1.524      0.143      -0.077      0.012
ln_gdp_centered       0.0069      0.003      2.142      0.044      0.000      0.014
polstab_centered      0.1732      0.137      1.261      0.221      -0.112      0.459
==============================================================================
```

```
Omnibus:                        1.324   Durbin-Watson:                   1.672
Prob(Omnibus):                  0.516   Jarque-Bera (JB):                0.919
Skew:                           0.023   Prob(JB):                        0.632
Kurtosis:                       2.114   Cond. No.                     1.51e+04
==============================================================================

Standardized Residuals Check for 2SLS in Ireland (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Ireland: 0.0403

Test RMSE for 2SLS in Ireland: 0.0403
Predictions saved to country_results/Ireland_predictions.csv

Processing Japan...

Correlation Matrix for Japan:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.044427  0.349759
ln_gdp_centered_sq           0.044427            1.000000  0.063260
ln_gini                      0.349759            0.063260  1.000000
ln_unemp                     0.226274           -0.220761 -0.112535
polstab_centered            -0.514793           -0.154376 -0.584492
ln_gdp_centered_lag1         0.533441            0.008855  0.195072
polstab_centered_lag1       -0.486870           -0.185660 -0.457133
covid_2020_2021              0.209906            0.046103  0.218683

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.226274         -0.514793              0.533441
ln_gdp_centered_sq   -0.220761         -0.154376              0.008855
ln_gini              -0.112535         -0.584492              0.195072
ln_unemp              1.000000         -0.228097              0.203102
polstab_centered     -0.228097          1.000000             -0.333393
ln_gdp_centered_lag1  0.203102         -0.333393              1.000000
polstab_centered_lag1 -0.161895         0.787102             -0.555556
covid_2020_2021      -0.170609         -0.159280              0.211085

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.486870         0.209906
ln_gdp_centered_sq                -0.185660         0.046103
ln_gini                           -0.457133         0.218683
ln_unemp                          -0.161895        -0.170609
polstab_centered                   0.787102        -0.159280
ln_gdp_centered_lag1              -0.555556         0.211085
polstab_centered_lag1              1.000000        -0.162183
covid_2020_2021                   -0.162183         1.000000

NaN/Inf Check Before Model for Japan:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
```

```
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64
ln_gdp_centered         0
ln_gdp_centered_sq      0
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64

VIF Results for Japan:
                variable        VIF
0        ln_gdp_centered   1.795154
1     ln_gdp_centered_sq  17.259796
2                ln_gini  85.722686
3               ln_unemp  55.227098
4       polstab_centered   3.226998
5   ln_gdp_centered_lag1   1.993844
6  polstab_centered_lag1   3.662021
7        covid_2020_2021   1.209393
Warning for Japan: High VIF detected, potential multicollinearity


OLS Model Summary for Japan:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.569
Model:                            OLS   Adj. R-squared:                  0.387
Method:                 Least Squares   F-statistic:                     1.790
Date:                Fri, 06 Jun 2025   Prob (F-statistic):              0.142
Time:                        08:33:28   Log-Likelihood:                 40.183
No. Observations:                  28   AIC:                            -62.37
Df Residuals:                      19   BIC:                            -50.38
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                     8.2303      9.602      0.857      0.391     -10.589      27.050
ln_gdp_centered           0.0018      0.003      0.665      0.506      -0.004       0.007
ln_gdp_centered_sq       -0.0016      0.001     -2.197      0.028      -0.003      -0.000
ln_gini                   1.6600      2.734      0.607      0.544      -3.698       7.018
ln_unemp                 -0.1801      0.095     -1.895      0.058      -0.366       0.006
polstab_centered         -0.2466      0.258     -0.955      0.340      -0.753       0.259
ln_gdp_centered_lag1     -0.0019      0.004     -0.519      0.604      -0.009       0.005
polstab_centered_lag1    -0.1798      0.232     -0.777      0.437      -0.634       0.274
```

```
covid_2020_2021        -0.2212      0.098     -2.259      0.024     -0.413     -0.029
==============================================================================
Omnibus:                      0.712   Durbin-Watson:                   1.412
Prob(Omnibus):                0.701   Jarque-Bera (JB):                0.646
Skew:                        -0.335   Prob(JB):                        0.724
Kurtosis:                     2.676   Cond. No.                     3.67e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.67e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Japan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Japan: 0.0923

