

An Analysis of Global Indicators Impacting Gender Parity Index in Secondary Education

Arina Oberoi

Pinewood Upper Campus, 26800 Fremont Rd, Los Altos Hills, CA, 94022, USA; arina@cubixon.com

ABSTRACT: Gender equality is a highly discussed topic, especially in regard to education. A standing issue is that there is gender parity in secondary education only in a small minority of nations. With the objective of understanding why gender parity fluctuates and how it can be made equitable, this research analyzes 400-plus social, economic, and political variables from nations across the world using modern data-mining techniques. Using basket-case analysis, Pearson's correlation coefficient, and regression models, the top indicators that affect gender parity are identified. This research found that internet users as a percentage of a population, government-effectiveness index, rule-of-law index, mobile users as a percentage of a population, political violence risk, demographic pressures, displaced persons as a percentage of a population, fragile-state index, and student-to-teacher ratio affect the gender parity index of secondary schools the most. Then the models for each indicator were scored with data from years not included in the model to validate the accuracy of the models. While most nations did support the model predictions, Bangladesh, Rwanda, and Honduras were the few that defied forecasts. Then the factors that allow these nations to achieve gender-parity ratios rivaling first-world economies were investigated. Finally, with insight gained from our regression models and bright-spot analysis, certain policies that improve gender parity were recommended.

KEYWORDS: Education, Gender Parity, Secondary Education, Kashmir.

■ Introduction

This work began in August of 2019 when the revocation of Article 370 led to high-intensity conflict in the region of Kashmir.¹ This conflict resulted in 1.5 million children being kept out of school and the entire region's population being placed under a strict lockdown.² This project partnered with a US-based education non-profit, Kashmir Education Initiative (KEI),³ and worked under the direct mentorship of Dr. Riyaz Bashir, the president and founder of KEI and a medical professor at Temple University, along with his field staff in the Kashmir Valley. As the work on this topic of investigating gender parity progressed, the work expanded to include other regions affected by political strife. Now some of the policies derived from this are being implemented and related research with a cohort of students is currently being studied with the assistance of KEI in the Kashmir Valley.

The history of the Kashmir Valley provides insight into the diverse population the region sees today. Until 1346, the Kashmir region was ruled by a series of Hindu dynasties. In 1346, the region fell into Muslim control, which lasted until 1819 when the Sikh Kingdom took power. In 1846, the Kashmir Valley was once again switched to the rule of the Dogra kingdom.

As a result of this inconsistent rule, the people of Kashmir are a very heterogeneous population. Religiously, most Kashmiri people practice Islam, Hinduism, or Buddhism. They also speak a variety of languages, including Hindi, Punjabi, Dogri, Balti, and Ladakhi.

The Kashmir region has been a point of contention between India and Pakistan since their 1947 partition. At this time, Hari Singh, the Maharaja of Kashmir, was given the choice to

join either India or Pakistan. Hari Singh chose to join India, quickly prompting a violent reaction from Pakistan. The conflict between the neighboring countries eventually reached a point of such intensity that the United Nations was forced to intervene and define a cease-fire line through the region in 1949, which still exists today. This partition divides Kashmir so that Pakistan holds the Kashmir regions of Azad Kashmir, Gilgit, and Baltistan, while the regions of Jammu and Kashmir, and Ladakh lay with India.

In 1962, China even got involved and took part of Ladakh under its control, resulting in tensions erupting in the region once again. In 1971, a cease-fire agreement was signed. The peace didn't last long as, in 1971, Pakistan and India quickly fell into war once again.⁴

Due to the continuous tensions and conflict between the nations of Pakistan and India over Kashmir, the military presence has remained strong in the region of Kashmir.

The region of Jammu and Kashmir of India has remained an autonomous state, as established by Article 370. This protects the region's right to formulate laws and follow a separate constitution. However, in August of 2019, the BJP Government of India revoked Article 370, removing Jammu and Kashmir's self-autonomous status in an attempt to integrate and unify Kashmir with the rest of India. Knowing the effect this revocation would have on the people of Kashmir, the government was quick to send thousands of troops into the region, while simultaneously placing the region under lockdown and house arrest, all to combat the erupting opposition to the revocation.⁵ The abrogation of Article 370 launched the region of Jammu and Kashmir into high-intensity conflict, as it added to the already existing tensions of the region.

Gender parity in education has long been an integral part of the reach for all-around gender equity. As a result, many have sought to understand how to improve and perfect gender parity in education. Understandably, the causes of low gender parity vary from region to region. A case study in Iran, for example, conducted by Golnar Mehran, concluded that the nation's low gender parity was primarily the effect of the social climate. Thus, to improve gender parity, most of the work would involve promoting the idea of female education to conservative families and making the idea of sending girls to school less daunting, by establishing girls-only dormitories and faculty.⁶

Another case study took place in Chile and yields many different conclusions. A paper by Beatrice Avalos hypothesized that women are generally demotivated to study alongside their male counterparts, knowing that they will not receive equal employment opportunities. Avalos also noted that most women in Chile who are not attending secondary school are from lower-income households. Thus, to promote gender parity, work would need to be done to address these financial issues, such as the creation of scholarship programs.⁷

Another report by Ershad Ali examined the effect of policy on gender parity in Bangladesh. He emphasized the Field Support Services Project (FSSP), a government initiative aimed at encouraging female students to attend school. This initiative worked to provide incentives for both the students and their parents, through loans and guaranteed employment. Though Ali noted the success of this initiative, he also highlighted how the initiative failed to lower the dropout rate of female students, which was already higher than their male counterparts.⁸

As highlighted by these previously conducted case studies, the reasons behind a lower gender parity and the manner in which a nation addresses it varies. This paper seeks to gain a better understanding of, generally, which indicators affect gender parity the most and how lower gender parity can best be addressed.

