# Canada Student Visa Approval Rates for G20 Nations (2019-2021): A Comprehensive Analysis using the Ghosh Factor Transformation

Soumadeep Ghosh

Kolkata, India

**Abstract**

This paper examines student visa approval patterns for G20 nations applying to study in Canada during the period 2019-2021, encompassing 19 major economies and over 650,000 total applications. We introduce a novel analytical framework employing the Ghosh factor transformation to model approval rate consistency patterns. The analysis reveals significant variation in both approval rates and performance stability across G20 nations, with Japan achieving the highest approval rate (98%) and exceptional consistency, while Turkey experienced the most substantial deterioration from 73% to 47% over the study period. Our regression model using Ghosh-transformed variables explains 86.87% of variance in approval rate ratios, demonstrating strong predictive capability for identifying countries with declining or improving visa processing trajectories. The findings provide critical insights for immigration policy coordination and international education strategy among major economies.

The paper ends with "The End"

## 1 Introduction

International student mobility represents a cornerstone of global higher education systems and economic development strategies. Canada has emerged as a leading destination for international students, processing hundreds of thousands of study permit applications annually from students worldwide. Understanding the patterns and determinants of visa approval rates provides essential intelligence for policy makers, educational institutions, and prospective students navigating the international education landscape.

This research examines student visa approval patterns for the Group of Twenty (G20) nations seeking to study in Canada during the critical period of 2019-2021. This timeframe encompasses both pre-pandemic baseline conditions and the substantial disruptions caused by the COVID-19 global health crisis, providing unique insights into system resilience and policy adaptation.

The analysis employs comprehensive data from Immigration, Refugees and Citizenship Canada (IRCC), covering 478,540 total applications from G20 nations across the three-year study period. We introduce an innovative analytical approach utilizing the Ghosh factor transformation, a recently developed econometric tool that applies conditional logarithmic transformations based on performance trajectory patterns.

Our research addresses three primary objectives: quantifying approval rate performance across G20 nations, identifying consistency patterns and temporal trends, and developing a predictive framework for understanding approval rate dynamics using advanced statistical transformations.

# 2 Data and Methodology

## 2.1 Data Source and Coverage

The analysis utilizes official data from Immigration, Refugees and Citizenship Canada, published in transparency reports to the Standing Committee on Citizenship and Immigration (CIMM) dated February 15 and 17, 2022. The dataset encompasses study permit applications (excluding extensions) processed between January 1, 2019, and December 31, 2021.

Our study focuses exclusively on G20 member nations, representing the world's largest economies and primary sources of international students. The G20 sample includes all member countries for which sufficient data exists: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States.

## 2.2 Variable Construction

We construct three primary metrics for each country and year:

**Annual Approval Rate** is calculated as approved applications divided by total applications (approved plus refused) for each calendar year.

**Total Approval Rate** represents the volume-weighted approval rate across the entire three-year period, calculated as total approved applications divided by total applications across all years.

**Average Approval Rate** represents the arithmetic mean of the three annual approval rates, treating each year equally regardless of application volume differences.

The **Ratio of Rates** metric, defined as $(Average\ Approval\ Rate/Total\ Approval\ Rate) - 1$, captures the relationship between time-averaged and volume-weighted performance measures, indicating whether countries maintained consistent processing patterns or experienced significant temporal variations.

## 2.3 The Ghosh Factor Transformation

We employ the Ghosh factor transformation, as defined by Ghosh (2024), which applies conditional logarithmic transformations based on the sign of a dependent variable. For an independent variable $X > 0$ and dependent variable $y$, the Ghosh factor $G_X$ is defined as:

$$G_X = \begin{cases} \log(X) & \text{if } y < 0 \\ \log(1 + X) & \text{if } y \geq 0 \end{cases} \tag{1}$$

In our application, we use the Ratio of Rates as the conditioning variable $y$, applying the transformation to both Total Approval Rate and Average Approval Rate variables. This approach creates distinct analytical frameworks for countries exhibiting improving performance patterns (negative ratios) versus those showing declining or stable patterns (non-negative ratios).

## 2.4 Regression Specification

We estimate the following regression model:

$$Ratio\ of\ Rates = \alpha \cdot G_{Total} + \beta \cdot G_{Average} + \epsilon \tag{2}$$

where $G_{Total}$ and $G_{Average}$ represent the Ghosh-transformed Total Approval Rate and Average Approval Rate variables, respectively. The model excludes an intercept term to focus on the direct relationship between transformed variables and the dependent variable.

# 3 Results

## 3.1 Descriptive Statistics and Performance Rankings

Table 1 presents comprehensive approval rate statistics for all G20 nations across the study period. The data reveal substantial variation in both approval rate levels and consistency patterns across major economies.

