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**ANALYSES OF FEMALE PARTICIPATION IN UNITED
NATIONS PEACEKEEPING OPERATIONS**

by

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March 2022

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**ANALYSES OF FEMALE PARTICIPATION IN UNITED NATIONS
PEACEKEEPING OPERATIONS**

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Submitted in partial fulfillment of the
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ABSTRACT

The United Nations issued the UN Security Council Resolution 1325 in 2000 and nine following resolutions promoting the Women, Peace, and Security agenda to protect more women in conflict areas and increase female participation in global peacekeeping operations. This research discusses essential issues about increasing female participation in UN missions. This thesis focuses on three critical areas: why the UN still has slight female participation in the missions, what the UN wants by adding more women to the forces, and how well the female participation campaign works so far. Monthly gender data from the official UN database and relevant literature are used in the research. The theoretical section connects the relationship between economic theories and the status quo of the UN peacekeeping labor market. The empirical research uses time-series data to measure the current trend of female numbers and calculate the estimated strength in the future. Two factors affect the missing number of female peacekeepers: the discrimination prejudices at a societal level and risk preference at an individual level. Findings show female participation in UN peacekeeping operations has a slightly positive trend during the last two decades; however, the number still has some room for improvement in the future.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACF	Autocorrelation Function
AIC	Akaike Information Criterion
AR	Autoregression
ARIMA	Autoregressive Integrated Moving Average
CIMIC	Civil-Military Cooperation
CL	Confidence Level
CWD	Compensating Wage Differential
DES	Double Exponential Smoothing
DF	Degree of Freedom
DPO	Department of Peace Operations
EUCSDP	European Union Common Security and Defense Policy
FPR	Female Participation Rate
FPU	Formed Police Unit
IPO	Individual Police Officer
IRT	Item Response Theory
LES	Linear Exponential Smoothing
MA	Moving Average
MAE	Mean Absolute Error
MOSO	Military Observer and Staff Officer
OLS	Ordinary Least Squares
OSCE	Organization for Security and Cooperation in Europe
PACF	Partial Autocorrelation Function
PCC	Police Contributing Country
PD	Police Division
SBC	Schwarz Bayesian Information Criterion
SES	Simple Exponential Smoothing
SSE	Sum of Squares due to Error
TCC	Troop Contributing Country
UNSCR	United Nations Security Council Resolution
WPS	Women, Peace, and Security

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I. INTRODUCTION

The United Nations issued UN Security Council Resolution (UNSCR) 1325 in 2000 and nine following resolutions promoting the Women, Peace, and Security (WPS) agenda to protect more women in conflict areas and increase female participation in global peacekeeping operations. These documents emphasize women's essential role in peacebuilding to assist other women and children in conflict areas and prevent any sexual assault and harassment to the minor group in the local communities. Specifically, the UN claims that female participation boosts the effectiveness of peacekeeping operations. Yet, female participation still grows sluggishly, especially in several groups of peacekeeping contingents. The lack of parity of female peacekeepers indicates crucial evidence that women in peacekeeping operations are still a significant issue in the UN WPS agenda.

My thesis research investigates essential questions about increasing female participation in UN peacekeeping operations. This thesis focuses on three critical areas: why the UN still has low female participation in the missions, what the UN wants by adding more women to the forces, and how well the female participation campaign is working so far. After reviewing credible literature and analyzing the findings, I construct relevant arguments. In addition, I compile the monthly gender data from the official UN database to measure the progress of the WPS campaign.

I conduct two types of analyses: theoretical analysis and empirical analysis. The theoretical section connects the relationship between popular theories and the status quo of the UN peacekeeping labor market to answer the first two research questions. This analysis explores some concepts to explain why the UN misses the opportunities to add female candidates to the labor pool and wants more women to serve under the flag. The empirical research uses time series data, which measure the current trend of female numbers and calculate the estimated strength in the future. This chapter is crucial because the result gives the actual numbers and calculations to prove the effectiveness of the UN WPS campaign in the last two decades.

In theoretical analysis, I find two factors affecting the low number of female peacekeepers: the discrimination of primary stakeholders at a societal level and women's risk preferences at an individual choice level. The peacekeeping stakeholders discriminate against women to join the mission. The female candidates feel that the UN undervalues their contribution by not providing additional compensation due to the higher risk of gender-based violence and sexual exploitation in conflict areas. I also find that the UN recognized that women have a comparative advantage in increasing operational effectiveness. Using gender as a signal, I use theory to suggest that women may have quicker access to female groups and provide relatively better care for women in conflict areas. Empirically, female participation has a slightly positive trend during the last two decades, but the movement still has some room for improvement in the future. Some UN contingents need special attention and effort to increase female participation. Both the theoretical and empirical findings support each other.

The UN and Troop Contributing Countries/Police Contributing Countries (TCCs/PCCs) should eliminate gender discrimination during peacekeeper recruitment, selection, and deployment. The peacekeeping stakeholders can work together to provide better workplaces for female peacekeepers by reducing the risk of gender-based violence in operation areas or adding more incentives for women to join the missions. If the UN wants to maximize the female comparative advantage, the organization must deploy more female peacekeepers in the community to offer necessary treatment and solutions. The UN Department of Peace Operations (DPO) may attract and select more qualified peacekeepers to expand the peacekeeping labor pool by committing a fresh perspective in promoting the WPS campaign.

