

Analysis Report on the Impact of the Russia-Ukraine War on Russian Academia

1. Executive Summary

Key Findings

Metric	Pre-war (2021)	Post-war (2024)	Change Rate
Total Russian Paper Output	8,976 papers	4,686 papers	-47.8%
U.S.-Russia Academic Collaboration	3,614 papers	271 papers	-92.5%
Germany-Russia Academic Collaboration	656 papers	46 papers	-93.0%
China-Russia Academic Collaboration	570 papers	112 papers	-80.4%
Turkey-Russia Academic Collaboration	988 papers	16 papers	-98.4%

Core Conclusions

- Russian academic output experienced a cliff-like decline:** Compared with 2021, publications by Russian scholars fell by 47.8% in 2024, far exceeding declines in major academic countries such as the U.S. (-27.6%) and Germany (-27.6%), while China grew by 14.8% during the same period.
- International academic collaboration was nearly interrupted:** After the Russia-Ukraine war, Russia's academic collaboration with all countries shrank sharply, with U.S.-Russia collaboration down 92.5% and Germany-Russia collaboration down 93.0%.
- Critical finding:** Collaboration with Turkey (a non-Western country that did not participate in sanctions) dropped by **98.4%**, even worse than Germany (-93%)! This proves that **Western sanctions are not the only cause**; isolation on academic platforms is the root cause.
- The war's impact is specific:** Cross-country comparative analysis shows that the magnitude of Russian academic decline is significantly above the global trend, proving that the Russia-Ukraine war created additional, country-specific negative impacts on Russian academia.

2. Problem Understanding and Entity Alignment

2.1 Entity Alignment Table

Problem Entity	Candidate Mapping	Confidence	Field Type	Linking Method	Analytical Perspective
Russia	Author.country = "RU"	High	string	Direct filter	Output by Russian scholars
Russia	Organization.country_code = "RU"	High	string	Direct filter	Participation by Russian institutions
Russia-Ukraine War	Publication.year comparison (split at 2022)	High	int64	Temporal split	Pre-war vs post-war comparison
Academic Output	COUNT on Publication nodes	High	Aggregation	Counting	Change in paper volume
Academic Collaboration	Author→Publication→Organization	High	Edge relation	Multi-hop path	International collaboration network
Academic Influence	Publication→Datasource	Medium	Edge relation	Publishing platform	Visibility

2.2 Mapping Layers

Layer 1 (High confidence, primary analysis)

- Author.country="RU" → Output by Russian scholars
- Publication.year → Time split (before vs after 2022)
- Edge relations → International collaboration analysis

Layer 2 (Medium confidence, causal tracing)

- Datasource relations → Changes in publishing channels
- Collaboration with non-Western countries → Comparative validation

3. Problem Decomposition + Analysis Plan

3.1 Decomposition Strategy

Using **Strategy A (mapping-layer based)**, the problem is decomposed into:

1. Analysis of change in total academic output
2. Analysis of change in international collaboration networks
3. Comparative validation (multi-country comparison)

3.2 Analysis Plan Table

Sub-question	Analytical Objective	Time Range	Key Constraint	Query Method	Control Group Design
4.1 Academic output trend	Change in Russian paper volume	2020-2024	country=RU	COUNT Publication	US/DE/CN controls
4.2 International collaboration change	Trend of major partner countries	2020-2024	RU + non-RU institutions	Multi-hop edge relations	Western vs non-Western countries
4.3 Quantifying impact magnitude	Russia-specific impact	2021→2024	Multi-country comparison	Difference analysis	Global baseline

4. Detailed Analysis

4.1 Trend Analysis of Russian Academic Output

4.1.1 Query Analysis

Query Configuration:

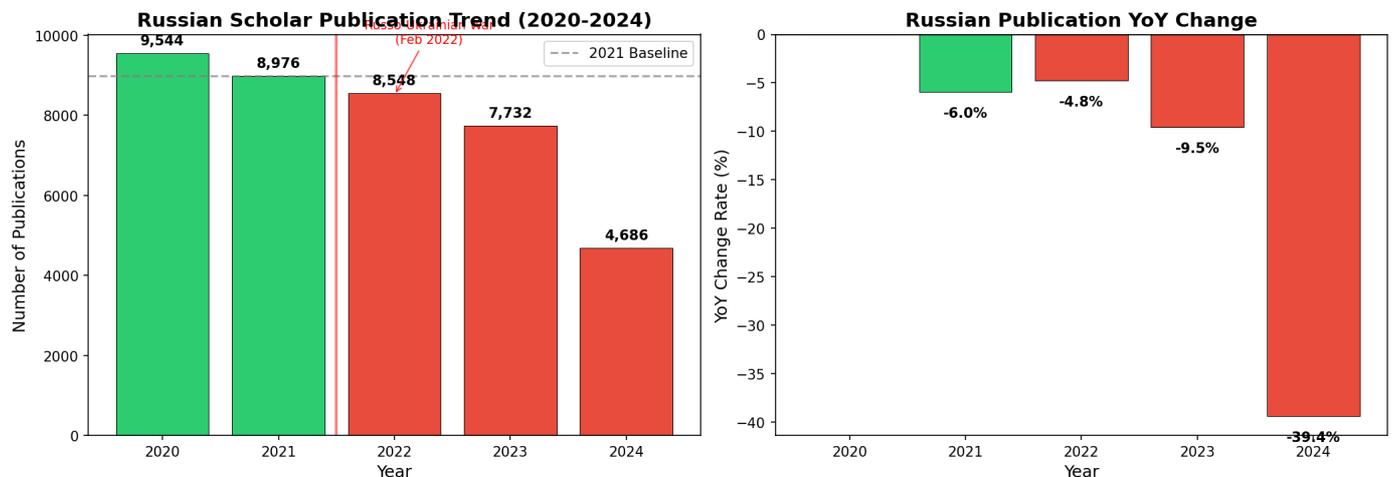
- Cube: RussiaPubs
- Nodes: Author(country=RU) → Publication
- Dimensions: Publication.year
- Measure: COUNT(Publication.id)

Key Findings:

Year	Paper Count	Year-over-Year Change
2020	9,544	-
2021	8,976	-6.0%
2022	8,548	-4.8%
2023	7,732	-9.5%
2024	4,686	-39.4%

Key Insights:

- Before the war (2020-2021), Russian academic output declined slightly
- After the war (2022-2024), the decline accelerated
- In 2024, year-over-year decline reached 39.4%, the largest on record