Methods

To ensure the data was as accurate and applicable to the modern world as possible, all of the data collected was narrowed down the time period 2016 to 2019.

To achieve the goal of this study, the following two goals were focused on for data analysis:

- 1: Identify the top factors that affect gender parity
- 2: Identify the rate at which each indicator affects gender parity

All data regarding the gender parity indexes of various nations in secondary education was collected from The World Bank.⁹ Then each nation's average gender parity index from 2016 to 2019 was calculated by adding each individual year's value and then dividing the sum by 4. The timeframe of 2016 to 2019 was chosen to ensure that the findings were recent and applicable to the current global state. The data regarding social, economic, and political global indicators were collected from The Global Economy.¹¹⁻²⁰ This data was also narrowed down to 2016 to 2019 to match the time

frame of the average gender parity, resulting in a total of 404 variables available for use.

Pearson's correlation coefficient was used to calculate which indicators affect gender parity in secondary education the most. Pearson's correlation coefficient,⁵ also referred to as Pearson's r, tracks the correlation between two variables and ranges between -1 to 1. The negative value implies inverse correlation, and the higher absolute coefficient value implies a stronger relationship.

Each correlation was plotted with the x-axis as an indicator and the y-axis as the average gender parity. Then, the univariate polynomial regression models were fit to each indicator, using the final model to extrapolate the fluctuation of gender parity according to each indicator. The fluctuation in rates of change in secondary education gender parity according to each indicator was then calculated and modeled in equations.

Results and Discussion

Analyzing Indicators Affecting Gender Parity Ratio:

With the data analysis for this study, the following list of the top global indicators that affect gender parity in secondary education were discovered (Table 1).

Table 1: List of top ten variables and their associated correlation strength (positive and negative) to Gender Parity Index (GPI) for Secondary Education.

Factor	Pearson's Correlation Coefficient
Political Stability	0.3682
Internet users as a percentage of a population	0.2952
Government effectiveness index	0.2910
Rule of law index	0.2872
Mobile users as a percentage of a population	0.2570
Political violence risk	-0.2990
Demographic pressures	-0.3021
Displaced persons as a % of a population	-0.3095
Fragile state index	-0.3152
Student to teacher ratio	-0.3597

Political Stability:

Political Stability Index (PSI)¹¹ tracks the traditions and institutions by which the country exercises its authority. Computing this involves looking at the country's processes by which it selects its governments, creates and implements policies, and respects the citizens and the institutions. The World Bank ranks countries' PSI index on a scale of -2.5 to 2.5.

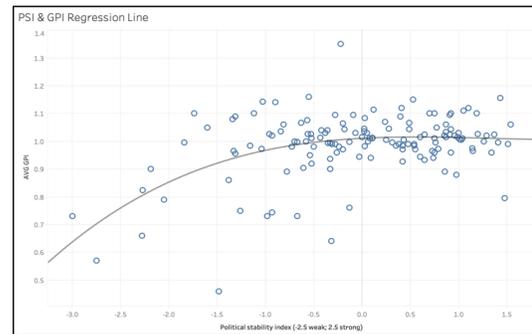


Figure 1: Regression model for GP according to Political Stability. GP and Political Stability have a strong positive correlation.

Gender disparity favoring males appears to be more prominent in politically unstable nations. The more politically unstable a nation appears to be, the higher the disparity is likely to be. Of note is that the country does not need to be a beacon of model governance to achieve good GPI numbers; countries scoring a neutral score of 0 starts achieving equitable GPI (Figure 1).

$$y = 0.00506388x^3 + -0.0202883x^2 + 0.0179989x + 1.01063$$

R-Squared: 0.231237

Internet Users:

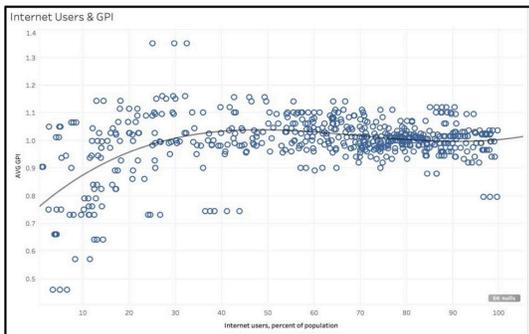


Figure 2: Regression model for GP according to Internet Users, as a percent of population. GP and Internet Users have a moderately strong positive correlation.