I observe that some research and studies find that the female peacekeepers have potential added values to accomplish any objectives in the peacekeeping operations. Bridges and Horsfall (2009) emphasize that the role of women in the mission significantly boosts UN operational effectiveness. The common issue is that the researchers do not investigate the theoretical underpinnings of the benefit of adding more women to the UN missions. There are essential factors that influence the preference of the peacekeeping stakeholders and female candidates. Some studies also miss analyzing women as a signal

and latent variable, which shapes the comparative advantage of female peacekeepers in the missions. Smit and Tidblad-Lundholm (2018) also analyze the current UN Female Participation Rate (FPR) and find a positive trend in the findings. The issue is that this paper does not perform a further time series analysis to predict the future movement of female participation.

Promoting future female roles in the UN peacekeeping operations can attract more female candidates, motivate the contributing countries, and shift the female peacekeepers' supply curve to the right. The technology innovation that can reduce the risk of dangerous jobs, ensure safety from injury and fatality, and eliminate potential gender-based violence or sexual harassment can also positively move the supply curve. The mission commanders should provide more job opportunities for female candidates in their units and build more non-discriminatory workplaces to capture female peacekeepers' interests. The leaders can start opening more female positions, which male peacekeepers conventionally fill. The UN DPO can also increase the supply of female candidates by changing prerequisites and job descriptions, which may contain pointless credentials or unintentionally gender-biased wording in recruiting female troops and policewomen. Promoting an equal employment opportunity, a safer workplace, and a better commitment to preventing gender discrimination in UN mission areas can add more value to the FPR in peacekeeping operations.

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II. BACKGROUND

The United Nations issued the UN Security Council Resolution (UNSCR) 1325 in 2000 (UN Security Council, 2000). The document introduces a new UN campaign promoting the WPS policy to admit that armed conflicts disproportionately hurt local women and girls in conflict areas. The UN Security Council (2000) demanded more female inclusion to support the unique necessities of women and girls during peacebuilding in conflict-affected areas. UN Security Council issued this first reference to oblige all peacekeeping stakeholders to defend women's rights, promote female participation, and eliminate gender-based violence or sexual exploitation in conflict areas. The UN Security Council also promulgates the following nine resolutions: 1820 (2008), 1888 (2008), 1889 (2009), 1960 (2010), 2106 (2013), 2122 (2013), 2242 (2015), 2467 (2019), and 2493 (2019) to boost the WPS campaign in protecting more women in conflict areas and increasing female participation in global peacekeeping operations. These documents also highlight women who have a comparative advantage in sustaining the peace in post-conflict regions and preventing sexual exploitation and abuse to the women and girls in local communities.

The UN claims that female participation boosts the effectiveness of peacekeeping operations (UN Security Council, 2019). However, female participation still grows sluggishly, especially in several groups of peacekeeping contingents. The UN Department of Peace Operations (2018) states that women only fulfill around 5% of all UN peacekeepers and have not significantly improved in recent years. UN DPO studies that external factors (information distribution, TCCs/PCCs policies, candidates' preference, etc.) and internal factors (funding, secure workplace, recruitment document, etc.) cause the difference of participation. The small proportion of female peacekeepers in UN missions provides crucial evidence that women's inclusion is still a big issue in the UN WPS agenda.

The UN still has a low level of female participation in the missions, although the WPS campaign has echoed for the last two decades. This insight alerts that the advertisement does not work well and requires adjusting to the correct projection. This low number of female peacekeepers also confirms that the men dominate the peacekeeping

labor pool, and women have less interest in joining the missions. The risk of fatality, injury, abduction and sexual violence is adverse for female peacekeeper candidates to join UN missions (Henke, 2016).

The UN wants to add more women to the forces because the organization believes that female participation boosts the effectiveness of peacekeeping operations (UN Security Council, 2019). Bridges and Horsfall (2009) support the UN statement by proposing more claims that female peacekeepers can reduce male sexual misconduct in the mission areas, promote gender equality in the workforce, and improve trust with the local community. Wilén (2020a) realizes the campaign on the added values of women in the missions as instrumentalization on gender signal. She emphasizes that this perception potentially shapes unrealistic expectations for female peacekeepers. Wilén underlines the need to recruit and select more peacekeepers based on performance, not only gender identity.

The number of female peacekeepers increased during the last fifteen years. There were 5,721 women out of 75,884 peacekeepers in November 2021 compared to 1,235 women out of 65,555 peacekeepers in August 2006 (UN Peacekeeping, 2021). The UN DPO issued the Uniformed Gender Parity Strategy in 2018 to specify the FPR targets in 2028 and outline the plans to achieve those end strengths (UN Department of Peace Operations, 2018). The main problem with the FPR is that this parameter causes bias in the result. The FPR calculates the percentage of women in the peacekeeping force. The increase in FPR does not always indicate the increasing number of female participation but rather the rapid drop of male numbers in the missions.

III. LITERATURE REVIEW

This chapter collects critical research and studies on female participation in peacekeeping operations. Many peace and gender analysts have researched women, peace, and security since the UN published UNSCR 1325 in 2000. I review some literature on female participation in UN peacekeeping operations to establish my position in the field of existing analysis. I investigate the methods that support answering my primary research questions and find the gaps I can solve through my investigations.

Some works of literature discuss the missing number of UN female candidates in the peacekeeping forces. Tidblad-Lundholm (2020) investigates the length of the peacekeeping service period from 2009 to 2015 that influences female participation in the missions. She disputes that the TCCs/PCCs and UN mission leaders are reluctant to deploy female peacekeepers in the early phase of the mission due to uncertainty and potential risks, such as high conflict intensity and sexual violence. She mentions that female participation increases as the conflict becomes more stable and less tense. She also discusses the risk of gender-based violence and sexual exploitation in high conflict areas.