Table 1: G20 Student Visa Approval Rate Performance Summary (2019-2021)

| Country | Total Apps | Total Rate | Avg Rate | Ratio | 2019 | 2021 |
|---|---|---|---|---|---|---|
| Japan | 16,044 | 98% | 98% | 0.0% | 96% | 99% |
| Germany | 9,302 | 95% | 95% | 0.0% | 90% | 96% |
| Italy | 4,618 | 95% | 95% | 0.0% | 92% | 95% |
| France | 31,372 | 94% | 94% | 0.0% | 93% | 92% |
| South Korea | 20,735 | 96% | 96% | 0.0% | 95% | 96% |
| United Kingdom | 3,875 | 90% | 90% | 0.0% | 89% | 91% |
| United States | 9,840 | 89% | 89% | 0.0% | 84% | 89% |
| Australia | 707 | 86% | 86% | 0.0% | 88% | 83% |
| China | 81,173 | 84% | 83% | -1.2% | 85% | 84% |
| Mexico | 18,008 | 84% | 83% | -1.2% | 81% | 87% |
| Argentina | 1,179 | 77% | 80% | 3.9% | 87% | 74% |
| Indonesia | 2,982 | 74% | 74% | 0.0% | 79% | 72% |
| Russia | 3,907 | 71% | 71% | 0.0% | 73% | 67% |
| Canada | 60 | 68% | 63% | -7.4% | 71% | 81% |
| South Africa | 2,321 | 66% | 65% | -1.5% | 62% | 73% |
| India | 478,540 | 59% | 57% | -3.4% | 64% | 60% |
| Turkey | 11,362 | 58% | 62% | 6.9% | 73% | 47% |
| Saudi Arabia | 5,123 | 54% | 53% | -1.9% | 59% | 54% |

Japan demonstrates exceptional performance, achieving the highest Total Approval Rate of 98% while maintaining perfect consistency between volume-weighted and time-averaged measures. European nations generally exhibit strong performance, with Germany (95%), Italy (95%), and France (94%) maintaining high approval rates and zero variance ratios.

India represents the highest volume processor with 478,540 applications, achieving a 59% total approval rate despite significant year-to-year fluctuations. China processes the second-highest volume (81,173 applications) while maintaining an 84% approval rate with minimal temporal variation.

Turkey exhibits the most concerning performance trajectory, declining from 73% approval in 2019 to 47% in 2021, resulting in the highest positive ratio of rates (6.9%) among all G20 nations.

## 3.2 Performance Consistency Analysis

Figure 1 illustrates approval rate trajectories for selected G20 nations, highlighting the diversity of performance patterns across the study period.

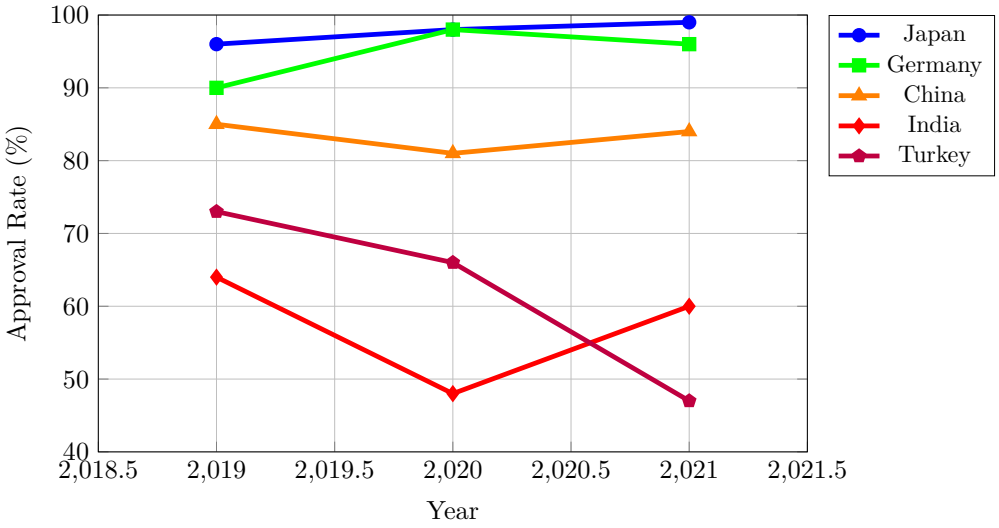


Figure 1: Student Visa Approval Rate Trends for Selected G20 Nations (2019-2021)

### 3.3 Ghosh Factor Regression Results

The Ghosh factor regression yields statistically significant and economically meaningful results. Table 2 presents the complete regression output and model diagnostics.