This variable tracks the portion of the adult population that has Internet access.¹² When about 50% or more of a population has internet access, gender parity appears to remain consistent at about 1.0 (perfect) (Figure 2).

$$y = 1.089e(-0.6x^3) + -0.000227334x^2 + 0.0143416x + 0.75266$$

R-Squared: 0.2434

Government Effectiveness:

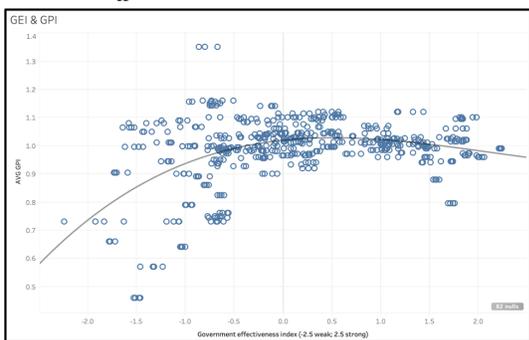


Figure 3: Regression model for GP according to Government Effectiveness Index. GP and Government Effectiveness have a moderately strong positive correlation.

The Government Effectiveness Index (GEI)¹³ measures the quality of public services. It is measured on a scale from -2.0 (weak) to 2.0 (strong). Like what is seen with the PSI, countries are likely to see an equitable gender parity ratio when they reach a certain threshold (GEI > -0.5). It is less likely that improving the GEI beyond this threshold (0.5) may meaningfully contribute to an increase in gender parity (Figure 3).

$$y = 0.00637171x^3 + -0.0401454x^2 + 0.0363262x + 1.01895$$

R-Squared: 0.187606

Rule of Law:

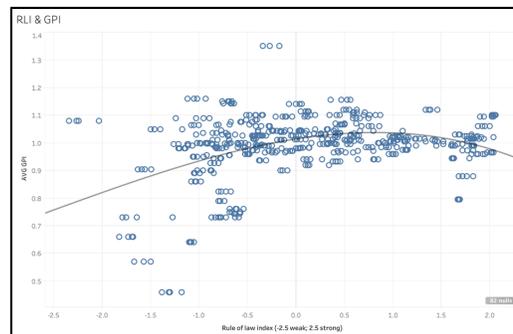


Figure 4: Regression model for GP according to Rule of Law Index. GP and Rule of Law Index have a moderately strong positive correlation.

The Rule of Law Index (RLI)¹⁴ measures across factors such as constraints on government power, absence of corruption, open government, and other factors to assess how a particular county applies the law. The World Bank’s RLI ranges from -2.0 to 2.0. Like with previous factors, a significant gender disparity is seen when the country performs poorly on this index. However, once the countries achieve a minimum threshold of rule of law (about 0.0), this particular governance factor does not appear to have a strong positive or negative correlation with GPI (Figure 4).

$$y = 6.61748e(-0.8x^3) + -3.94178e(-0.5x^2) + 0.00692386x + 0.638892$$

R-Squared: 0.181936

Mobile Phone Subscribers:

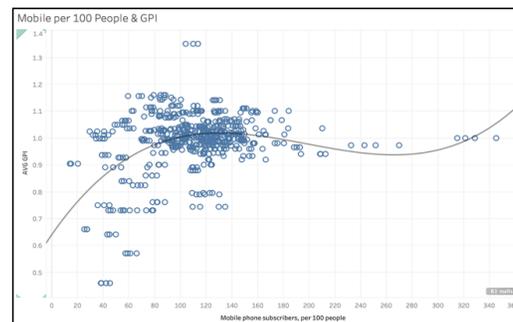


Figure 5: Regression model for GP according to Mobile Phone Subscribers, per 100 people. GP and Mobile Phone Subscribers have a moderately strong positive correlation.

It appears that the more mobile phone subscribers per 100 people,¹⁵ the more likely a nation is to see perfect gender parity. When access to mobile phone subscriptions decreases to be below 80%, GP appears to quickly decrease by about 0.4% per subscriber drop per 100 people (Figure 5).

$$y = -0.00379218x^3 + -0.028694x^2 + 0.0547951x + 1.01386$$

R-Squared: 0.158001

Political Violence Risk:

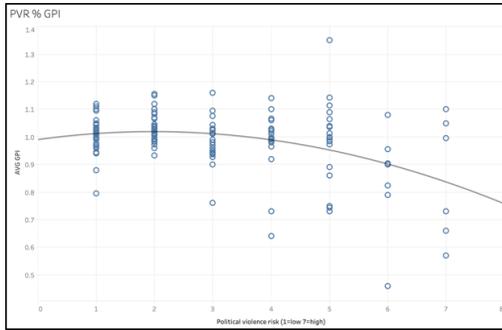


Figure 6: Regression model for GP according to Political Violence Risk. GP and Political Violence Risk have a moderately strong negative correlation.

This indicator measures the likelihood of political instability or politically motivated violence, including terrorism.¹⁶ The World Bank records nations' risk on a scale between 1 (low) to 7 (high). It appears that higher political violence risks are linked to lower gender parity values (Figure 6).

$$y = 2.74883e(-0.5x^2) - 0.00752393x^2 + 0.0294145x + 0.990229$$

R-Squared: 0.14642

Demographic Pressures:

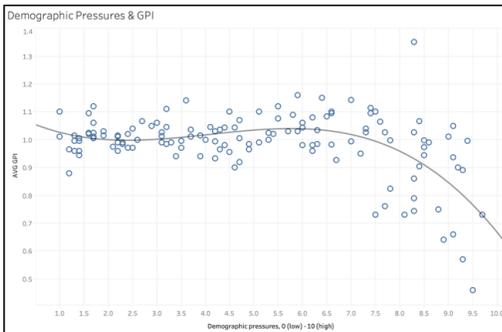


Figure 7: Regression model for GP according to Demographic Pressures. GP and Demographic Pressures have a strong negative correlation.