Dharmapuri (2013), who researches the UN FPR from 2010 to 2013, also finds that the small number of female peacekeepers is due to different TCCs/PCCs policies. She obtains data to find that the UN faces difficulty increasing female participation in global peacekeeping operations. This challenge appears because TCCs/PCCs lack awareness of the importance of implementing UNSCR 1325. She mentions that the prevalence of social norms and behaviors propagates gender inequality obstacles to female participation in UN missions.

Tidblad-Lundholm (2020) and Dharmapuri (2013) do not explore the mechanism of gender discrimination that affects the number of females in peacekeeping operations. Both studies argue that the TCCs discriminate against women joining the force due to security and cultural reasons. The analysis does not include economic factors that affect the female labor pool in peacekeeping operations. The authors also miss explaining how

the risk of sexual violence in conflict areas shapes the individual female preference for selecting peacekeeping jobs.

Adding more females to the UN peacekeeping operations is always an exciting topic to be discussed. This issue helps me think critically about the extensive campaign on deploying more women to conflict areas. UN Security Council (2019) claims that “deploying female personnel in UN peace operations is not only the right thing to do but also the smart thing because they can win the hearts and minds of the local people with whom they work” (para. 1). Bridges & Horsfall (2009) conduct a qualitative analysis on female peacekeepers by interviewing some female troops from the Australian Defense Forces to analyze how the increased percentage of UN female peacekeepers is advantageous to its operational effectiveness. The researchers focus on increased female participation in opposing sexual violence, promoting gender equalities, and improving trust in local communities.

Wilén (2020a) investigates the instrumentalization of female participation in peacekeeping operations. She explains that the instrumentalization of female peacekeepers harms productivity and potentially adds more burden to achieve the mission objectives. Her study mentions eight female characteristics, which are supposed to be potential female advantages but do not work well in reality. The high expectations of women’s performance in the missions may cause degradation in the effectiveness of operations. Wilén proposes that the UN measure male and female peacekeepers by productivity in conflict areas, not gender. UN mission leaders must identify talent needs in the operation areas and deploy the right peacekeepers in the right place.

The issue with Bridges and Horsfall’s study (2009) is that the result seems narrow, as this paper discusses female participation rates from a military organization perspective. The result appears that the writers force the conclusion to align with the hypothesis. The small number of interviewees also causes subjective preferences in the conclusion section. Wilén (2020a) misses recognizing gender as a visible signal that adds more value to the UN missions. She avoids any debate on the advantage of deploying more women and focuses on how the organization implements diversity and inclusion to absorb more human resources to strengthen the institutional value and impact the operations. Both studies lack

theoretical preference or data to support their standings and need further analysis to enhance their findings.

The official UN DPO website and other independent peace research institutes provide more accessible data in their respective peacekeeping databases. Many available sources help many researchers to conduct empirical studies to measure the effectiveness of gender inclusion in the missions. Smit & Tidblad-Lundholm (2018) study women's participation in peacekeeping operations through compiled data from 2008 to 2017. This research covers women's broad involvement in peacekeeping operations organized by the UN, the European Union Common Security and Defense Policy (EU CSDP) missions, and the Organization for Security and Cooperation in Europe (OSCE) field operations. The research displays the numbers of female peacekeepers and their participation rates by specific peacekeeping jobs in each peacekeeping organization. Smit & Tidblad-Lundholm (2018) conclude that female peacekeepers are under-represented, with their numbers stagnating or decreasing in some groups. The authors also recommend fixing each organization's data compilations and presentations to enhance their transparency and accountability to future quantitative research and policy analysis.

Smit and Tidblad-Lundholm successfully present the big picture of the FPR and its problems based on valid data compiled from all peacekeeping organizations. Smit and Tidblad-Lundholm also give some recommendations to increase the operational effectiveness of each institution. This study lacks detailed analysis and investigation due to many jobs in all peacekeeping organizations. The results summarize the trends and provide interpretations based on the data records. The research displays the time series data on female peacekeepers' ten-year participation but does not conduct forecasting analysis to predict the future movement.

All works of literature have some positive values in each analysis. These papers assist me in developing my primary method in answering my research questions. I also notice some gaps in information and analysis in those papers. These drawbacks allow me to profoundly analyze my topics and fill the missing concepts that produce more reliable findings in this paper.

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IV. THEORETICAL ANALYSES

Theoretical analyses introduce and describe those theories that explain why the research problem under this study exists. The assumptions allow the reader to evaluate the issues critically. The frameworks connect the existing knowledge to the researcher's hypothesis. The analyses help the researcher explain some simple noticeable phenomena more profoundly. These theoretical frameworks also identify which key variables affect a fact of interest and emphasize the need to assess how those variables might vary and under what conditions. Specifically, these analyses provide some overview of the models, concepts, and scientific literature relevant to female participation in the UN peacekeeping forces. The frameworks help facilitate understanding of the relationship between popular economic theories and the status quo of the UN DPO labor market.

This chapter answers two questions of this research. First, why does the UN need to instigate a female-recruitment campaign? This question becomes a hint that the UN DPO has a missing number of female participants. I use a theory of discrimination in the labor market to explain the external factors contributing to the small number of female peacekeepers at a societal level. The discriminatory preferences of the contributing countries, male coworkers, and the mission leaders in deploying women in the conflict area affect female contributions to UN missions. I also include the compensating wage differentials theory analysis to explain why an internal factor such as personal preference affects the motivation of female candidates to join the UN DPO missions at an individual choice level.