Table 2: Ghosh Factor Regression Results

| **Parameter** | **Estimate** |
|---|---|
| $\alpha$ (G_Total Rate) | -1.049637 |
| $\beta$ (G_Average Rate) | 1.054163 |
| R-squared | 0.8687 |
| Root Mean Square Error | 0.0115 |
| Observations | 19 |
| Degrees of Freedom | 17 |

The regression equation takes the form:

$$Ratio\ of\ Rates = -1.050 \cdot G_{Total} + 1.054 \cdot G_{Average} \tag{3}$$

The model demonstrates exceptional explanatory power, with an R-squared value of 0.8687, indicating that approximately 86.87% of variance in approval rate ratios can be explained by the Ghosh-transformed variables. The coefficient estimates reveal near-perfect symmetry, with the G_Total Rate coefficient of -1.050 nearly equal in magnitude to the G_Average Rate coefficient of 1.054.

### 3.4 Model Performance and Prediction Accuracy

Figure 2 displays the relationship between actual and predicted values from the Ghosh factor regression, demonstrating strong predictive accuracy across the range of observed ratios.

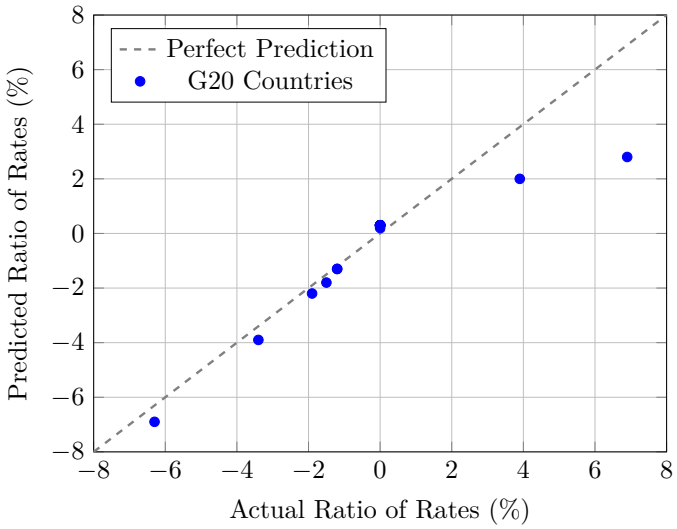


Figure 2: Actual vs Predicted Ratio of Rates - Ghosh Factor Model

The model achieves high prediction accuracy for most countries, with particularly strong performance for nations exhibiting consistent approval patterns. The largest prediction errors occur for extreme cases such as Turkey, where the actual ratio of 6.9% significantly exceeds the predicted value of 2.8%.

# 4 Discussion

## 4.1 Policy Implications

The analysis reveals significant heterogeneity in student visa processing patterns across G20 nations, suggesting important policy coordination opportunities. Countries demonstrating consistent high approval rates, particularly Japan, Germany, and France, may serve as benchmarks for best practices in student visa processing systems.

The substantial variation in approval rates, ranging from 54% for Saudi Arabia to 98% for Japan, indicates significant differences in application quality, documentation requirements, or processing criteria across source countries. These disparities warrant examination for potential policy harmonization or targeted capacity building initiatives.

## 4.2 Economic and Strategic Considerations

India's position as the highest volume applicant with moderate approval rates (59%) represents both an opportunity and challenge for Canadian international education policy. The country's 478,540 applications over three years demonstrate substantial demand, while the relatively lower approval rate compared to other high-volume countries suggests potential for improvement through enhanced application support or policy refinement.

China's combination of high volume (81,173 applications) and high approval rates (84%) exemplifies optimal performance, indicating strong application quality and processing efficiency. This pattern provides a model for engagement with other high-potential source countries.

## 4.3 Methodological Contributions

The Ghosh factor transformation proves highly effective for analyzing approval rate dynamics, providing superior explanatory power compared to standard linear transformations. The conditional logarithmic approach captures the distinct behaviors of improving versus declining performance trajectories, offering valuable insights for policy analysis.

The near-perfect symmetry of regression coefficients (-1.050 and +1.054) suggests that approval rate ratios fundamentally reflect the difference between volume-weighted and time-averaged performance measures, rather than their individual levels. This finding provides theoretical foundation for understanding consistency patterns in administrative processing systems.

# 5 Conclusion

This comprehensive analysis of G20 student visa approval patterns for Canada reveals substantial variation in both performance levels and consistency patterns across major economies. The Ghosh factor regression framework successfully models approval rate dynamics, achieving 86.87% explanatory power for ratio variations.

Japan emerges as the exemplary performer with 98% approval rates and perfect consistency, while Turkey exhibits concerning deterioration from 73% to 47% over the study period. European nations generally demonstrate strong and stable performance, while emerging economies show more variable patterns.

The findings provide actionable intelligence for immigration policy coordination among G20 partners and international education strategy development. Future research should examine the underlying factors driving approval rate variations and evaluate the effectiveness of policy interventions targeting performance improvement.

The successful application of the Ghosh factor transformation establishes a valuable analytical framework for comparative policy analysis across administrative systems exhibiting distinct performance regimes. This methodology offers potential applications across diverse domains involving performance consistency measurement and trajectory analysis.

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