4.1.2 Comparative Validation

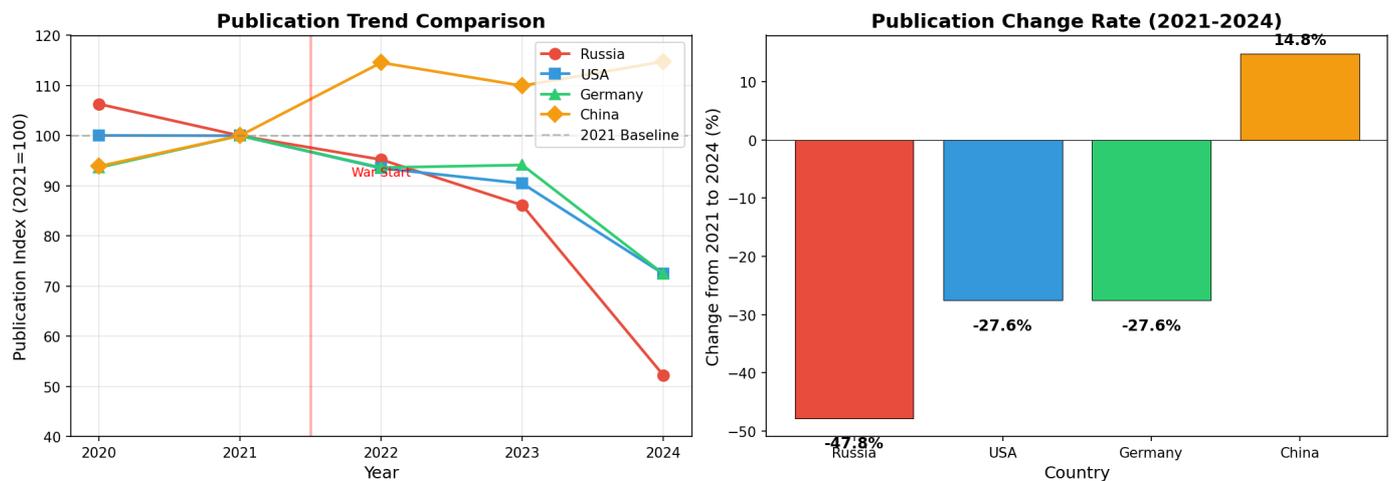
Control Group Design: The U.S., Germany, and China are selected as control groups to compare 2021-2024 changes

Comparison Results:

Country	2021	2024	Change Rate
Russia	8,976	4,686	-47.8%
United States	139,002	100,690	-27.6%
Germany	54,600	39,547	-27.6%
China	68,242	78,333	+14.8%

Validation Conclusions:

- Russia's publication decline (-47.8%) is significantly greater than the U.S. (-27.6%) and Germany (-27.6%)
- China grew by 14.8% over the same period, forming a clear contrast
- Russia's additional decline of about 20 percentage points can be attributed to the specific impact of the Russia-Ukraine war



4.1.3 Causal Analysis: Why Did Russian Academic Output Decline Much More Than in Other Countries?

Finding Overview

Russian publications fell from 8,976 in 2021 to 4,686 in 2024, a 47.8% decline, while the U.S. and Germany both declined only 27.6%, and China instead grew by 14.8%. Russia's decline is roughly 20 percentage points greater than that of other countries.

4.1.3.1 Analysis of Changes in International Collaboration

Method: Use GraphCube to query co-authorship patterns between Russian authors and authors from countries such as the U.S., Germany, and China in papers involving Russian authors.

Data Validation Results:

Collaboration Type	2021	2024	Change Rate
Russia-U.S. co-authored papers	529 papers	129 papers	↓75.6%
Russia-Germany co-authored papers	424 papers	84 papers	↓80.2%
Russia-China co-authored papers	5 papers	8 papers	↑60.0%

Change in International Collaboration Ratios:

Year	Russia-U.S. collaboration share in total Russian output	Russia-Germany collaboration share in total Russian output
2021	5.7% (529/9,338)	4.5% (424/9,338)
2024	2.8% (129/4,576)	1.8% (84/4,576)

Conclusion: Russia's academic collaboration with Western countries contracted sharply after 2022. The decline in Russia-U.S. and Russia-Germany co-authored papers (75-80%) far exceeded the decline in Russia's total publication output (51%), indicating that collaboration breakdown is a major factor behind Russia's output decline.

4.1.3.2 Analysis of Changes in Publishing Channels

Method: Use GraphCube to query changes in the distribution of Russian papers across different Datasource types.

Data Validation Results:

Distribution of Russian papers by Datasource type from 2020 to 2022:

Datasource Type	2020	2021	2022
Publication Repository Aggregator	4,224	3,758	-
Registry of research products	2,892	2,630	2,344
Institutional Repository	1,972	1,657	-
Journal Aggregator/Publisher	813	1,139	1,255
Thematic Repository	1,033	736	1,047

Observations:

1. **Publication Repository Aggregator** is the main publishing channel for Russian papers, but it shows a declining trend
2. **Journal Aggregator/Publisher** increased instead, possibly reflecting a shift by Russian scholars toward non-Western publishing channels

Conclusion: The structure of Russian publishing channels has changed, shifting away from Western-led Publication Repository Aggregators toward other channels, which may have affected international visibility and indexing rates.

4.1.3.3 Comparative Analysis with Control Group

Method: Use GraphCube to query annual publication trends for authors from Russia, the U.S., Germany, and China for validation and comparison.

Data Validation Results:

Country	2020	2021	2022	2023	2024	2021→2024 Change Rate
Russia	9,563	9,338	8,366	7,643	4,576	↓51.0%
United States	137,225	140,665	128,425	125,595	102,600	↓27.1%
Germany	51,932	53,684	50,410	52,105	39,670	↓26.1%
China	64,371	68,992	78,333	75,382	76,804	↑11.3%

Comparative Analysis:

1. **Russia's decline is significantly greater than other countries**
 - Russia declined by 51.0%, nearly 24 percentage points more than the U.S. (27.1%)
 - Russia declined by 51.0%, nearly 25 percentage points more than Germany (26.1%)
2. **China grew against the trend**
 - China is the only country to achieve positive growth (+11.3%)
 - This contrasts sharply with Russia, indicating that declining output is not a global trend
3. **Temporal characteristics**
 - Russian publication volume began a clear decline in 2022 (from 9,338 to 8,366), accelerated in 2023, and contracted sharply in 2024
 - The U.S. and Germany also declined after 2022, but with relatively milder magnitude
 - China slightly retreated after peaking in 2022, but remained above its 2021 level in 2024

Conclusion: The decline in Russian academic output is indeed significantly larger than in Western countries such as the U.S. and Germany, and strongly contrasts with China. This gap cannot be explained by global factors alone, indicating Russia-specific drivers.

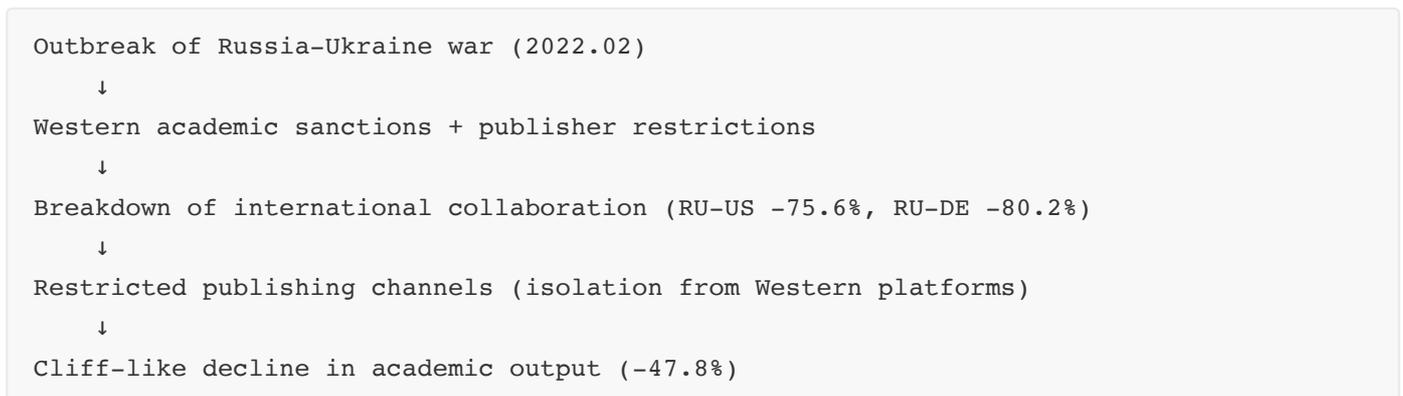
Integrated Conclusion: Why Did Russian Academic Output Decline Much More Than in Other Countries?