The second question is what the UN gains from adding more female peacekeepers into the missions. I use item response theory to analyze whether a woman is a positive indicator of goal achievement. I observe women as a latent variable through the sigmoid function of the item characteristic curve, which identifies the quality of care for other women by gender parity. I also use the opportunity cost theory to measure women's comparative advantage in UN missions. Comparative advantage indicates that female peacekeepers have less opportunity cost to accomplish specific tasks than male peacekeepers. Increasing the participation of female peacekeepers means less opportunity

cost, more comparative advantage, and more productivity in the workplace. I also use the supply theory to recommend some options on how the UN can shift the supply curve of female peacekeepers in the market.

A. THE MISSING NUMBER OF FEMALE PEACEKEEPERS IN UN MISSIONS

This section discusses the possible causes of low FPR in UN missions. I analyze any potential factors contributing to this issue at a societal and individual level. At a societal level, I examine the potential of gender discrimination to decrease the demand for female peacekeepers in the UN missions. At an individual level, I discuss the preference of female candidates who consider UN jobs a high-risk occupation with less compensation due to the potential for gender-based violence and sexual harassment in the conflict area. The insight of the missing number of female peacekeepers helps the UN determine the campaign's effectiveness. The UN can modify the campaign strategy to recruit more women in the missions by understanding why the organization has insufficient women in the workplace.

1. Discrimination in the Workplace

Gary Becker, a Nobel Prize winner in economics in 1992, presents a popular economic theory of racial discrimination. In his first book, published in 1957, Becker introduces discrimination models specifically in hiring workers influenced by skin color. He finds that discrimination in the labor force is more often the result of the negative racial preferences of the three main actors: employers, coworkers, and customers.

Negative prejudice to gender contributes to the sluggish growth of FPR in the UN missions. Becker's racial discrimination theory describes a negative preference for gender that triggers discrimination in the workplace. In the UN peacekeeping operation, gender discrimination creates a small number of UN female peacekeepers at a societal level. Three primary actors also generate gender discrimination in UN peacekeeping operations. The actors are the TCCs/PCCs, the male peacekeepers, and the mission leaders or commanders.

TCCs/PCCs become employers in charge of selecting and hiring their female troops and police and transferring these female peacekeeper candidates to the UN DPO to be deployed to specific mission areas. TCCs/PCCs that discriminate against female candidates

affect the UN peacekeeper supply pool. Countries' discriminatory prejudice in recruiting female peacekeepers causes a small number of military or policewomen to join the peacekeeping operations. Carreiras (2010) states that some TCCs/PCCs are more likely to send more male soldiers and police officers because of cultural burdens and political interests. Those national governments take this policy to avoid involving military and policewomen in harsh workplaces such as armed conflict areas.

The preference bias of UN peacekeepers as masculine creates gender discrimination. The male group peacekeepers have a slightly discriminated preference as coworkers on the field. These men hold back from working and collaborating with female troops or policewomen. Wilén (2020) mentions that there is still an unwillingness to involve work related to some of the physical limitations of women, who are assumed to interfere with and lower cumulative performance in the workplace. The coworkers' assumption indirectly forces the UN DPO to pay a premium cost to attract more women and provide equal employment opportunities in peacekeeping.

Although the UN DPO fosters increasing participation of women in conflict areas, some military commanders or civilian mission leaders are still hesitant to deploy female troops to uncertain zones. Karim (2017) finds that gender separations occur in peacekeeping operations even when the female peacekeepers believe their group brings added value to the mission. The mission commanders decide to deploy these women to a limited number of secure workplaces due to the higher risk of fatality, threats, crimes, and sexual harassment arising in conflict areas. This unproductive decision is soft gender discrimination which affects the number of opportunities for women in the UN missions compared with the men in the force. This trend eases the demand for female participants and decreases the peacekeeping labor pool due to the lack of some talented human resources.

Those three essential stakeholders who perform gender discrimination are equally detrimental to the female peacekeepers at the societal level. These stakeholders are influential in contributing to the low number of female participants in UN missions. Women suffer economically due to declining demand and opportunities in the labor market. The UN DPO also experiences decreased productivity due to the limited number

of qualified peacekeepers in its labor pool. Other institutions or companies that do not show gender discrimination in their workplace are more appealing for female applicants to have on-demand labor at an equal wage. Under these conditions, organizations that avoid discrimination tend to be more productive, have lower operational costs, and have better survivability than discriminatory organizations.

Figure 1 illustrates the application of Becker’s model in the UN peacekeeping labor pool. This graph provides an ideal starting point with no gender discrimination in the UN workforce. The supply curve (S) of male and female participants is similar. The primary assumption is both groups of peacekeepers have an identical marginal product and are equally productive in the missions. In the absence of gender preference, line D represents the demand curve for both groups. Both males and females receive similar wages per labor unit (W), and the UN DPO equally hires many male and female candidates (L).

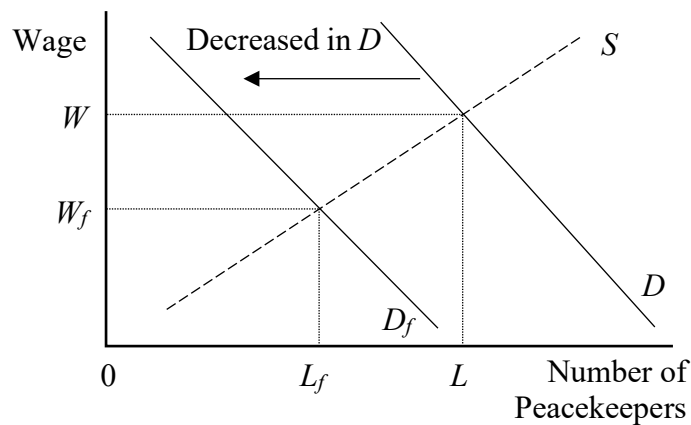


Figure 1. The shift of demand curve due to gender discrimination.