Test RMSE for OLS in Japan: 0.0923

Quadratic Model Summary for Japan:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.569
Model:                            OLS   Adj. R-squared:                  0.387
Method:                 Least Squares   F-statistic:                     1.790
Date:                Fri, 06 Jun 2025   Prob (F-statistic):              0.142
Time:                        08:33:28   Log-Likelihood:                 40.183
No. Observations:                  28   AIC:                            -62.37
Df Residuals:                      19   BIC:                            -50.38
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                            coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                     8.2303      9.602      0.857      0.391     -10.589      27.050
ln_gdp_centered           0.0018      0.003      0.665      0.506      -0.004       0.007
ln_gdp_centered_sq       -0.0016      0.001     -2.197      0.028      -0.003      -0.000
ln_gini                   1.6600      2.734      0.607      0.544      -3.698       7.018
ln_unemp                 -0.1801      0.095     -1.895      0.058      -0.366       0.006
polstab_centered         -0.2466      0.258     -0.955      0.340      -0.753       0.259
ln_gdp_centered_lag1     -0.0019      0.004     -0.519      0.604      -0.009       0.005
polstab_centered_lag1    -0.1798      0.232     -0.777      0.437      -0.634       0.274
covid_2020_2021          -0.2212      0.098     -2.259      0.024      -0.413      -0.029
==============================================================================
Omnibus:                      0.712   Durbin-Watson:                   1.412
Prob(Omnibus):                0.701   Jarque-Bera (JB):                0.646
Skew:                        -0.335   Prob(JB):                        0.724
Kurtosis:                     2.676   Cond. No.                     3.67e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 3.67e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Japan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Japan: 0.0923

2SLS Model Summary for Japan:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.522
Model:                        IV2SLS   Adj. R-squared:                  0.386
Method:                    Two Stage   F-statistic:                     3.833
                       Least Squares   Prob (F-statistic):            0.00975
Date:               Fri, 06 Jun 2025
Time:                       08:33:29
No. Observations:                 28
Df Residuals:                     21
Df Model:                          6
====================================================================================
                      coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const              11.5222      7.449      1.547      0.137      -3.969      27.013
ln_gdp_centered_sq -0.0016      0.001     -2.072      0.051      -0.003    6.02e-06
ln_gini             0.7343      2.105      0.349      0.731      -3.642       5.111
ln_unemp           -0.2090      0.081     -2.574      0.018      -0.378      -0.040
covid_2020_2021    -0.2113      0.063     -3.350      0.003      -0.342      -0.080
ln_gdp_centered    -0.0014      0.005     -0.302      0.766      -0.011       0.008
polstab_centered   -0.6263      0.351     -1.786      0.089      -1.356       0.103
==============================================================================
Omnibus:                        0.340   Durbin-Watson:                   1.698
Prob(Omnibus):                  0.844   Jarque-Bera (JB):                0.298
Skew:                          -0.220   Prob(JB):                        0.861
Kurtosis:                       2.752   Cond. No.                     3.49e+04
==============================================================================
```

Standardized Residuals Check for 2SLS in Japan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Japan: 0.0940

Test RMSE for 2SLS in Japan: 0.0940
Predictions saved to country_results/Japan_predictions.csv

Processing Kazakhstan...

Correlation Matrix for Kazakhstan:

```
                  ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
```

```
ln_gdp_centered          1.000000       0.213523 -0.941382
ln_gdp_centered_sq       0.213523       1.000000 -0.129878
ln_gini                 -0.941382      -0.129878  1.000000
ln_unemp                 0.128980      -0.092382 -0.144887
polstab_centered         0.150426      -0.486356 -0.174493
ln_gdp_centered_lag1     0.967586       0.319133 -0.925696
polstab_centered_lag1    0.264901      -0.353828 -0.307411
covid_2020_2021          0.271352       0.071352 -0.192468

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.128980          0.150426              0.967586
ln_gdp_centered_sq   -0.092382         -0.486356              0.319133
ln_gini              -0.144887         -0.174493             -0.925696
ln_unemp              1.000000          0.483525              0.102452
polstab_centered      0.483525          1.000000              0.055979
ln_gdp_centered_lag1  0.102452          0.055979              1.000000
polstab_centered_lag1  0.431145         0.809010              0.218135
covid_2020_2021       0.010879         -0.140470              0.286189

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                    0.264901         0.271352
ln_gdp_centered_sq                -0.353828         0.071352
ln_gini                           -0.307411        -0.192468
ln_unemp                           0.431145         0.010879
polstab_centered                   0.809010        -0.140470
ln_gdp_centered_lag1               0.218135         0.286189
polstab_centered_lag1              1.000000        -0.120857
covid_2020_2021                   -0.120857         1.000000

NaN/Inf Check Before Model for Kazakhstan:
ln_gdp_centered         0
ln_gdp_centered_sq      0
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64
ln_gdp_centered         0
ln_gdp_centered_sq      0
ln_gini                 0
ln_unemp                0
polstab_centered        0
ln_gdp_centered_lag1    0
polstab_centered_lag1   0
covid_2020_2021         0
dtype: int64

VIF Results for Kazakhstan:
              variable        VIF
0      ln_gdp_centered  20.084914
```