Demographic pressures,¹⁷ ranging between 1 and 10, is an indicator that measures population pressures related to the food supply, access to safe water, and other life-sustaining resources, or health, such as the prevalence of disease and epidemics. When a nation's demographic pressures are low, less than 4.0, gender parity appears to be linear and close-to-perfect. When demographic pressures become moderate, (between 4.0 and 7.0) gender parity experiences a slight increase in favor of females. Demographic pressures past 7.0 are linked to lower, decreasing gender parity values (Figure 7).

$$y = -0.00223279x^3 + 0.0273782x^2 - 0.0930919x + 1.09422$$

R-Squared: 0.309687

Fragile State:

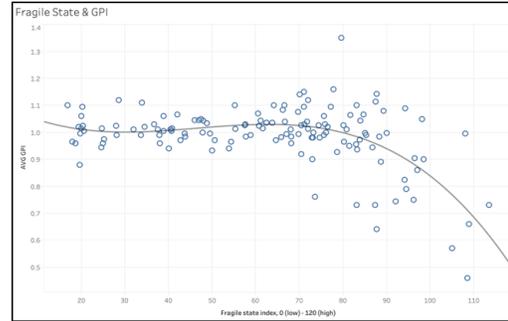


Figure 8: Regression model for GP according to Fragile State Index. GP and Fragile State Index have a strong negative correlation.

The Fragile State Index measures the vulnerability of a state to conflict or collapse.¹⁸ It ranges from 0 to over 120 by summing 12 indicators. When a nation's fragile state index is below 80, it appears that the gender parity is fairly consistent and 1.0 (perfect). At x = 40, however, there appears to be a very slight increase in gender parity. When the fragile state index reaches 80 (moderately high), there is a rapid fall in gender parity at the rate of about 0.012 (Figure 8).

$$y = -0.00134662x^3 + 0.015734x^2 - 0.058351x + 1.07948$$

R-Squared: 0.233586

Refugee and Displaced Persons:

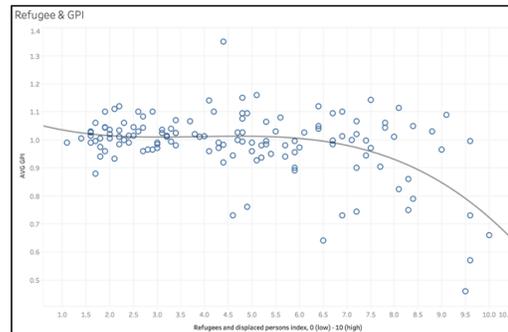


Figure 9: Regression model for GP according to Refugee and Displaced Persons Index. GP and Refugee and Displaced Persons Index have a strong negative correlation.

Gender parity seems particularly sensitive to the Refugee and Displaced Person index (RDP).¹⁹ As the RDP index crosses a threshold (6.5) there is a sharp decrease in gender parity at the rate of about 0.08. While the refugee and displaced persons index is below about 6.5, however, the gender parity appears to be linear and consistent at 1.0 (perfect) (Figure 9).

$$y = -1.62533e(-0.6x^3) + 0.000227457x^2 - 0.00930039x + 1.11923$$

R-Squared: 0.348468

Student to Teacher Ratio:

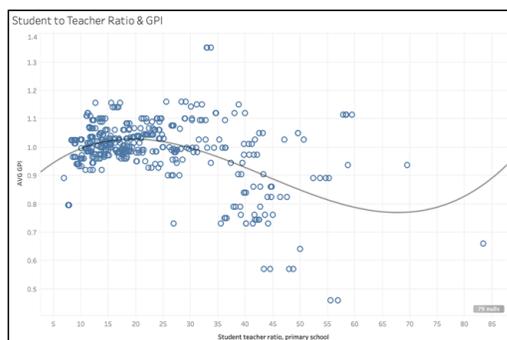


Figure 10: Regression model for GP according to Student to Teacher Ratio. GP and Student to Teacher Ratio have a strong negative correlation.

It was discovered that 25 is the magic number for the student-to-teacher ratio. When the student-to-teacher ratio is between 10 and 25, it appears that the gender parity of the various countries stays consistent close-to or directly at 1.00 (perfect).²⁰ Once the student-teacher ratio hits 25, however, the gender parity appears to quickly decrease in favor of males (Figure 10).

$$y = 4.59474e(-0.6x^3) + -0.000601764x^2 + 0.0182235x + 0.867519$$

R-Squared: 0.223758

While the regression models offer insightful statistical analysis on gender parity, it is also useful to speculate the plausible reasons behind each indicator contributing to the Gender Parity Index.

Political Stability, Violence Risk, and Fragile State:

Political stability is defined as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. The more politically stable the nation, the more likely its gender parity will be closer to 1.00. When a nation is politically weak, the government is often unable to provide for and support its citizens. This may lead to financial instability and overall uncertainty in citizens' lives. As a result, families may resort to pulling their children out of schools, as they may be unable to pay the fees or desperate for another source of income through their children.