The opposite outcome occurs when there is gender discrimination from the TCCs/PCCs, male coworkers, or the UN mission leaders. The female group will have a lower demand (D_f) than male candidates, and their demand curve will shift to the left. As a result, TCCs/PCCs recruit fewer women (L_f), and female peacekeepers will get a lower income due to the lower wage this group earns (W_f) in the missions. There will be a different wage between male and female peacekeepers, which signals economic

discrimination in the workforce. The women will feel undervalued in the mission, which will reduce the interest of women to join future UN missions.

Labor discrimination occurs due to the different treatment of minority workers from a majority group, even though the minority has a similar level of productivity (Autor, 2009). I can analyze the mathematic formula of the wage equation below to explain the result of gender discrimination in the UN labor force:

$$Y_i = \alpha X_i + \beta Z_i + e_i. \quad (1)$$

Suppose Y_i is the salary received by all peacekeepers, X_i is the characteristic variable of work productivity, and Z_i is the indicator variable for gender (female=1 and male=0). The e is the error term or the different value from the equation during empirical analysis, and i is the group observations (m for male and f for female). The α is the value of some factors that support the peacekeepers' productivity in the workplace, such as applied technology, simple bureaucracy, standardized operating procedures, clear job descriptions, etc., while the β is the value generated by the UN's gender preference in the missions. In a discriminatory workplace, the β value is negative ($\beta < 0$) because gender discrimination harms the female value, as illustrated in Figure 1. The β value is zero when a company eliminates gender discrimination in its workplace.

I analyze Equation 1 by two assumptions. The first assumption is all peacekeepers have the same productivity characteristics ($\alpha X_m = \alpha X_f$) in the UN missions. In that case, the salary received by female peacekeepers will be lower than the male group due to the β value:

$$Y_f = Y_m - \beta. \quad (2)$$

The β value becomes the diminishing value to female participants' wages. In this assumption, females become victims of salary discrimination due to their gender status.

The second assumption is all peacekeepers have the same wage regardless of gender, male or female ($Y_m = Y_f$). Suppose wage (Y) is a fixed number, and there is a gender discrimination indicator in the recruitment and selection of UN peacekeepers ($Z_m = 0$ and $Z_f = 1$). In that case, the military female and policewomen discriminated against

during the recruitment and selection phases will be required to perform more productivity than male peacekeepers:

$$\alpha X_f = \alpha X_m + \beta. \quad (3)$$

The β value becomes the extra value to female participants' productivity that must be performed during the recruitment or deployment. This condition will certainly make the recruitment more difficult for women to pass the selection and reduce their opportunities to participate in UN peacekeeping missions, affecting the supply of peacekeepers in UN missions. The reduced supply of peacekeepers diminishes the UN's option to select more talented peacekeepers in the mission areas.

2. The Effect of Job Risk on Individual Preference to Work

Female candidates feel that the UN DPO offers dangerous jobs with less incentive for female peacekeepers. Tidblad-Lundholm (2020) emphasizes this statement by stating that female peacekeepers have a higher risk of gender violation and sexual harassment than male groups in mission areas with high conflict intensity. The effect of UN high-risk jobs in the conflict area constructs a negative preference for women to participate in the mission. I use compensating wage differential (CWD) theory to provide a clear and concise framework for analyzing the experiences of individual peacekeepers. This theoretical basis examines missing female peacekeepers from individual preference instead of the societal factors described in the previous section.

CWD is a certain amount of money offered by a firm to recruit or retain its employees and remain competitive in the labor market. The theory of CWD, introduced by Adam Smith, outlines the idea behind pay differences. An employer cannot attract skilled workers without such a differential. Ehrenberg & Smith (2015) state that the CWD satisfies personal needs by incentivizing people to work in dirty, dangerous, or hostile environments. CWD also become the solution to the valuation of various job characteristic in the labor market.

Henke (2019) mentions that the more UN peacekeepers are deployed to conflict areas, the higher their fatality rate. This finding rationalizes UN DPO to provide more

CWD to peacekeepers than regular jobs. Some UN jobs, such as military observers, negotiators, conflict mediators, border protection forces, intelligent officers, logistic suppliers, etc., are inherently insecure or hazardous and costly to make them harmless. The peacekeeper candidates follow rigorous recruitment, selection, and induction training to fulfill the manpower and personnel requirements set by the UN. This process is essential to prepare all UN peacekeepers to encounter the worst situations in a conflict area.

Generally, all UN peacekeepers have the same potential risk to all genders in operation areas. The critical difference between male and female peacekeepers is the risk of gender-based violence and sexual harassment, in addition to its current job-related hazards. Cohen and Nordås (2014) find that sexual violence is miserably commonplace in areas of armed conflict where the security and safety of vulnerable groups are less guaranteed. Tidblad-Lundholm (2020) also states that the UN DPO deploys female peacekeepers who have a higher risk of gender-based violence and sexual harassment than men to mission areas with high conflict intensity.