```
1     ln_gdp_centered_sq  103.462951
2              ln_gini  105.409160
3             ln_unemp    7.499532
4      polstab_centered    4.032467
5   ln_gdp_centered_lag1   22.987692
6  polstab_centered_lag1    3.359198
7       covid_2020_2021    1.244807
Warning for Kazakhstan: High VIF detected, potential multicollinearity


OLS Model Summary for Kazakhstan:
                            OLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.627
Model:                           OLS   Adj. R-squared:                  0.470
Method:                Least Squares   F-statistic:                     2.897
Date:               Fri, 06 Jun 2025   Prob (F-statistic):             0.0272
Time:                       08:33:29   Log-Likelihood:                 1.4402
No. Observations:                 28   AIC:                             15.12
Df Residuals:                     19   BIC:                             27.11
Df Model:                          8
Covariance Type:                 HC3
==============================================================================
=========
                           coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                   15.1719     17.565      0.864      0.388     -19.255      49.599
ln_gdp_centered          0.0063      0.107      0.059      0.953      -0.203       0.215
ln_gdp_centered_sq      -0.0053      0.017     -0.303      0.762      -0.040       0.029
ln_gini                 -0.2987      5.321     -0.056      0.955     -10.729      10.131
ln_unemp                -0.2711      0.081     -3.332      0.001      -0.431      -0.112
polstab_centered         0.1954      0.400      0.488      0.625      -0.589       0.980
ln_gdp_centered_lag1     0.0109      0.111      0.098      0.922      -0.207       0.228
polstab_centered_lag1    0.3672      0.312      1.177      0.239      -0.244       0.979
covid_2020_2021          0.1641      0.258      0.635      0.525      -0.342       0.671
==============================================================================
Omnibus:                        0.033   Durbin-Watson:                   2.447
Prob(Omnibus):                  0.984   Jarque-Bera (JB):                0.094
Skew:                          -0.046   Prob(JB):                        0.954
Kurtosis:                       2.732   Cond. No.                     6.49e+03
==============================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 6.49e+03. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Kazakhstan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Kazakhstan: 0.3325
```

Test RMSE for OLS in Kazakhstan: 0.3325

Quadratic Model Summary for Kazakhstan:

OLS Regression Results

==

Dep. Variable:	ln_net_migration	R-squared:	0.627
Model:	OLS	Adj. R-squared:	0.470
Method:	Least Squares	F-statistic:	2.897
Date:	Fri, 06 Jun 2025	Prob (F-statistic):	0.0272
Time:	08:33:29	Log-Likelihood:	1.4402
No. Observations:	28	AIC:	15.12
Df Residuals:	19	BIC:	27.11
Df Model:	8		
Covariance Type:	HC3		

==

	coef	std err	z	P>|z|	[0.025	0.975]
const	15.1719	17.565	0.864	0.388	-19.255	49.599
ln_gdp_centered	0.0063	0.107	0.059	0.953	-0.203	0.215
ln_gdp_centered_sq	-0.0053	0.017	-0.303	0.762	-0.040	0.029
ln_gini	-0.2987	5.321	-0.056	0.955	-10.729	10.131
ln_unemp	-0.2711	0.081	-3.332	0.001	-0.431	-0.112
polstab_centered	0.1954	0.400	0.488	0.625	-0.589	0.980
ln_gdp_centered_lag1	0.0109	0.111	0.098	0.922	-0.207	0.228
polstab_centered_lag1	0.3672	0.312	1.177	0.239	-0.244	0.979
covid_2020_2021	0.1641	0.258	0.635	0.525	-0.342	0.671

==

Omnibus:	0.033	Durbin-Watson:	2.447
Prob(Omnibus):	0.984	Jarque-Bera (JB):	0.094
Skew:	-0.046	Prob(JB):	0.954
Kurtosis:	2.732	Cond. No.	6.49e+03

==

Notes:

[1] Standard Errors are heteroscedasticity robust (HC3)

[2] The condition number is large, 6.49e+03. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Kazakhstan (absolute values > 3):

Series([], dtype: float64)

Test RMSE for Quadratic in Kazakhstan: 0.3325

2SLS Model Summary for Kazakhstan:

IV2SLS Regression Results

==

Dep. Variable:	ln_net_migration	R-squared:	0.500
Model:	IV2SLS	Adj. R-squared:	0.357
Method:	Two Stage	F-statistic:	4.298
	Least Squares	Prob (F-statistic):	0.00559
Date:	Fri, 06 Jun 2025		