There may be many reasons female students are more likely to be pulled out of school compared to their male counterparts, such as prominent cultural beliefs that undermine the importance of female education. In most cultures, women are often designated to tend to household duties and children, while men are left to work, earn, and support the family. With this traditional family structure in mind, many believe that a woman's education is not as important as a man's, as she will likely not have to work. While this belief may even prevent families, in some places, from enrolling their daughters in school, it can also be speculated that it is why families are more reluctant to pull their sons out of school compared to their daughters.

When a nation's government is politically vulnerable, the nation itself becomes especially vulnerable to rebel groups and terrorism. With a weak government and increased conflict amongst citizens, it's likely that the nation's streets will become unsafe. In some nations, rebel groups have taken over schools.

As a result, families may feel it is safer to keep their children home from school. Some families may be more protective of their daughters, as they are often more likely to be targets of sexual violence and harassment; thus, when a nation is becoming gradually unsafe, families may be likely to pull their daughters out before their sons.

Internet Access:

The larger the percentage of a population that has internet access is, the more likely it is that the nation will have a gender parity closer to 1.00. With internet access, students are more likely to have open access to resources, such as online educational material, messaging apps, and contact with teachers outside of school. Thus, having access to the internet would likely make it much easier for students to stay engaged with their education as well as support themselves should it be needed.

Internet access is also considered an indicator of a first-world nation. So, this correlation may also simply be a situation of correlation, not causation. It must be considered that internet access does not directly contribute to a gender parity closer to 1.00. Rather, it is plausible that the nation's wealth and resources, which allow it to provide internet access, are rather what results in the nation's perfect gender parity (Table 2; Figure 11)

Government Effectiveness:

Government effectiveness is defined as an index that captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. As shown in the case studies of Rwanda and Bangladesh, government policies and projects often provide a great deal of support to initiatives and yield significant results. Inversely, families worried about instability and poverty may be less likely to prioritize education. This may be especially true for females, as a daughter is more likely to be pulled out of school to aid the family in domestic chores and duties (Table 3; Figure 12).

When government effectiveness is high, a government is effectively engaging with its citizens. As a result, issues amongst citizens are more likely to be addressed and overall satisfaction is likely to be higher. This would likely result in safer environments, as unstable governments and political climates often result in the opposite: rebel groups, terrorist activity, etc.

Rule of Law:

Rule of law index captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. When the rule of law is higher, gender parity is more likely to be closer to 1.00. Some cultures and families may be more protective of their daughters, as women are often more likely to be targets of sexual violence and harassment. When a nation is overall safer, families may feel more comfortable sending their children out to school, especially their daughters. Similarly, when a nation is unsafe, families are likely to pull their children out, their daughters, once again, before their sons.

Mobile Phones:

The larger the number of mobile phones per 100 people is, the more likely the nation is to have an equitable gender parity index. With mobile phones, students are more likely to have more access to resources, such as online educational material, messaging apps, and contact with teachers outside of school. An example of this would be the situation in Kashmir. When the lockdown was implemented, students with access to mobile phones and devices were more likely to be able to continue their education remotely. Similarly, with Covid-19, students with access to devices were able to continue engaging with their education despite the circumstances. This index can be especially helpful in conflict zones or times of crisis. As illustrated by the events in Kashmir and Covid-19, having access to mobile phones, otherwise simply a device, allows students to continue their education despite the circumstances of the nation.

Refugee Index:

When a nation's refugee and displaced person index (ranges from 0 to 10) is higher, it is likely that the nation's gender parity will decrease substantially. Nations with a higher refugee or displaced person population are also likely to be the nations where the conflict itself is occurring. This explains why nations with a refugee index less than 7.0 on the index have a close-to-perfect GPI, as they may be bordering nations offering asylum to refugees. However, nations above that number are more likely to be the nations harboring the conflict and producing the refugees. In a nation where circumstances are so poor that the country becomes inhabitable, therefore producing refugees, it is likely that education is an afterthought for many. As a result, it is incredibly likely that students will be pulled out of school.

Student-Teacher Ratio:

When a student-to-teacher ratio is smaller, it is more likely that gender parity will be closer to one. When the student-teacher ratio becomes larger, it is likely that gender parity will substantially decrease. A smaller student-to-teacher ratio may be an indicator of more access to resources. For example, underfunded schools cannot afford to hire multiple teachers. Therefore, these schools may allocate more students per teacher. Likewise, wealthier schools are more likely to allocate smaller numbers of students per teacher. Therefore, this ratio may be an indicator of a nation's wealth and prosperity. It may not be the student-to-teacher ratio alone that produces gender parity, but rather the national environment which creates this ratio that produces gender parity.

Validating the Forecasting Accuracy of the Models:

To verify that these models predict gender parity to an acceptable degree of accuracy, two regression models were chosen at random: Internet Users and Government Effectiveness Index. For each model, a nation was chosen at random and plotted on the model, using data from 2010, a year not included when making the models. While this method does not illustrate the full scope of the models' accuracy or inaccuracy, it offers strong evidence that the regression models are accurate.^{12,13}

Table 2: Table of values used to predict and compare gender parity in the Internet Users regression model.

Country	Internet Users	Actual GPI	Predicted GPI
Angola, 2010	2.80	0.679	0.80
Albania, 2010	45.00	1.005	1.0367
Germany, 2010	82.00	0.948	1.000

Table 3: Table of values used to predict and compare gender parity in the Government Effectiveness regression model.