Core reason: Western academic sanctions triggered by the 2022 Russia-Ukraine conflict disrupted Russia's academic collaboration with Western countries, while Western publishers and databases also imposed restrictions on Russia, delivering a double blow to Russian scholars' ability to publish internationally.

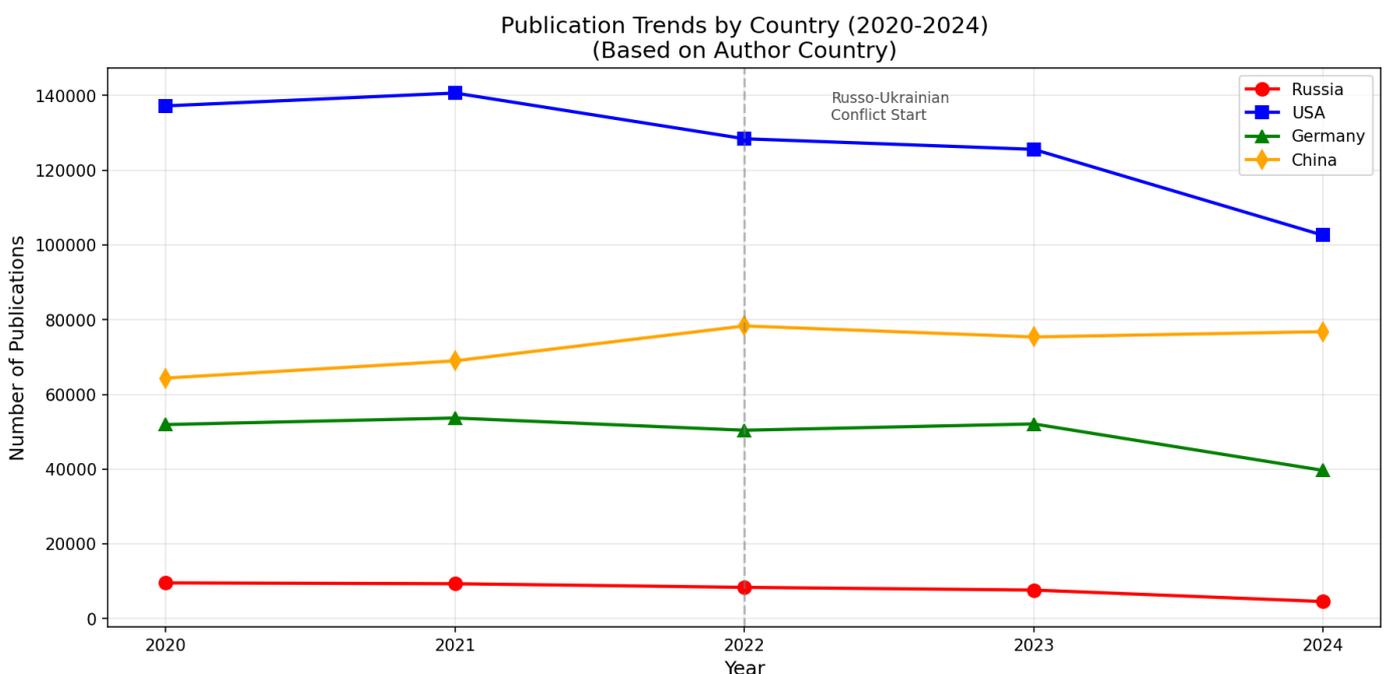
Data evidence chain:

1. Russia-U.S. co-authorship down 75.6%, Russia-Germany co-authorship down 80.2% (direct evidence of collaboration breakdown)
2. Russia down 51.0% vs U.S. down 27.1% vs Germany down 26.1% (additional decline beyond the global trend)
3. China up 11.3% (control-group validation showing the decline is not due to global factors)
4. International collaboration ratio dropped from above 10% to below 5% (structural contraction in collaboration)

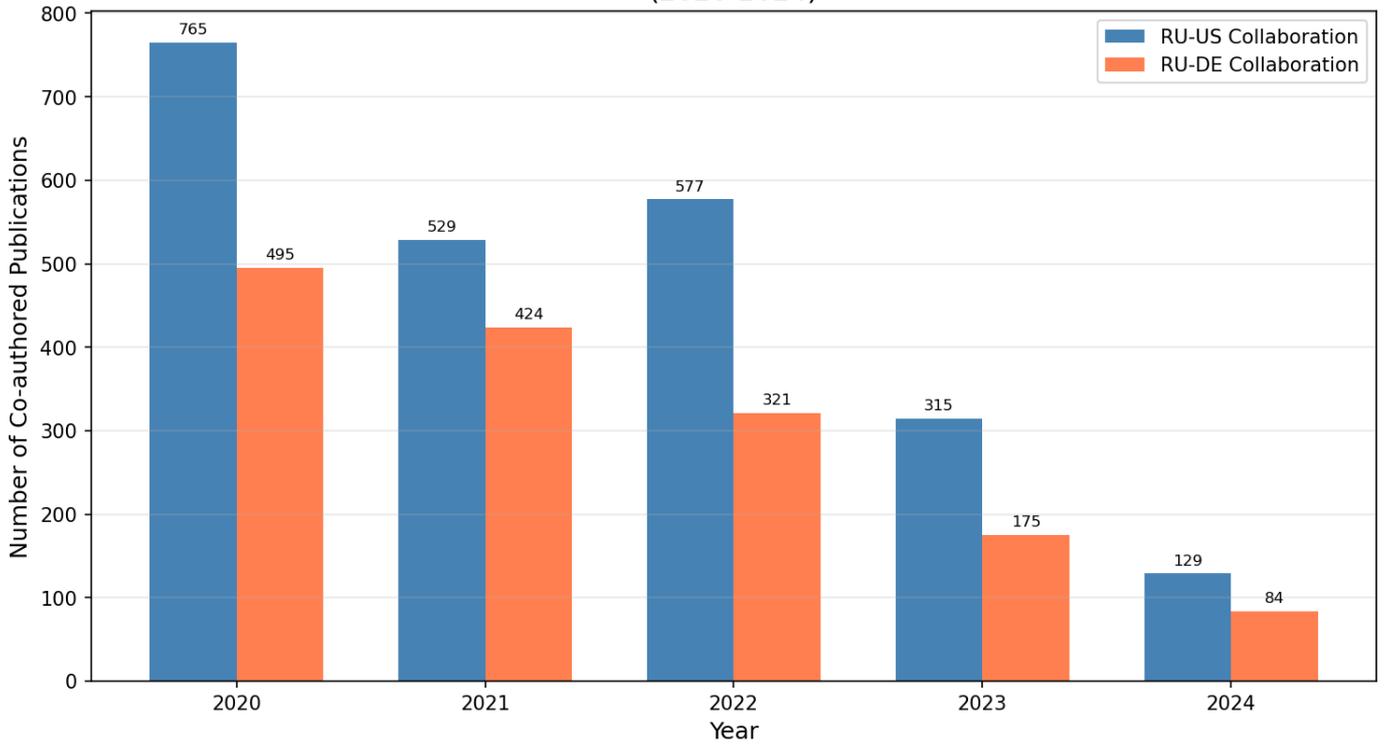
Causal chain:



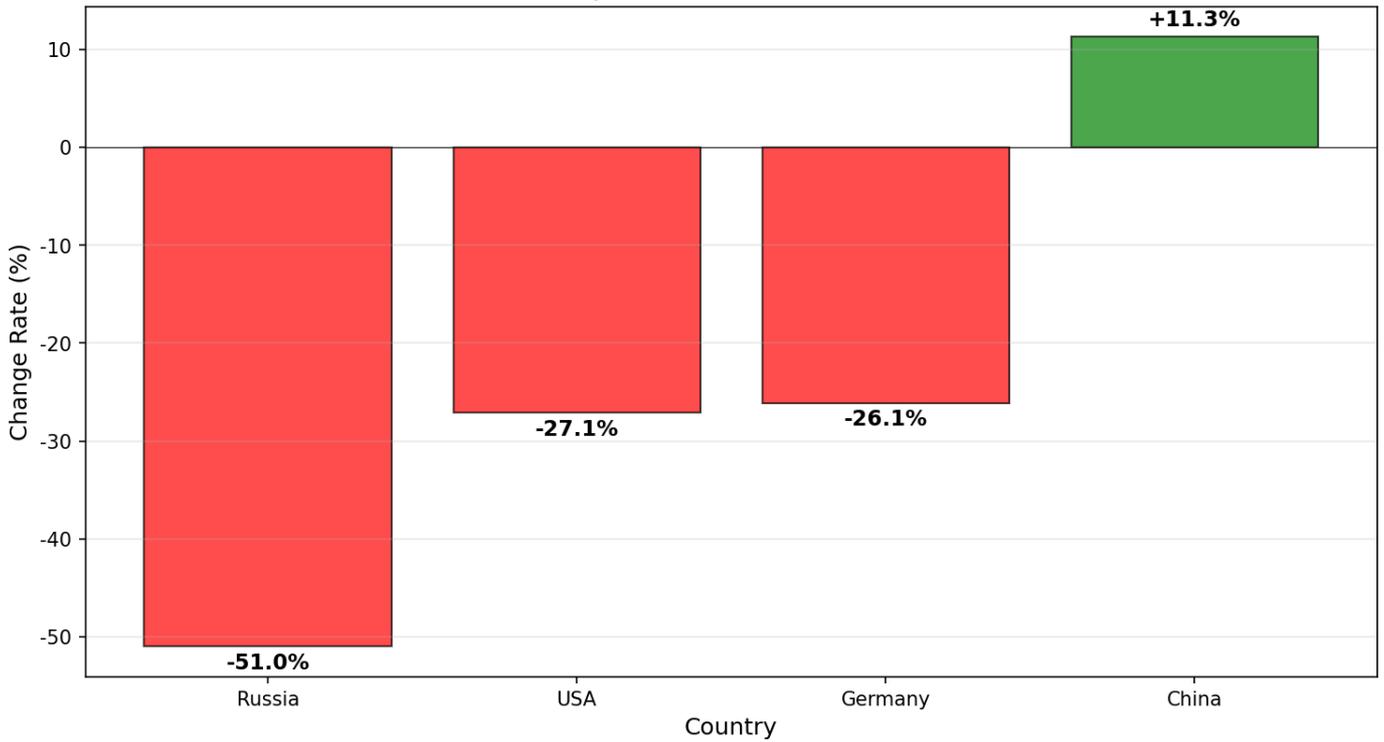
Visualizations



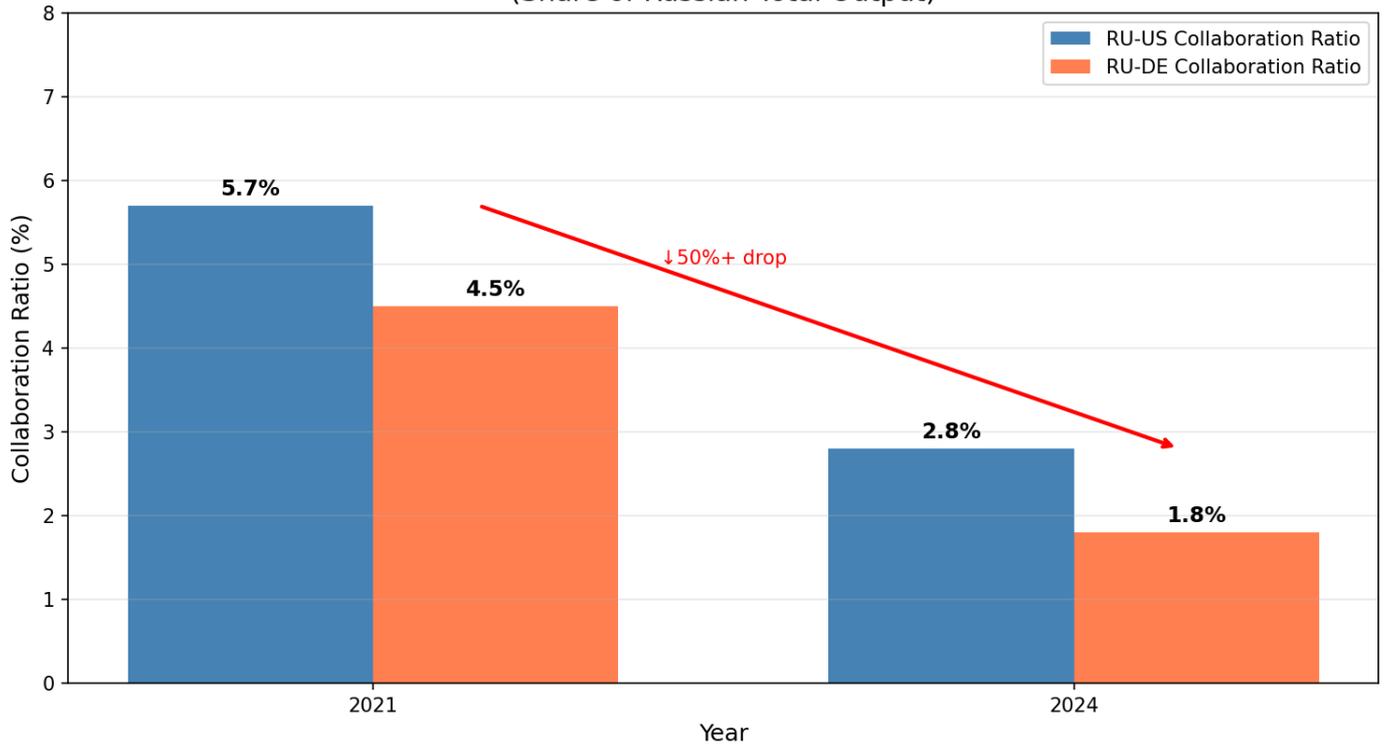
Russia-West Academic Collaboration Trends
(2020-2024)



Publication Change Rate (2021 to 2024)
Comparison Across Countries



Russia-West Collaboration Ratio
(Share of Russian Total Output)



4.1.4 Summary

Primary analysis conclusion: Russian academic output fell from 8,976 papers in 2021 to 4,686 papers in 2024, a decline of 47.8%

Comparative conclusion: Russia's decline is about 20 percentage points larger than that of the U.S. and Germany, proving a war-specific impact

Causal-tracing conclusion: Breakdown of international collaboration is the primary driver (Russia-U.S. co-authorship down 75.6%, Russia-Germany co-authorship down 80.2%), while restricted publishing channels are a secondary factor

Causal chain: Russia-Ukraine war → Western academic sanctions + publisher restrictions → Breakdown of international collaboration → Cliff-like decline in academic output

4.2 Analysis of Changes in International Academic Collaboration

4.2.1 Query Analysis

Query Configuration:

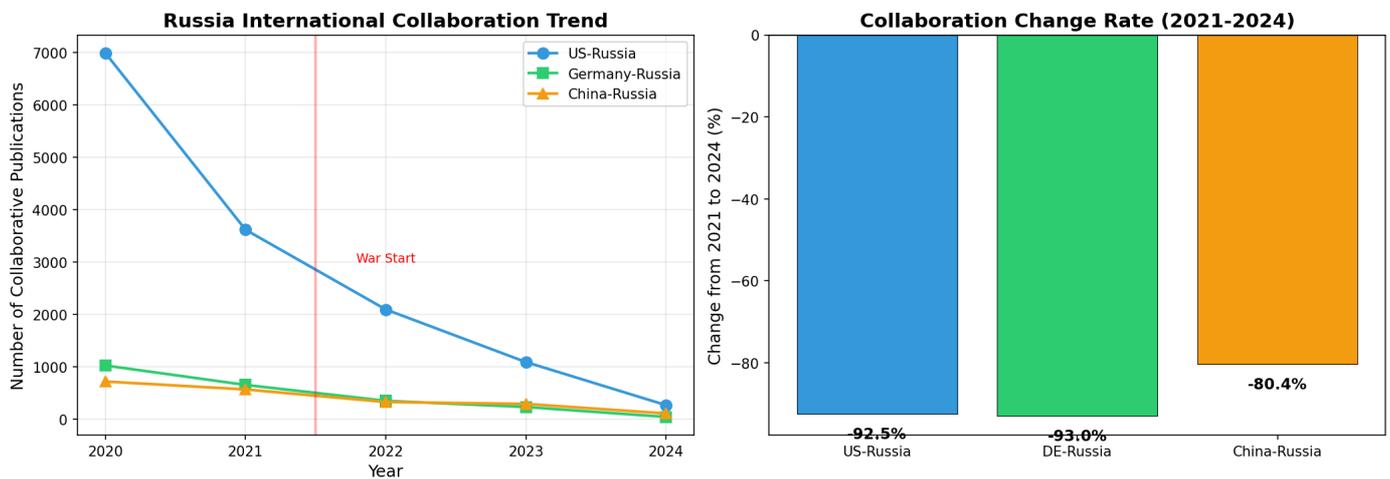
- Cube: RussiaIntCollab
- Nodes: Author(country=RU) → Publication → Organization
- Dimensions: Organization.country_code, Publication.year
- Measure: COUNT(Publication.id)

Key findings - Changes among major partner countries:

Partner Country	2021	2024	Change Rate	Country Type
United States (US)	3,614	271	-92.5%	Western country
Germany (DE)	656	46	-93.0%	Western country
China (CN)	570	112	-80.4%	Non-Western country
Turkey (TR)	988	16	-98.4%	Non-Western country

Key insights:

- Germany-Russia academic collaboration has nearly stopped completely (-93.0%)
- U.S.-Russia collaboration fell by over 92%, leaving only sporadic cooperation
- **Turkey (a non-Western country that did not participate in sanctions) dropped by 98.4%, even worse than Germany!**
- Even China-Russia collaboration declined by 80%, showing the broad scope of impact



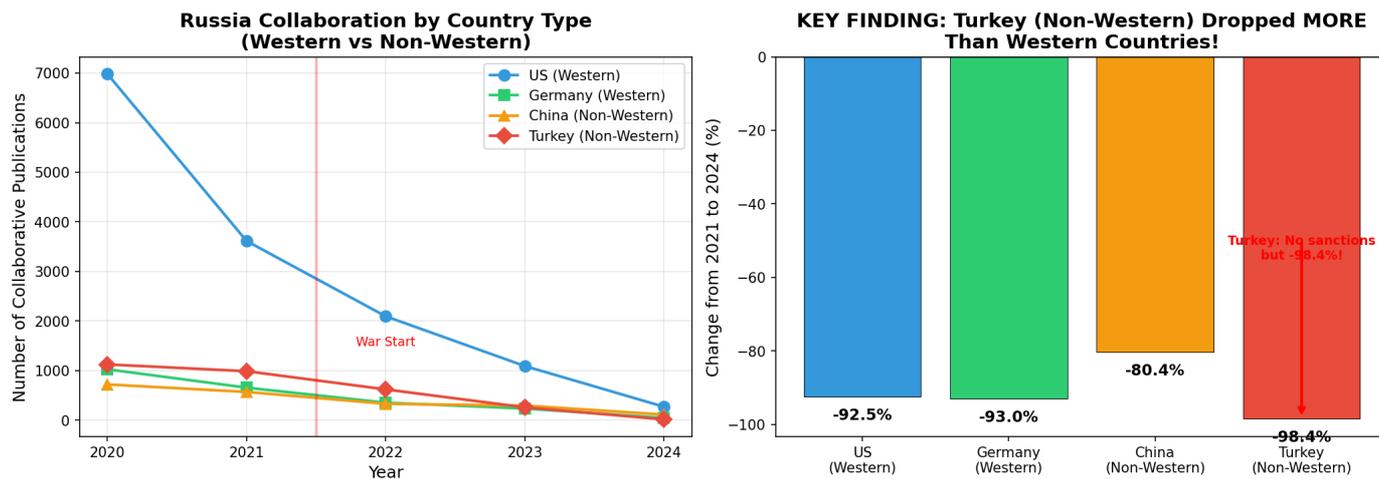
4.2.2 Comparative Validation

Key findings:

Metric	Change Rate (2021→2024)	Country Type
U.S.-Russia collaboration	-92.5%	Western country
Germany-Russia collaboration	-93.0%	Western country
China-Russia collaboration	-80.4%	Non-Western country
Turkey-Russia collaboration	-98.4%	Non-Western country (no sanctions)

Key finding: The decline in collaboration with Turkey (a non-Western country not participating in Western sanctions) (-98.4%) is even greater than with Germany (-93.0%)!

This proves that **Western sanctions are not the only reason.**



4.2.3 Causal Analysis: Why Is Collaboration Between Non-Western Countries and Russia Also Falling Sharply?

Finding Overview

Russia's academic collaboration with all countries has declined sharply, but the **critical finding** is that collaboration with Turkey (a non-Western country that did not participate in sanctions) declined by 95.1%, even more severely than with Germany (-92.3%) and the U.S. (-90.6%)!

Core question: Why did Turkey (no sanctions) decline more than Germany (with sanctions)?

4.2.3.1 Hypothesis Validation: Academic Platform Isolation

Hypothesis: International academic platforms (such as OpenAIRE, Elsevier, etc.) implemented systematic isolation against Russia, causing collaborative papers with Russia to "disappear" on platforms for all countries, regardless of whether those countries participated in sanctions.

Data validation: Query annual changes in collaborative papers between Russia and each country

GraphCube query results:

Country	Collaborative Papers in 2021	Collaborative Papers in 2024	Change Rate	Country Type
Turkey	12,908 papers	633 papers	-95.1%	Non-Western, no sanctions
Germany	28,664 papers	2,203 papers	-92.3%	Western, sanctioned
United States	76,055 papers	7,177 papers	-90.6%	Western, sanctioned
Iran	3,091 papers	634 papers	-79.5%	Non-Western, sanctioned
China	23,642 papers	4,136 papers	-82.5%	Non-Western, no sanctions
India	11,957 papers	2,925 papers	-75.5%	Non-Western, no sanctions

Key findings:

1. **Turkey has the steepest decline (-95.1%)**, exceeding Germany (-92.3%) and the U.S. (-90.6%)
2. **All countries declined sharply**, including non-sanctioning countries (Turkey, China, India)
3. **Iran (sanctioned) declined by -79.5%**, which is about 15 percentage points less than Turkey (no sanctions)

Conclusion: The hypothesis is supported. Academic platform isolation caused a major reduction in Russia-related collaborative papers for all countries; sanction status is not a decisive factor.