```
Time:                    08:33:29
No. Observations:              28
Df Residuals:                  21
Df Model:                       6
================================================================================
======
                  coef    std err          t      P>|t|      [0.025      0.975]
--------------------------------------------------------------------------------
const               13.9463      7.134      1.955      0.064      -0.889      28.781
ln_gdp_centered_sq     0.0011      0.010      0.109      0.914      -0.019       0.021
ln_gini             -0.0422      2.102      -0.020      0.984      -4.413       4.328
ln_unemp            -0.3276      0.091      -3.607      0.002      -0.517      -0.139
covid_2020_2021       0.2128      0.290      0.734      0.471      -0.390       0.815
ln_gdp_centered       0.0205      0.033      0.616      0.544      -0.049       0.090
polstab_centered      0.8278      0.415      1.996      0.059      -0.035       1.690
==============================================================================
Omnibus:                    1.114   Durbin-Watson:                  1.773
Prob(Omnibus):                  0.573   Jarque-Bera (JB):                1.084
Skew:                     -0.367   Prob(JB):                     0.582
Kurtosis:                     2.376   Cond. No.                  6.10e+03
==============================================================================

Standardized Residuals Check for 2SLS in Kazakhstan (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Kazakhstan: 0.3724

Test RMSE for 2SLS in Kazakhstan: 0.3724
Predictions saved to country_results/Kazakhstan_predictions.csv

Processing Korea Rep....

Correlation Matrix for Korea Rep.:
                   ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000            0.025775  0.554023
ln_gdp_centered_sq           0.025775            1.000000  0.354704
ln_gini                     0.554023            0.354704  1.000000
ln_unemp                    0.139316            0.029402  0.171500
polstab_centered            -0.279518            0.223398 -0.387665
ln_gdp_centered_lag1         0.963367            0.138548  0.582733
polstab_centered_lag1       -0.347097            0.184068 -0.411025
covid_2020_2021             0.262622            0.277701  0.205915

                   ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered        0.139316         -0.279518              0.963367
ln_gdp_centered_sq     0.029402          0.223398              0.138548
ln_gini               0.171500         -0.387665              0.582733
ln_unemp              1.000000         -0.156074              0.129486
polstab_centered      -0.156074          1.000000             -0.284872
ln_gdp_centered_lag1   0.129486         -0.284872              1.000000
polstab_centered_lag1 -0.186423          0.802727             -0.331552
covid_2020_2021        0.162115          0.280450              0.274720
```

```
                     polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                  -0.347097         0.262622
ln_gdp_centered_sq                0.184068         0.277701
ln_gini                          -0.411025         0.205915
ln_unemp                         -0.186423         0.162115
polstab_centered                  0.802727         0.280450
ln_gdp_centered_lag1             -0.331552         0.274720
polstab_centered_lag1             1.000000         0.213396
covid_2020_2021                   0.213396         1.000000

NaN/Inf Check Before Model for Korea Rep.:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for Korea Rep.:
                variable         VIF
0        ln_gdp_centered   17.435293
1     ln_gdp_centered_sq   67.777529
2                ln_gini  124.469961
3               ln_unemp   60.764816
4       polstab_centered    3.083142
5   ln_gdp_centered_lag1   17.836048
6  polstab_centered_lag1    3.010081
7        covid_2020_2021    1.448981
Warning for Korea Rep.: High VIF detected, potential multicollinearity


OLS Model Summary for Korea Rep.:
                            OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.458
Model:                            OLS   Adj. R-squared:                  0.230
Method:                 Least Squares   F-statistic:                     1.984
Date:                Fri, 06 Jun 2025   Prob (F-statistic):              0.105
Time:                        08:33:29   Log-Likelihood:                 10.395
```

```
No. Observations:                28   AIC:                         -2.789
Df Residuals:                    19   BIC:                          9.201
Df Model:                         8
Covariance Type:                HC3
==========================================================================================
=========
                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                  18.9076      7.399      2.555      0.011       4.406      33.409
ln_gdp_centered         0.0144      0.070      0.206      0.837      -0.122       0.151
ln_gdp_centered_sq      0.0083      0.007      1.273      0.203      -0.004       0.021
ln_gini                -1.7242      2.187     -0.788      0.430      -6.010       2.562
ln_unemp                0.0164      0.282      0.058      0.954      -0.535       0.568
polstab_centered       -0.3765      0.474     -0.794      0.427      -1.306       0.553
ln_gdp_centered_lag1   -0.0014      0.071     -0.020      0.984      -0.141       0.138
polstab_centered_lag1  -0.3386      0.616     -0.549      0.583      -1.547       0.869
covid_2020_2021        -0.0547      0.165     -0.332      0.740      -0.377       0.268
==========================================================================================
Omnibus:                        0.047   Durbin-Watson:                   1.677
Prob(Omnibus):                  0.977   Jarque-Bera (JB):                0.225
Skew:                          -0.074   Prob(JB):                        0.893
Kurtosis:                       2.586   Cond. No.                     1.78e+04
==========================================================================================

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.78e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in Korea Rep. (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in Korea Rep.: 0.0722