Country	Government Effectiveness Index	Actual GPI	Predicted GPI
Serbia, 2010	- 0.05	1.02	1.150
Denmark, 2010	2.10	1.009	0.97

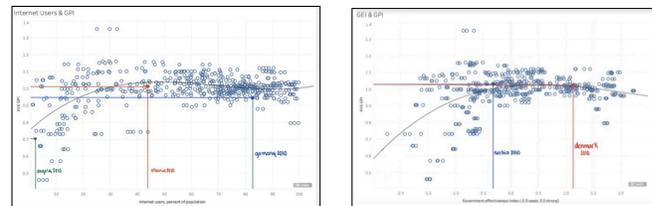


Figure 11 and 12: Statistical comparison of the models to data not included in the given datasets.

Developing a Remediation Path with Bright Spot Analysis:

Another perspective that offers insight into the usefulness of these models is a bright-spot analysis. A bright spot is a positive-deviant measurement. In this case, it was a nation with a perfect or close to perfect gender parity index despite the circumstances that would forecast a lower GPI. These bright spots directly contradicted this model's predictions. The goal of the bright-spot analysis was to identify and understand how certain nations were able to uphold a close-to-perfect or perfect gender parity despite circumstances that normally result otherwise. To make the findings of this analysis as applicable as possible, this analysis focused on finding larger-scale reasons or initiatives that contribute to these nations' exceptional gender parities.

The positive-deviant countries were tracked across the ten indicators and organized by their frequency of deviation from the forecasts (while filtering out extremely small nation-states) (Table 4).

Table 4: List of countries identified as positive deviants with models.

Nation	Frequency
Honduras	6
Bangladesh	3
Nepal	3
Rwanda	3

Honduras is an outlier in six indicators: internet users, government effectiveness index, rule of law index, mobile user, fragile state index, and student-teacher ratio. Even with only about 32% of its population using the internet, a -0.75 on the GEI, a -1.00 on the RLI, 79 per 100 being mobile users, a 77.8 on the FSI, and 27.5 students per teacher, the nation maintains a GPI of 1.16.

Table 5: Table displaying the homicide rate per 100,000 for females and males, as well as gender parity index, secondary, for Honduras, Antigua and Barbuda, El Salvador, and Venezuela.

Country	Homicide Rate per 100,000 (Female)	Homicide Rate per 100,000 (Male)	Gender Parity Index, Secondary
Honduras (2018)	7.8	70.1	1.15
Antigua and Barbuda (2008)	11.2	27.0	0.99
El Salvador (2017)	13.8	115.9	1.15
Venezuela (2018)	10.7	61.9	1.08

Like Honduras, it was found that these nations show a stark difference between the male and female homicide rates. Interestingly, the gender parity for these nations, like Honduras, were all above 1.00. This indicates that the influence of gang violence discourages males from attending school, making the gender parity for these nations extremely high. For this reason, despite extremely poor circumstances which would normally result in a low GPI, these nations with prominent gang activity are able to maintain a high GPI.

Rwanda is an outlier in three indicators: mobile users, fragile state index, and student-teacher ratio. Even with only about 76 per 100 being mobile users, an 87.5 (high) on the Fragile State Index, and 58.5 students per teacher, the nation maintains a GPI of 1.11.

After the Rwandan genocide in 1994, the Rwandan government realized that it must allow its women into the workplace should the nation hope to rebuild itself. Rwanda launched an Education For All Plan of Action (MINEDUC) in 2003,²⁵ which thoroughly addressed the constraints that discouraged female attendance in schools as well as developed respective plans to address these issues.

A notable objective from the Education For All Plan of Action is Objective 5: Eliminate gender disparities in primary and secondary education by 2005, and achieve gender equality in education by 2015, with a focus on ensuring girls full and equal access to and achievement in basic education of good quality.²⁵ The plan lists the “Constraints to the elimination of gender disparities in education” as well as their respective, proposed solutions and strategies, some of which include: increasing capacity of schools to take more girls, enhancing policy development on alternative education opportunities for girls, and promoting quality and gender-sensitive learning to reduce dropout and repetition rates for female students.

Rwanda’s government intervention narrowed the gender gap in secondary education. Rwanda also rewrote its Constitution in 2003, introducing Article 20, which guaranteed the right to education for all citizens, and Article 80, which allocated 30% of the Senate for women.²⁶ With strong government initiative and focus to improve the nation’s gender parity, Rwanda was able to uplift its female citizens in both the workplace and in schools and, to this day, maintains an exceptional gender parity index given the nation’s resources.

Bangladesh is an outlier in three indicators: internet users, government effectiveness index, and fragile state index. Even with only about 15% of its population using the internet, a -0.72 on the GEI, and an 87.7 on the FSI, the nation maintains a GPI of 1.14.

Bangladesh is a predominantly patriarchal society, making its exceptional gender parity index noteworthy. Since 1990, Bangladesh’s secondary gender parity index has doubled, going from 0.508 to 1.14. The nation’s immense progress despite cultural settings can be attributed to the number of government interventions aimed at promoting girls’ education.

In 1994, the Bangladesh Government implemented the Female Stipend Program,²⁴ an initiative that provided female students with a stipend and tuition fee waiver. This program effectively was modeled and executed similarly to Rwanda’s Education For All Plan of Action and, like Rwanda, helped narrow and eventually eliminate the gender gap in secondary education.