Matthews et al. (2021) conduct a quantitative study on dissimilarity in the risk of sexual assault and sexual harassment among U.S. Army men and women at the military installations, commands, and career fields from August 2017 to July 2018. The study finds that the average total risk to all women during the period was 5.8% compared with the threat to men (0.6%). In addition, this study also emphasizes that the rate of sexual assault and harassment is higher at combatant units than at secure offices or headquarters. The researchers assume that the combatant units' characteristics, such as young age, unmarried, less educated, and junior ranks, affect the higher sexual assault and harassment results in their establishments. This study also highlights that the risk of sexual assault highly correlates with sexual harassment. This paper gives me valid evidence that women have a higher risk of gender-based violence and sexual harassment in the military workplace.

The rate of gender-based violence and sexual harassment in a specific area of operation or local community influences the individual female preference to evade the front line and riskier areas and reject being made vulnerable to sexual assault with no additional incentives or rewards. This personal preference causes women to avoid participating in the

UN peacekeeping operation or applying for more secure UN jobs in a controllable environment less prone to gender-based violence or sexual harassment.

I analyze women's CWD using three assumptions that construct individual female preference besides potential gender-based violence and sexual harassment in high-risk conflict areas. The first assumption is utility maximization. Holohan (2019) mentions that many female troops join UN missions with specific soft skills, such as medical personnel, supply officers, administrative staff, financial staff, manpower analysts, etc. Those skilled female peacekeepers are less suitable for being deployed in a rough neighborhood with more potential threats and fatalities and need more survival and combat skill. This individual preference indirectly forces the UN missions to receive their skills and maximize their utilities in more controllable areas with limited vacancies and opportunities.

The second assumption is information deficiency. Ideally, all peacekeeping candidates can recognize the job characteristics and descriptions to which the candidates will apply. UN DPO offering hazardous jobs with unclear information will have difficulty recruiting and retaining the peacekeepers. Candidates obtain essential information to evaluate the situation through official recruitment orders, direct observations, or informal conversations from recent peacekeepers. Job information may also be incomplete because very obscure job characteristics may be unknown and unidentified initially. Candidates need special preparations, requirements, and permits to apply for these specific jobs. Some prerequisites and job descriptions may contain pointless credentials or unintentionally gender-biased wording limiting female opportunity (UN Department of Peace Operations, 2018). This misinformation and less publicized job opportunities shape negative preferences for women to join the UN missions.

The third assumption is limited mobility. UN peacekeepers typically are rigid in job mobility because peacekeepers work in dangerous areas with very restricted rules, conducts, and procedures. The peacekeepers serve the mission based on the period mentioned in the letter of agreement between the UN DPO and their respective contributing countries. There are limited promotions, career advancements, or annual leave during one period time of service. This lack of mobility causes a slight undesirable preference, especially for the female forces with family responsibilities.

Those three assumptions formed a solid negative individual preference among female troops and police officers to join UN peacekeeping missions. These assumptions determine the priority of female peacekeepers in choosing their workplace in the mission. Although the UN has vigorously promoted the increased participation of women in peacekeeping operations, this individual preference is still a constraining factor in recruiting more women to serve in conflict areas without any additional compensations or incentives to the group.

CWD is the disparity of wage between higher risk and regular jobs. I use a utility function to help understand the relationship of higher risk jobs to the UN peacekeeper CWD:

$$U = W_i^{\frac{1}{2}} - D_i. \quad (4)$$

Suppose U_i is the utility function of peacekeepers, W_i is the wage received by peacekeepers, and D_i is the indicator variable for a dangerous job in the UN mission (more risk=1 and less risk=0). The little i is the group observations, i.e., m for male and f for female.

I assume that females carry more risk than males due to potential gender-based violence and sexual harassment in the mission areas. With an identical UN job utility, the female peacekeepers should accrue the wage of:

$$W_f = (U + 1)^2. \quad (5)$$

While the male peacekeepers accept less wage:

$$W_m = U^2. \quad (6)$$

In this case, the CWD between female and male peacekeepers is:

$$CWD_f = 2U + 1. \quad (7)$$

Equation 7 helps me understand the effect of gender-based violence and sexual harassment risk on female peacekeepers' CWD in the armed conflict area. I emphasize that female CWDs are not always in the form of economic value but also can be an intangible

benefit that incentivizes the individual woman's choice to join UN peacekeeping operations.

Figure 2 illustrates an indifference curve of the UN peacekeeping jobs. This graph compares the ideal wage rate between male and female peacekeepers, who differ in their risk of injury. The x-axis represents the risk level of the jobs, and the y-axis represents the wage rate. Line R_f shows the mean of risk for female peacekeepers with more probability of gender violation and sexual harassment than the mean of risk for male peacekeepers in line R_m . The male wage rate at point b is lower, and the slope is flatter than the female wage rate at point a . I notice that women should accrue CWD ($a - b$) than male peacekeepers in the same job.