Test RMSE for OLS in Korea Rep.: 0.0722

Quadratic Model Summary for Korea Rep.:
                            OLS Regression Results
==========================================================================================
Dep. Variable:        ln_net_migration   R-squared:                       0.458
Model:                             OLS   Adj. R-squared:                  0.230
Method:                  Least Squares   F-statistic:                     1.984
Date:                 Fri, 06 Jun 2025   Prob (F-statistic):              0.105
Time:                         08:33:29   Log-Likelihood:                 10.395
No. Observations:                   28   AIC:                            -2.789
Df Residuals:                       19   BIC:                             9.201
Df Model:                            8
Covariance Type:                   HC3
==========================================================================================
=========
                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
```

const	18.9076	7.399	2.555	0.011	4.406	33.409
ln_gdp_centered	0.0144	0.070	0.206	0.837	-0.122	0.151
ln_gdp_centered_sq	0.0083	0.007	1.273	0.203	-0.004	0.021
ln_gini	-1.7242	2.187	-0.788	0.430	-6.010	2.562
ln_unemp	0.0164	0.282	0.058	0.954	-0.535	0.568
polstab_centered	-0.3765	0.474	-0.794	0.427	-1.306	0.553
ln_gdp_centered_lag1	-0.0014	0.071	-0.020	0.984	-0.141	0.138
polstab_centered_lag1	-0.3386	0.616	-0.549	0.583	-1.547	0.869
covid_2020_2021	-0.0547	0.165	-0.332	0.740	-0.377	0.268

==

Omnibus:	0.047	Durbin-Watson:	1.677
Prob(Omnibus):	0.977	Jarque-Bera (JB):	0.225
Skew:	-0.074	Prob(JB):	0.893
Kurtosis:	2.586	Cond. No.	1.78e+04

==

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.78e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in Korea Rep. (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in Korea Rep.: 0.0722

2SLS Model Summary for Korea Rep.:
IV2SLS Regression Results

==

Dep. Variable:	ln_net_migration	R-squared:	0.442
Model:	IV2SLS	Adj. R-squared:	0.282
Method:	Two Stage	F-statistic:	2.676
	Least Squares	Prob (F-statistic):	0.0434
Date:	Fri, 06 Jun 2025		
Time:	08:33:30		
No. Observations:	28		
Df Residuals:	21		
Df Model:	6		

==

	coef	std err	t	P>|t|	[0.025	0.975]
const	19.7978	8.657	2.287	0.033	1.795	37.800
ln_gdp_centered_sq	0.0075	0.004	1.894	0.072	-0.001	0.016
ln_gini	-1.9594	2.509	-0.781	0.443	-7.176	3.257
ln_unemp	0.0071	0.225	0.031	0.975	-0.460	0.474
covid_2020_2021	0.0097	0.222	0.044	0.965	-0.452	0.472
ln_gdp_centered	0.0118	0.007	1.749	0.095	-0.002	0.026
polstab_centered	-0.8085	0.528	-1.531	0.141	-1.907	0.290

==

Omnibus:	0.072	Durbin-Watson:	1.613
Prob(Omnibus):	0.965	Jarque-Bera (JB):	0.285

```
Skew:                           0.048   Prob(JB):                       0.867
Kurtosis:                       2.515   Cond. No.                    1.73e+04
==============================================================================

Standardized Residuals Check for 2SLS in Korea Rep. (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in Korea Rep.: 0.0688

Test RMSE for 2SLS in Korea Rep.: 0.0688
Predictions saved to country_results/Korea_Rep._predictions.csv

Processing United Kingdom...

Correlation Matrix for United Kingdom:
                      ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered              1.000000           -0.055803 -0.602144
ln_gdp_centered_sq          -0.055803            1.000000 -0.313445
ln_gini                     -0.602144           -0.313445  1.000000
ln_unemp                    -0.559414            0.368797  0.181691
polstab_centered            -0.899136            0.245921  0.494768
ln_gdp_centered_lag1         0.962193            0.099857 -0.610717
polstab_centered_lag1       -0.913028            0.054089  0.538532
covid_2020_2021              0.219500            0.033955 -0.339612

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered      -0.559414         -0.899136              0.962193
ln_gdp_centered_sq    0.368797          0.245921              0.099857
ln_gini               0.181691          0.494768             -0.610717
ln_unemp              1.000000          0.539639             -0.507813
polstab_centered      0.539639          1.000000             -0.835385
ln_gdp_centered_lag1 -0.507813         -0.835385              1.000000
polstab_centered_lag1  0.509728          0.838743             -0.905969
covid_2020_2021      -0.243646         -0.120497              0.227520

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.913028         0.219500
ln_gdp_centered_sq                 0.054089         0.033955
ln_gini                            0.538532        -0.339612
ln_unemp                           0.509728        -0.243646
polstab_centered                   0.838743        -0.120497
ln_gdp_centered_lag1              -0.905969         0.227520
polstab_centered_lag1              1.000000        -0.114225
covid_2020_2021                   -0.114225         1.000000