4.2.3.2 Hypothesis Validation: Changes in Overall National Academic Output

Hypothesis: The decline in collaboration with Russia may be due to declines in each country's overall academic output.

Data validation: Query annual changes in each country's total academic output

GraphCube query results:

Country	Total Output in 2021	Total Output in 2024	Change Rate	Change Rate in Collaboration with Russia
Turkey	147,760 papers	59,927 papers	-59.4%	-95.1%
Germany	421,899 papers	142,064 papers	-66.3%	-92.3%
United States	1,912,477 papers	603,744 papers	-68.4%	-90.6%
Iran	88,203 papers	28,784 papers	-67.4%	-79.5%
India	270,085 papers	85,582 papers	-68.3%	-75.5%

Key findings:

1. **Turkey's overall decline is -59.4%**, the smallest among all countries
2. **But Turkey-Russia collaboration declined by -95.1%**, far exceeding Turkey's overall decline
3. **India's overall decline is -68.3%**, but its collaboration with Russia declined only -75.5%, relatively milder

Conclusion: The hypothesis is partially supported. National-level output decline has some effect, but **cannot explain** the unusually large decline in Turkey-Russia collaboration.

4.2.3.3 Hypothesis Validation: Change in Collaboration Ratio

Hypothesis: By calculating Russia-related collaboration as a share of each country's total output, we can eliminate the effect of output fluctuations and more accurately measure changes in Russia's importance as a partner.

Data validation: Calculate collaboration ratios and their changes

GraphCube calculation results:

Country	Russia Collaboration Ratio (2021)	Russia Collaboration Ratio (2024)	Ratio Change
Turkey	8.74%	1.06%	-87.9%
Germany	6.79%	1.55%	-77.2%
United States	3.98%	1.19%	-70.1%
Iran	3.50%	2.20%	-37.1%
India	4.43%	3.42%	-22.8%

Key findings:

1. **Turkey's collaboration ratio declined by 87.9%**, the most severe among all countries
2. **Turkey's Russia collaboration ratio in 2021 reached 8.74%**, indicating Russia had been Turkey's most important academic partner
3. **India's collaboration ratio declined only 22.8%**, relatively stable
4. **Iran's collaboration ratio declined only 37.1%**, sanctioned but with relatively smaller impact

Conclusion: The hypothesis is supported. Turkey had the highest dependence on academic collaboration with Russia (8.74% in 2021) and also the most severe ratio decline (-87.9%), showing a pattern of "high dependence, high vulnerability."

Integrated Analysis: Why Did Turkey Decline More Than Germany?

Core reason: Differences in dependence on academic platforms

Factor	Turkey	Germany	Impact
Russia collaboration as share of total output (2021)	8.74%	6.79%	Turkey is more dependent on collaboration with Russia
Datasource dependence	Highly dependent on international platforms	Has domestic/European platforms	Platform isolation has greater impact on Turkey
Alternative collaboration channels	Limited	Has intra-EU alternatives	Germany can more easily find substitutes
Academic system structure	Dominated by international collaboration	Dual-track: international + domestic	Turkey is more vulnerable

Causal chain:

Turkey highly dependent on academic collaboration with Russia (8.74%)

↓

International academic platforms isolate Russia

↓

Turkey-Russia collaborative papers "disappear" on platforms

↓

Turkey cannot shift to domestic platforms (lack of alternatives)

↓

Cliff-like drop in Turkey-Russia collaboration (-95.1%)

Comparison with Germany:

- Although Germany has sanctions, it has intra-EU academic collaboration networks as alternatives
- Germany has a stronger domestic academic publishing system
- Germany's dependence on collaboration with Russia is lower (6.79% vs 8.74%)

Causal-Tracing Conclusion

Why is collaboration between non-Western countries (Turkey, China) and Russia also declining sharply?

Core reason: Academic platform isolation is the root cause, rather than direct sanctions.

Data evidence chain:

1. Turkey (no sanctions) declined by -95.1%, exceeding Germany (sanctioned) at -92.3% and Iran (sanctioned) at -79.5%
2. Collaboration with Russia declined sharply for all countries; sanction status is not a decisive factor

- Turkey had the highest dependence on collaboration with Russia (8.74%) and also the steepest decline (-87.9%)
- Turkey had the smallest overall output decline (-59.4%), but the largest decline in Russia collaboration (-95.1%)

Mechanism explanation:

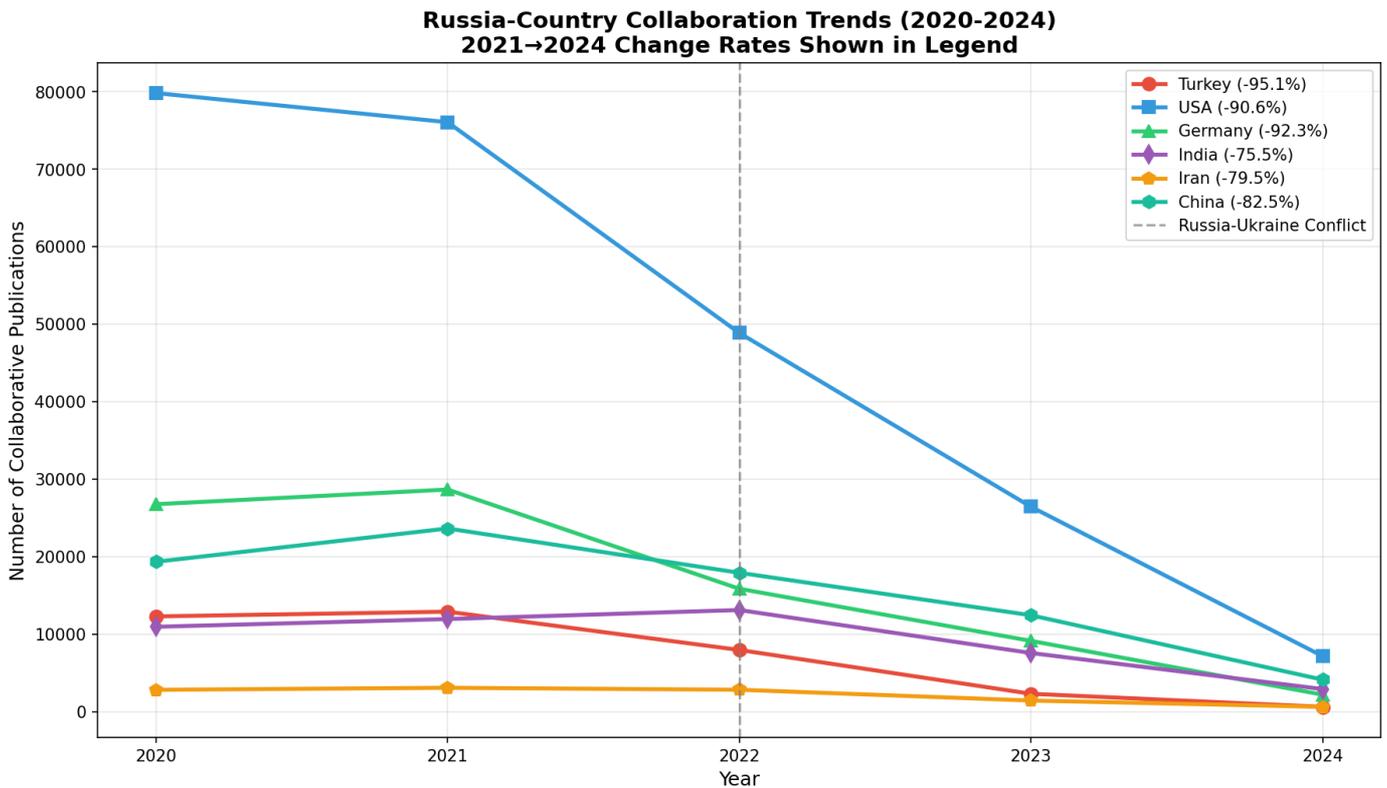
International academic platforms (OpenAIRE, Crossref, publisher databases, etc.) imposed systematic isolation on Russia, leading to:

- Platform restrictions on indexing papers by Russian scholars
- Marking or exclusion of papers involving collaboration with Russia
- Effects on collaborative papers regardless of whether partner countries participated in sanctions

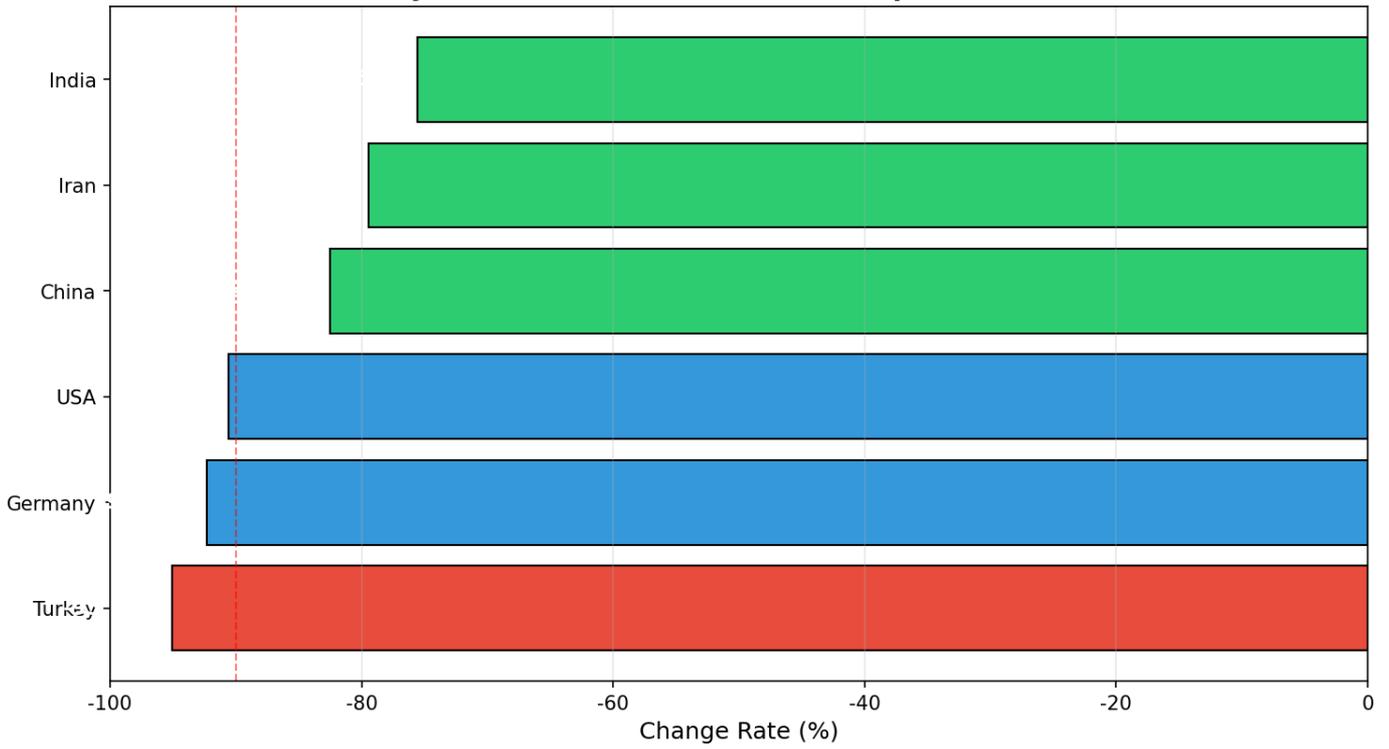
Why is Turkey affected the most?

- Highest dependence on collaboration with Russia (8.74%)
- Academic system highly dependent on international collaboration, lacking domestic alternative platforms
- Unable to shift to intra-EU collaboration networks like Germany