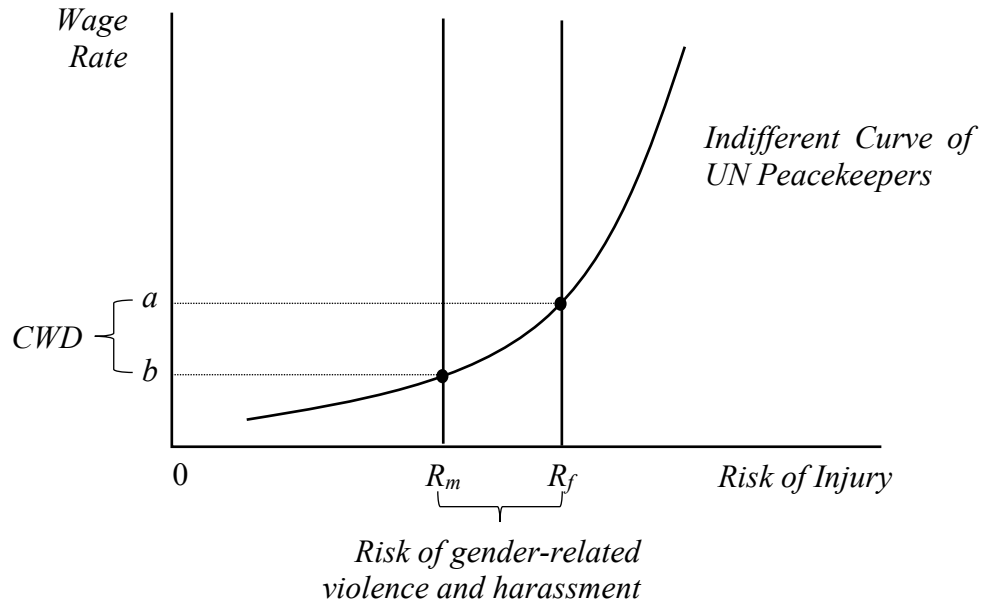


Figure 2. The comparison of CWDs for male and female peacekeepers.

The female peacekeepers who deal with a greater risk of gender-based violence and sexual harassment in the same conflict area feel less valued without CWD. This group senses that there are not enough incentives to offset the higher risk in the workplace. Both negative assumptions affect the recruitment of female candidates in peacekeeping missions. There are two options to solve this issue of different risk preferences in the

deployment areas. The UN DPO must reduce the risk gap between male and female peacekeepers by eliminating the risk of gender-based violence and sexual harassment in mission areas. The organization shall work hard to ensure all UN peacekeeping areas are free from sexual harassment and abuse and promote gender equality to all participants. The other option is by providing more incentives (CWD) to the female peacekeepers who are deployed in more dangerous areas to acknowledge their choice to be exposed to the high risk of hazardous jobs and gender-based violence or sexual harassment. This incentive may disregard the negative individual choice of serving in peacekeeping operations and become an advertisement to attract more women to join the UN missions.

B. THE POSITIVE VALUE OF ADDING MORE WOMEN TO THE MISSIONS

The UN DPO has worked seriously to expand women's opportunities to join the peacekeeping mission under the UN flag for the last two decades. The organization pushes member states to issue each national action plan to support the WPS agenda established in the early 21st century. The UN WPS agenda is an advertising tool based on the positive expectations of the added values contributed by female peacekeepers (Shepherd, 2014). The big issue related to this campaign is that the UN wants more female peacekeepers to achieve better outcomes for women and children in conflict areas.

1. Gender Signaling in Peacekeeping Operations

The gender stereotype in peacekeeping operations triggers a new question regarding potential signaling in the workplace. Are women better at facilitating help for women, or is the gender of the peacekeeper just a quick signal? When I talk about gender, this term signifies an individuals' perception of their sex more roughly. While if I speak about genotypic or phenotypic sex, these terminologies refer to the biological aspect of sex attached to individual genes and organs (Purves et al., 2001). I emphasize that the UN wants more women in the peacekeeping operations related to women as the gender in a social environment.

Wilén (2020a) finds that the UN DPO requires more women, like male peacekeepers, to build access to the entire population from diverse social norms,

backgrounds, and cultures. Both genders are signaling their strength to resolve any issue in different environments. Adding more women does not instantly increase the effectiveness of the operations. The more important consideration is hiring more high-quality peacekeepers and deploying them to the right areas to maximize their support in local communities.

2. The Opportunity Cost of Deploying More Female Peacekeepers

Gender as a visual signal quickly gives female peacekeepers access to a limited social group but may not positively value a different community. The gender signal may reduce the opportunity costs to enter a particular society. Female peacekeepers have instant permission to engage with controlled local neighborhoods, construct communication, and support certain cultures where women are prohibited from speaking to unfamiliar men. Certain conflict areas may have societal norms that prevent cross-gender socializing, and the women in the conflict zone may feel uncomfortable interacting with male peacekeepers. Male peacekeepers may also become outstanding advocates for victims in these conflict zones. Still, men may need to spend more time showing trustworthiness to enter the same spaces as female peacekeepers.

Economists use comparative advantage theory to explain producing a good or service at a lower opportunity cost than competitors (Mankiw, 2018). The opportunity cost is the price of an item sacrificed to obtain another product. Comparative advantage is the key to determining production and trading patterns between the two economic players. The producers who give up more minor sources to manufacture certain goods or services have less opportunity cost and more comparative advantage in making the product or service. One group cannot have a comparative advantage in both items because the opportunity cost of one product is the inverse to others. A company specializing in providing a product or service with a comparative advantage can increase its total production in the economy.

The UN peacekeeping operation is a proper model of a competitive labor market promoting female inclusion in the workforce. The UN Security Council (2019) claims that female troops and policewomen have a comparative advantage in boosting operation effectiveness significantly in the UN mission. There is a positive benefit in deploying

female peacekeepers when accomplishing equal tasks in a different cultural area. Gender is an observable signal attached to women, compared to the male peacekeepers. The female peacekeepers who maximize this signal in constructing networks can perform better and faster in a local community dominated by older people, women, and children. Their gender signal becomes their positive value, which the restricted social environment can accept and trust undoubtedly. In economics, the female peacekeepers spend less time and opportunity cost to touch restricted communities than male peacekeepers.