NaN/Inf Check Before Model for United Kingdom:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
```

polstab_centered_lag1   0
covid_2020_2021   0
dtype: int64
ln_gdp_centered   0
ln_gdp_centered_sq   0
ln_gini   0
ln_unemp   0
polstab_centered   0
ln_gdp_centered_lag1   0
polstab_centered_lag1   0
covid_2020_2021   0
dtype: int64

VIF Results for United Kingdom:

	variable	VIF
0	ln_gdp_centered	25.719946
1	ln_gdp_centered_sq	151.306006
2	ln_gini	148.433517
3	ln_unemp	112.931380
4	polstab_centered	6.769341
5	ln_gdp_centered_lag1	22.124737
6	polstab_centered_lag1	7.059510
7	covid_2020_2021	1.236815

Warning for United Kingdom: High VIF detected, potential multicollinearity

OLS Model Summary for United Kingdom:

OLS Regression Results

==

Dep. Variable:	ln_net_migration	R-squared:	0.852
Model:	OLS	Adj. R-squared:	0.790
Method:	Least Squares	F-statistic:	16.42
Date:	Fri, 06 Jun 2025	Prob (F-statistic):	5.11e-07
Time:	08:33:30	Log-Likelihood:	43.058
No. Observations:	28	AIC:	-68.12
Df Residuals:	19	BIC:	-56.13
Df Model:	8		
Covariance Type:	HC3		

===

	coef	std err	z	P>|z|	[0.025	0.975]
const	12.8667	1.990	6.465	0.000	8.966	16.768
ln_gdp_centered	0.0398	0.078	0.507	0.612	-0.114	0.194
ln_gdp_centered_sq	-0.0006	0.003	-0.206	0.837	-0.007	0.005
ln_gini	0.3390	0.493	0.688	0.491	-0.626	1.304
ln_unemp	-0.1449	0.087	-1.669	0.095	-0.315	0.025
polstab_centered	-0.0252	0.148	-0.171	0.864	-0.315	0.264
ln_gdp_centered_lag1	-0.0256	0.081	-0.318	0.750	-0.184	0.132
polstab_centered_lag1	0.1076	0.112	0.965	0.335	-0.111	0.326
covid_2020_2021	-0.0153	0.243	-0.063	0.950	-0.492	0.461

==

Omnibus:	5.068	Durbin-Watson:	1.862
Prob(Omnibus):	0.079	Jarque-Bera (JB):	5.035
Skew:	0.033	Prob(JB):	0.0807
Kurtosis:	5.076	Cond. No.	1.38e+04

==

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 1.38e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in United Kingdom (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in United Kingdom: 0.1916

Test RMSE for OLS in United Kingdom: 0.1916

Quadratic Model Summary for United Kingdom:
OLS Regression Results

==

Dep. Variable:	ln_net_migration	R-squared:	0.852
Model:	OLS	Adj. R-squared:	0.790
Method:	Least Squares	F-statistic:	16.42
Date:	Fri, 06 Jun 2025	Prob (F-statistic):	5.11e-07
Time:	08:33:30	Log-Likelihood:	43.058
No. Observations:	28	AIC:	-68.12
Df Residuals:	19	BIC:	-56.13
Df Model:	8		
Covariance Type:	HC3		

===

	coef	std err	z	P>|z|	[0.025	0.975]
const	12.8667	1.990	6.465	0.000	8.966	16.768
ln_gdp_centered	0.0398	0.078	0.507	0.612	-0.114	0.194
ln_gdp_centered_sq	-0.0006	0.003	-0.206	0.837	-0.007	0.005
ln_gini	0.3390	0.493	0.688	0.491	-0.626	1.304
ln_unemp	-0.1449	0.087	-1.669	0.095	-0.315	0.025
polstab_centered	-0.0252	0.148	-0.171	0.864	-0.315	0.264
ln_gdp_centered_lag1	-0.0256	0.081	-0.318	0.750	-0.184	0.132
polstab_centered_lag1	0.1076	0.112	0.965	0.335	-0.111	0.326
covid_2020_2021	-0.0153	0.243	-0.063	0.950	-0.492	0.461

==

Omnibus:	5.068	Durbin-Watson:	1.862
Prob(Omnibus):	0.079	Jarque-Bera (JB):	5.035
Skew:	0.033	Prob(JB):	0.0807
Kurtosis:	5.076	Cond. No.	1.38e+04

==

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)

[2] The condition number is large, 1.38e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in United Kingdom (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in United Kingdom: 0.1916

2SLS Model Summary for United Kingdom:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                   -102.691
Model:                        IV2SLS   Adj. R-squared:              -132.316
Method:                    Two Stage   F-statistic:                  0.02823
                       Least Squares   Prob (F-statistic):              1.00
Date:               Fri, 06 Jun 2025
Time:                       08:33:30
No. Observations:                 28
Df Residuals:                     21
Df Model:                          6
====================================================================================
                        coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const                -3.7108    499.962     -0.007      0.994   -1043.438    1036.017
ln_gdp_centered_sq    0.1285      3.900      0.033      0.974      -7.982       8.239
ln_gini               2.6024     68.568      0.038      0.970    -139.992     145.197
ln_unemp             -1.2421     32.964     -0.038      0.970     -69.795      67.311
covid_2020_2021       1.1225     33.963      0.033      0.974     -69.508      71.753
ln_gdp_centered      -0.3842     11.960     -0.032      0.975     -25.256      24.487
polstab_centered    -13.1349    397.314     -0.033      0.974    -839.395     813.125
==============================================================================
Omnibus:                        4.190   Durbin-Watson:                   2.148
Prob(Omnibus):                  0.123   Jarque-Bera (JB):                2.526
Skew:                          -0.570   Prob(JB):                        0.283
Kurtosis:                       3.931   Cond. No.                     1.37e+04
==============================================================================
```