In 1983, the Bangladesh government created the Grameen Bank, a financial initiative aiming to alleviate poverty through social and credit intermediation.²⁷ The initiative especially helped women in Bangladesh who, due to the nation’s socio-cultural climate, were often at more risk of poverty than their male counterparts. As a result, the Grameen Bank resulted in an increase in the financial empowerment of the female Bangladeshi population. From 1985 to 1992, the female borrowers of the bank increased by 1,205%, while the male borrowers increased by 67%. In 1992, women received about 80% of the bank’s loans. Over the same time period, the number of center-operated schools increased by about 386% and enrollment increased by 583%.²⁷

This indicated that encouraging female financial independence may directly result in higher enrollment in schools, and thus a higher gender parity. Though female financial freedom was not an indicator represented in the models above, the Grameen Bank initiative provides convincing evidence that by encouraging gender parity in financial independence, a nation can improve its gender parity in education as well.

Application to Kashmir:

The intention with this paper was to understand the variables that affect gender parity. As the regression models and the bright-spot analysis indicate, government effectiveness and intervention may be one of the more influential variables in gender parity. Therefore, a method can be introduced in which strong government effectiveness can be modeled on a smaller scale, e.g., with non-profits. In nations where the overall state of the nation is not ideal, non-profits have a profound impact, as they often take over the duties the government cannot fulfill.

The region of Kashmir has been a conflict region for dozens of years. Due to this conflict, the region has suffered immensely. If plots were created for Kashmir on the models from Section 3, it is highly probable that the models would predict the region to have a low gender parity index.

To address these challenges, The Kashmir Education Initiative has implemented initiatives along the “Three-Axis of Intervention”:

1. Mentoring & Counseling: As illustrated by Figure 11, nations with lower student-to-teacher ratios tend to have better gender parity values. Thus, it can be hypothesized that focusing

on decreasing student-to-teacher ratios may improve gender parity. As directly addressing student-to-teacher ratios may be difficult, considering hiring and paying for new teachers, mentorship may be a great alternative. The implementation of mentoring may boost gender parity, as mentors can often take the role of teachers and offer students one-on-one support that might be lacking in larger classroom settings.

2. Financial & Material Assistance: As shown in Figure 3 and 6, access to resources play a significant role in gender parity. Nations, where larger populations have access to mobile phones and the internet, tend to be linked with higher gender parity values. Thus, one way to improve gender parity may be to provide resources to students. In KEI, students not only receive scholarships but also devices with educational software made by Gooru.²⁸ Gooru's educational software uses artificial intelligence to create a custom learning path for each student based on their proficient and developing skills. By providing students with devices as well as personalized learning plans, this initiative may improve gender parity by providing students with resources they would've otherwise been denied: internet access and mobile devices. The customized learning plan Gooru provides even works to address the student-to-teacher ratio as it provides customized attention without the need of a teacher. The scholarships that KEI provides to students also works to follow the path shown by "positive deviant" countries such as Bangladesh where grass-root level economic support is seen to have an impact on education. These methods of assistance that KEI provides may, as supported by the above research, work to improve their gender parity.

3. Experiential Opportunities: By providing workshops building competency and expertise, and offering full-time and internship opportunities internationally, the Kashmir Education Initiative works to remove the isolation students feel as a result of the lockdown.

The Kashmir Education Initiative's work in Kashmir has been extremely successful at not only providing quality education to students who would otherwise suffer due to the conflict but also improving gender parity. KEI was founded in 2007, and its first batch of students from 2008 - 2013 had a gender parity of 0.67. In 2015, KEI's efforts had successfully boosted their gender parity up to 0.83.³ It is important to note KEI's method of selecting students. KEI is open to any students who qualify financially and academically. Students who qualify financially are encouraged to take an exam in which top scorers are chosen to join KEI, regardless of gender. Being so, the gender parity ratio is most often determined by the number of male versus female applicants who apply. In years with more male applicants, a larger portion of top-scorers are male, thus resulting in lower gender parity.

KEI's work in Kashmir goes to show that one does not have to wait for sweeping government legislation to improve gender parity. While it does help improve parity on a larger scale, significant change can be made through smaller groups and individuals, as KEI and its efforts have so well demonstrated. While the region of Kashmir's gender parity, as of 2016, was 0.95,²⁹ the Kashmir Education Initiative was 1.52.³

■ Conclusion

In this paper, indicators that positively or negatively affect the gender parity ratio for nations and communities were identified. Models were developed and validated based on accuracy by testing them on untrained data. Countries that are positive deviants were examined and what they are doing differently to break away was also examined despite scarce resources, poverty, and risk of political violence. All of these have provided insights, for which there is no need to wait for federal or state legislation to improve the conditions of gender equality and education in the world.

Grameen Bank illustrates how a small community development bank changed the course of gender equity and financial independence in a country of 160 million. Rwanda's Education for All Plan of Action showed how a government can successfully work to create and implement initiatives to improve a nation's gender parity and equity. The Kashmir Education Initiative shows how there is no need to wait for legislation to make a significant change in the lives of students. Each person can act -- by volunteering to mentor a student from an underprivileged school, statistically improving the gender-parity ratio. By providing devices with internet connectivity and/or learning curriculums to kids in remote, high-conflict areas of the world, the quality of education can be leveled and, once again gender parity, can be statistically improved. There is no need to discuss legislation with the congresspeople of a nation, though it may help. Each person has the ability to affect the indicators that improve the gender parity index. It may sound cliché, but, as this paper shows, we can be the difference we want to see.