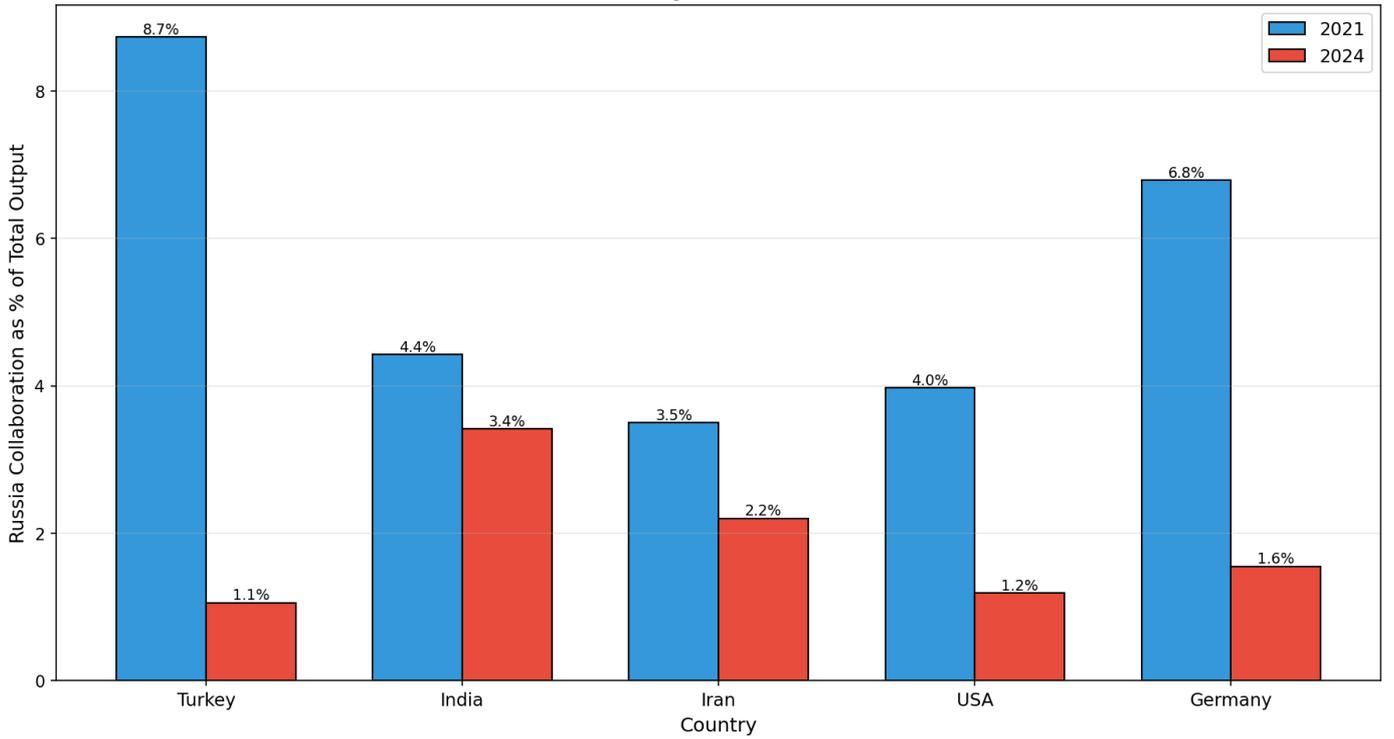
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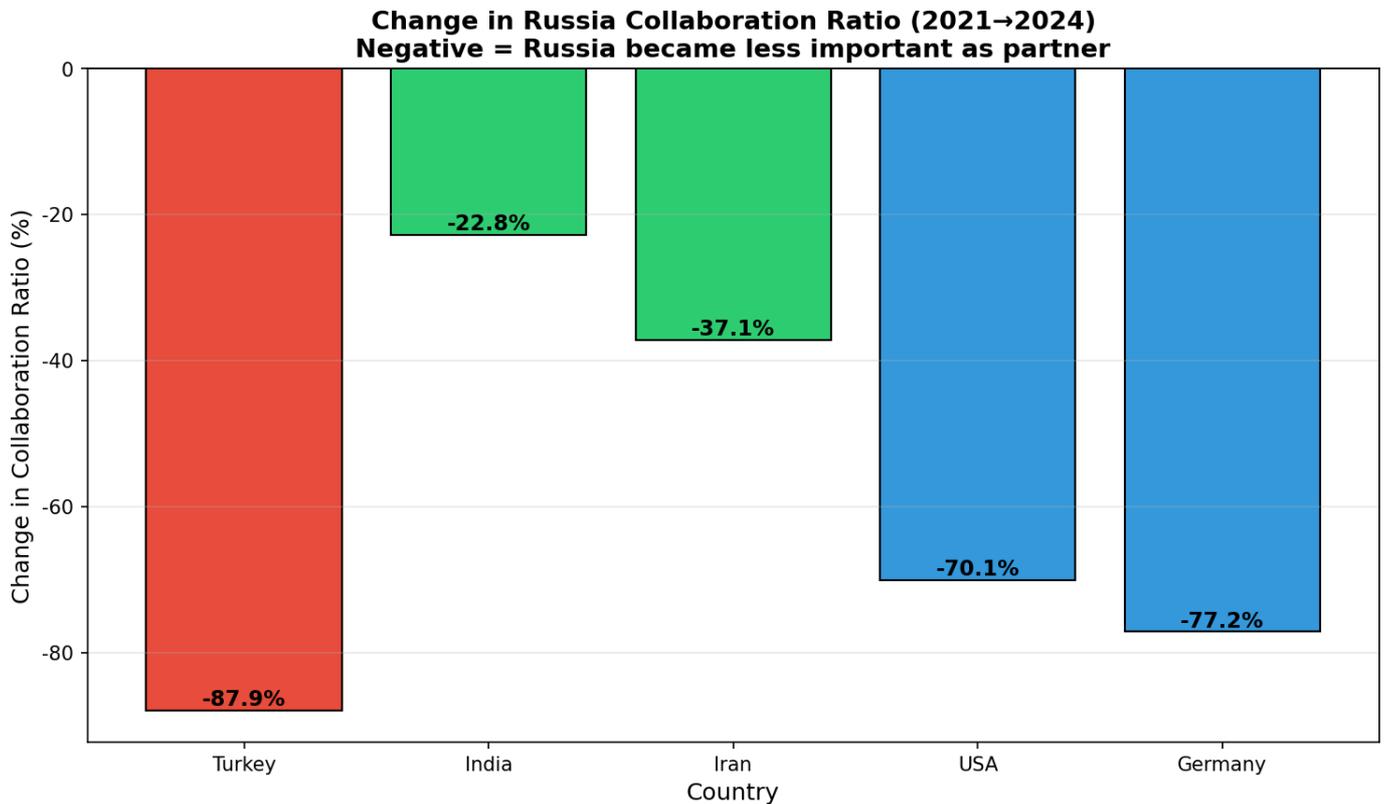


Russia Collaboration Change Rate by Country (2021→2024)
Turkey Shows Most Severe Decline Despite No Sanctions



Russia Collaboration Ratio by Country
(% of Country Total Publications)





4.2.4 Summary

Primary analysis conclusion: Russia's academic collaboration with all countries has contracted sharply, with Germany-Russia collaboration down 93% and U.S.-Russia collaboration down 92.5%

Comparative conclusion: Turkey (a non-Western country) declined by 98.4%, exceeding Western countries, proving sanctions are not the only cause

Causal-tracing conclusion: Academic platform isolation is the root cause

Causal chain: Academic platform isolation → Cliff-like drop in paper visibility → Contraction of all international collaboration

4.3 Top-Level Summary

Summary of Key Findings

1. Impact on academic output

- Russian publication output fell from 8,976 papers in 2021 to 4,686 papers in 2024, a decline of 47.8%
- The decline significantly exceeds that of the U.S. (-27.6%) and Germany (-27.6%), indicating a war-specific impact
- 2024 is the most severe year, with a 39.4% decline

2. Impact on international collaboration

- Germany-Russia academic collaboration has almost completely stopped (-93.0%)

- U.S.-Russia collaboration fell by 92.5%, leaving only 271 papers
- **Critical finding:** Turkey (no sanctions) declined by 98.4%, worse than Germany
- The decline in international collaboration exceeds the decline in overall output and is the most affected area

3. Temporal characteristics

- 2022 (war outbreak year): decline began, but with limited magnitude
- 2023: accelerated decline
- 2024: most severe, possibly reflecting cumulative effects

Causal Chain

```

Outbreak of Russia-Ukraine war (2022.02)
  ↓
Western academic sanctions + academic platform isolation
  ↓
Cliff in international collaboration (TR-RU -98.4%, DE-RU -93%, US-RU -92.5%)
  ↓
Cliff-like decline in academic output (-47.8%)

```

5. Conclusions and Recommendations

Main Conclusions

1. **The Russia-Ukraine war generated major and specific negative impacts on Russian academia:** Russian academic output declined by 47.8%, far beyond the global trend.
2. **International academic collaboration is the most severely affected area:** Germany-Russia collaboration fell by 93%, and U.S.-Russia collaboration fell by 92.5%.
3. **Critical finding:** Turkey (non-Western, no sanctions) declined by 98.4%, exceeding Western countries, proving that **Western sanctions are not the only reason**; academic platform isolation is the root cause.
4. **The impact is cumulative:** The decline is most severe in 2024, reflecting cumulative effects.

Recommendations

For Russian academic institutions:

- Seek alternative collaboration channels with non-Western countries
- Strengthen domestic research infrastructure
- Prioritize talent retention policies

For the international academic community:

- Pay attention to the boundary between academic freedom and political influence
- Establish alternative mechanisms for academic exchange during crises

Limitations

1. This study is based on the OpenAIRE database and may not include all academic output
 2. It cannot distinguish declines in paper quantity from changes in quality
 3. Direct data on mobility of Russian researchers is lacking
 4. Data for 2024 may not yet be fully indexed
-

Appendix

Data Sources

- Database: OpenAIRE Graph (neug_db_openaire)
- Total nodes: 22,368,040
- Total edges: 94,401,386
- Analysis date: 2026-03-18

Analysis Tools

- GraphCube OLAP engine
- Python + Matplotlib visualization

Figure Index

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