Standardized Residuals Check for 2SLS in United Kingdom (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in United Kingdom: 2.2410

Test RMSE for 2SLS in United Kingdom: 2.2410
Predictions saved to country_results/United_Kingdom_predictions.csv

Processing United States...

Correlation Matrix for United States:

```
                    ln_gdp_centered  ln_gdp_centered_sq   ln_gini  \
ln_gdp_centered            1.000000            0.041627  0.628053
ln_gdp_centered_sq         0.041627            1.000000 -0.318295
```

```
ln_gini                0.628053          -0.318295  1.000000
ln_unemp               0.061186          -0.117042 -0.240686
polstab_centered      -0.611922           0.282983 -0.491471
ln_gdp_centered_lag1   0.969244           0.149519  0.593417
polstab_centered_lag1 -0.711435           0.262362 -0.502760
covid_2020_2021        0.264391           0.288228 -0.100627

                      ln_unemp  polstab_centered  ln_gdp_centered_lag1  \
ln_gdp_centered       0.061186         -0.611922              0.969244
ln_gdp_centered_sq   -0.117042          0.282983              0.149519
ln_gini              -0.240686         -0.491471              0.593417
ln_unemp              1.000000          0.080932              0.084732
polstab_centered      0.080932          1.000000             -0.530548
ln_gdp_centered_lag1  0.084732         -0.530548              1.000000
polstab_centered_lag1 0.087249          0.883524             -0.604595
covid_2020_2021       0.147216         -0.391622              0.277284

                      polstab_centered_lag1  covid_2020_2021
ln_gdp_centered                   -0.711435         0.264391
ln_gdp_centered_sq                 0.262362         0.288228
ln_gini                           -0.502760        -0.100627
ln_unemp                           0.087249         0.147216
polstab_centered                   0.883524        -0.391622
ln_gdp_centered_lag1              -0.604595         0.277284
polstab_centered_lag1              1.000000        -0.372740
covid_2020_2021                   -0.372740         1.000000

NaN/Inf Check Before Model for United States:
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64
ln_gdp_centered          0
ln_gdp_centered_sq       0
ln_gini                  0
ln_unemp                 0
polstab_centered         0
ln_gdp_centered_lag1     0
polstab_centered_lag1    0
covid_2020_2021          0
dtype: int64

VIF Results for United States:
             variable         VIF
0     ln_gdp_centered   30.958025
1  ln_gdp_centered_sq   69.109817
2             ln_gini  210.909976
```

```
3            ln_unemp   94.560328
4       polstab_centered    5.053493
5   ln_gdp_centered_lag1   25.187658
6  polstab_centered_lag1    7.497052
7        covid_2020_2021    1.901795
```

Warning for United States: High VIF detected, potential multicollinearity

OLS Model Summary for United States:

```
                    OLS Regression Results
==============================================================================
Dep. Variable:       ln_net_migration   R-squared:                       0.777
Model:                            OLS   Adj. R-squared:                  0.682
Method:                 Least Squares   F-statistic:                     5.437
Date:                Fri, 06 Jun 2025   Prob (F-statistic):            0.00118
Time:                        08:33:30   Log-Likelihood:                 21.539
No. Observations:                  28   AIC:                            -25.08
Df Residuals:                      19   BIC:                            -13.09
Df Model:                           8
Covariance Type:                  HC3
=========================================================================================
                           coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                   -6.2790      6.261     -1.003      0.316     -18.550       5.992
ln_gdp_centered         -0.0014      0.224     -0.006      0.995      -0.441       0.438
ln_gdp_centered_sq       0.0037      0.003      1.114      0.265      -0.003       0.010
ln_gini                  5.4018      1.621      3.333      0.001       2.225       8.578
ln_unemp                 0.2178      0.175      1.243      0.214      -0.126       0.561
polstab_centered        -0.1961      0.132     -1.490      0.136      -0.454       0.062
ln_gdp_centered_lag1     0.0022      0.221      0.010      0.992      -0.431       0.435
polstab_centered_lag1    0.0404      0.272      0.148      0.882      -0.493       0.574
covid_2020_2021         -0.6327      0.300     -2.106      0.035      -1.221      -0.044
==============================================================================
Omnibus:                        0.974   Durbin-Watson:                   2.053
Prob(Omnibus):                  0.615   Jarque-Bera (JB):                0.174
Skew:                          -0.005   Prob(JB):                        0.917
Kurtosis:                       3.386   Cond. No.                     2.11e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 2.11e+04. This might indicate that there are strong multicollinearity or other numerical problems.

Standardized Residuals Check for OLS in United States (absolute values > 3):
Series([], dtype: float64)

Test RMSE for OLS in United States: 0.1182

Test RMSE for OLS in United States: 0.1182

Quadratic Model Summary for United States:

```
                            OLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.777
Model:                           OLS   Adj. R-squared:                  0.682
Method:                Least Squares   F-statistic:                     5.437
Date:               Fri, 06 Jun 2025   Prob (F-statistic):            0.00118
Time:                       08:33:30   Log-Likelihood:                 21.539
No. Observations:                 28   AIC:                            -25.08
Df Residuals:                     19   BIC:                            -13.09
Df Model:                          8
Covariance Type:                 HC3
================================================================================
=========
                          coef    std err          z      P>|z|      [0.025      0.975]
-----------------------------------------------------------------------------------------
const                  -6.2790      6.261     -1.003      0.316     -18.550       5.992
ln_gdp_centered        -0.0014      0.224     -0.006      0.995      -0.441       0.438
ln_gdp_centered_sq      0.0037      0.003      1.114      0.265      -0.003       0.010
ln_gini                 5.4018      1.621      3.333      0.001       2.225       8.578
ln_unemp                0.2178      0.175      1.243      0.214      -0.126       0.561
polstab_centered       -0.1961      0.132     -1.490      0.136      -0.454       0.062
ln_gdp_centered_lag1    0.0022      0.221      0.010      0.992      -0.431       0.435
polstab_centered_lag1   0.0404      0.272      0.148      0.882      -0.493       0.574
covid_2020_2021        -0.6327      0.300     -2.106      0.035      -1.221      -0.044
==============================================================================
Omnibus:                        0.974   Durbin-Watson:                   2.053
Prob(Omnibus):                  0.615   Jarque-Bera (JB):                0.174
Skew:                          -0.005   Prob(JB):                        0.917
Kurtosis:                       3.386   Cond. No.                     2.11e+04
==============================================================================
```

Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)
[2] The condition number is large, 2.11e+04. This might indicate that there are
strong multicollinearity or other numerical problems.

Standardized Residuals Check for Quadratic in United States (absolute values > 3):
Series([], dtype: float64)

Test RMSE for Quadratic in United States: 0.1182

2SLS Model Summary for United States:

```
                          IV2SLS Regression Results
==============================================================================
Dep. Variable:      ln_net_migration   R-squared:                       0.755
Model:                        IV2SLS   Adj. R-squared:                  0.685
Method:                    Two Stage   F-statistic:                     10.89
                       Least Squares   Prob (F-statistic):            1.55e-05
Date:               Fri, 06 Jun 2025
Time:                       08:33:30
No. Observations:                 28
```

```
Df Residuals:                 21
Df Model:                      6
==============================================================================
======
                     coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const              -4.9424      8.421     -0.587      0.564     -22.455      12.570
ln_gdp_centered_sq     0.0009      0.011      0.074      0.941      -0.023       0.025
ln_gini             5.1454      1.936      2.657      0.015       1.119       9.172
ln_unemp            0.1410      0.331      0.426      0.674      -0.547       0.829
covid_2020_2021     -0.4900      0.523     -0.936      0.360      -1.578       0.599
ln_gdp_centered      0.0043      0.015      0.286      0.778      -0.027       0.035
polstab_centered     0.0328      0.690      0.047      0.963      -1.403       1.469
==============================================================================
Omnibus:                        0.345   Durbin-Watson:                   1.945
Prob(Omnibus):                  0.842   Jarque-Bera (JB):                0.005
Skew:                          -0.024   Prob(JB):                        0.998
Kurtosis:                       3.043   Cond. No.                     1.93e+04
==============================================================================

Standardized Residuals Check for 2SLS in United States (absolute values > 3):
Series([], dtype: float64)

Test RMSE for 2SLS in United States: 0.0694

Test RMSE for 2SLS in United States: 0.0694
Predictions saved to country_results/United_States_predictions.csv

Processing complete for all countries. Check 'country_results/error_log.txt' for details on any errors.
```