■ Acknowledgements

I would like to extend my sincere thanks to Dr. Riyaz Bashir, professor at Temple University, for his continuous support and guidance. His insightful suggestions and unparalleled knowledge served as an invaluable contribution to creating this paper.

I must also thank Supreet Singh for his constructive suggestions and unwavering guidance throughout.

I also gratefully acknowledge the assistance of Sana Ghazi, whose extensive knowledge and guidance made this paper possible.

■ References

1. *India's Constitution of 1949 with Amendments through 2015*. Constitute Project. (n.d.). https://www.constituteproject.org/constitution/India_2015.pdf?lang=en.
2. Yasir, S., & Gettleman, J. (2019, October 31). *Anxious and Cooped Up, 1.5 Million Kashmiri Children Are Still Out of School*. The New York Times. <https://www.nytimes.com/2019/10/31/world/asia/kashmir-school-children.html>.
3. Kashmir Education Initiative. (n.d.). <https://www.kashmirei.org/>.
4. *The Editors of Encyclopaedia Britannica*. (n.d.). *The Kashmir Problem*. Encyclopædia Britannica. Retrieved September 24, 2021, from <https://www.britannica.com/place/Kashmir-region-Indian-subcontinent/The-Kashmir-problem>.
5. BBC. (2019, August 5). *Article 370: What happened with Kashmir and why it matters*. BBC News. Retrieved September 24, 2021, from <https://www.bbc.com/news/world-asia-india-49234708>.
6. Mehran, G. (2003). *Gender and Education in Iran*. *United Nations Educational, Scientific and Cultural Organization*. Retrieved September 25, 2021, from file:///Users/arinaoberoi/Desktop

- top/10.1.1.550.6578.pdf.
7. Avalos, B. (2003). Gender Parity and Equality in Chile: A Case Study . *United Educational, Scientific and Cultural Organization*. Retrieved September 25, 2021, from file:///Users/arinaoberoi/Desktop/Gender_parity_and_equality_in_Chile_a_case_study.pdf.
 8. Ali, E. (2010). Does Scholarship Scheme Contribute to Gender Parity in Female Education?: The Case of Secondary Education in Bangladesh . *Cross-Cultural Communication*, 6(3), 1–9. Retrieved September 25, 2021, from file:///Users/arinaoberoi/Desktop/976-1016-1-PB.pdf.
 9. The World Bank. (n.d.). Indicators. <https://data.worldbank.org/indicator?tab=all>.
 10. Correlation Coefficient: Simple Definition, *Formula, Easy Steps*. Statistics How To. (2021, July 1). <https://www.statisticshowto.com/probability-and-statistics/correlation-coefficient-formula/>
 11. *Political stability by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/wb_political_stability/.
 12. *Internet users by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/internet_users/.
 13. *Government effectiveness by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/wb_government_effectiveness/
 14. *Rule of law by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/wb_ruleoflaw/.
 15. *Mobile phone subscribers by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/mobile_phone_subscribers/.
 16. *Political violence risk by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/political_violence_risk/.
 17. *Demographic pressures index by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/demographic_pressures_index/.
 18. *Fragile state index by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/fragile_state_index/.
 19. *Refugees and displaced persons index by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/refugees_displaced_persons_index/.
 20. *Student teacher ratio, primary school by country, around the world*. TheGlobalEconomy.com. (2019). https://www.theglobaleconomy.com/rankings/student_teacher_ratio_primary_school/.
 21. *Intentional homicides (per 100,000 people)*. Data. (2018). <https://data.worldbank.org/indicator/VC.IHR.PSRC.P5>.
 22. *Intentional homicides, female (per 100,000 female)*. Data. (2018). <https://data.worldbank.org/indicator/VC.IHR.PSRC.FE.P5>.
 23. *Intentional homicides, male (per 100,000 male)*. Data. (2018). <https://data.worldbank.org/indicator/VC.IHR.PSRC.MA.P5>.
 24. Xu, S., Shonchoy, A., & Fujii, T. (2019). Illusion of Gender Parity in Education: Intrahousehold Resource Allocation in Bangladesh. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3386159>
 25. Ministry of Education, Science, Technology and Scientific Research. (2003). *Education For All Plan of Action*.
 26. *Rwanda's Constitution of 2003 with Amendments through 2015*. Constitute Project. (n.d.). https://www.constituteproject.org/constitution/Rwanda_2015.pdf?lang=en.
 27. Khandker, S., Khalily, B., & Khan, Z. (1994). *Grameen Bank Sustainable? - World Bank. Human Resources Development and Operations Policy*. <https://documents.worldbank.org/curated/en/658601468768006874/pdf/multi-page.pdf>.
 28. *Navigator is a GPS for Learning*. Gooru. (n.d.). <https://gooru.org/about/>.
 29. Government of India. (n.d.). *Education Statistics at a Glance*. https://www.education.gov.in/sites/upload_files/mhrd/files/statistics-new/ESAG-2018.pdf.

■ Author

Arina Oberoi is a 12th-grade student at Pinewood Upper Campus. She is interested in pursuing a career involving data analysis and law.