I measure the opportunity cost of peacekeepers by comparing the number of task accomplishments with time to finish the job. I use a simple opportunity cost function to help understand the relationship between those factors:

$$C_i = \frac{T_i}{J}. \quad (8)$$

Suppose C_i is the opportunity function of peacekeepers, T_i is the time used by peacekeepers to accomplish a specific task, and J is the number of jobs that the peacekeepers should finish. The little i is the group observations, i.e., m for male and f for female. Females who carry their gender signal to a particular society gain trust easier and faster compared to male peacekeepers who need more effort to be accepted to that community. In this case, females spend less time ($T_f < T_m$) accomplishing the same number of tasks in the peacekeeping area and incur less opportunity cost ($C_f < C_m$) than the male group. The UN mission may calculate the cost reduction by:

$$\Delta C = C_f - C_m. \quad (9)$$

The opposite result may happen when specific cultures negatively perceive women as less acceptable to collaborate with during a peacekeeping mission. In this case, male peacekeepers will contribute more effectively during the peacekeeping process in those areas.

Karim and Beardsley (2016) also find that UN missions that involve more peacekeepers from contributing countries with better records of gender equality tend to have fewer counts of sexual exploitation and abuse allegations. This finding brings me to a new perspective that more female peacekeepers reduce the rate of sexual exploitation and

abuse to local women and girls in the conflict areas. The female peacekeepers also generate new insights and solutions to specific missions. This group effectively accommodates the needs of local women in a conflict area, especially for female ex-combatants and child militants, during the process of demobilizing and reintegrating them into a peaceful community (UN Peacekeeping, 2020). This positive value also reduces the opportunity cost and helps the organization build trust and peace within the conflict parties.

3. Female Peacekeepers as a Latent Variable in Peacekeeping Areas

Womanhood as a gender characteristic, which is possibly correlated with care for other women and children, is an unobservable variable. An unobservable variable differs from a visual variable, such as the phenotypic sex that people can physically recognize. This unobservable or latent variable is a variable that is indirectly detected but is instead deduced from other variables that are directly measured. The UN DPO deploys female peacekeepers who carry their phenotypic sex as a detectable signal in the belief that female peacekeepers will contribute more to a conflict area with more women and children population.

I use item response theory (IRT) to investigate how the latent variable “care for women” increases UN peacekeeping effectiveness in conflict areas. The IRT refers to a mathematical model that explains the relationship between latent traits (female peacekeepers as a good agent of caring for other women and children) and their manifestations (i.e., UN task accomplishment, trust-building, peace growth, etc.). I analyze the item characteristic curve of care provided by the UN peacekeepers to measure the power of gender as a latent variable in the missions, as shown in Figure 3.

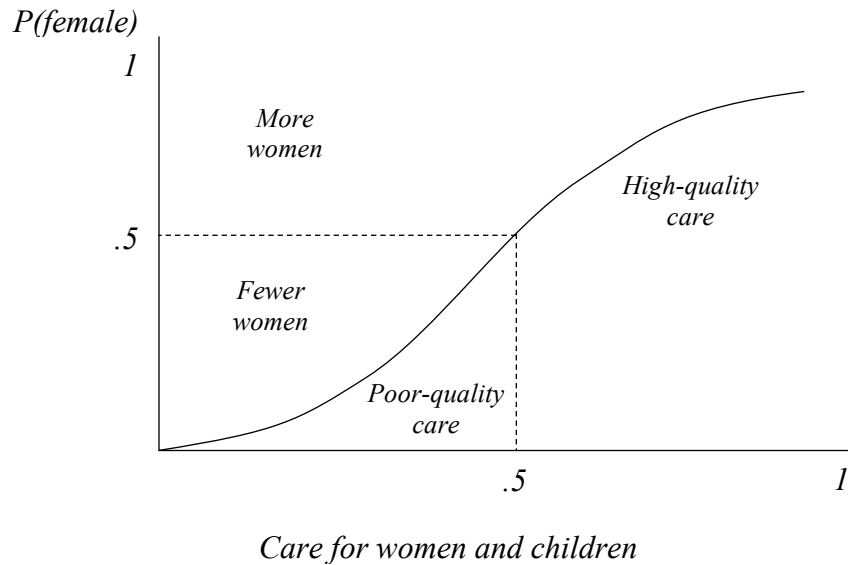


Figure 3. The item characteristic curve of care for women and children by the probability of peacekeepers being female.

The x-axis is the quality of “care for women” provided by all peacekeepers, and the y-axis is the probability that peacekeepers are female. I assume that high-quality care is in the range of 0.5 to 1, while poor care is 0 to 0.5. In this case, the high quality of care for women and children correlates with having women in peacekeeping operations. This graph does not conclude that male peacekeepers cannot provide high-quality care for women in a conflict area, but the parity is less than the female group. The curve also demonstrates that a few females perform low quality in caring for other women in mission areas.

Gender as a latent variable also appears in other studies. Wallis et al. (2022) investigate the association between a surgeon’s gender with postoperative differential results. Fatality, readmission, or complication within thirty days after the treatment are unfavorable postoperative outcomes. The research finds that gender difference between surgeons and patients negatively correlates to the postoperative results. This finding shows that female patients experienced significantly worse effects when male surgeons treated them.

The UN DPO believes that gender as a latent variable can add more value and boost mission effectiveness in conflict areas. Combining the latent and observable variables may

give positive outcomes to provide better care for women and children in local cultures. This positive value does not instantly eliminate the importance of adding male peacekeepers to those communities because each gender can support each other in the UN mission accomplishment.

4. Theory versus Reality

Theories speak to the fact that female peacekeepers can contribute better to mainly restricted societies due to their phenotypic sex as a visible signal. These female groups can gain trust faster from the residents and provide better treatment for local women and children due to their gender as a latent variable. The UN DPO may exploit this theoretical evidence to recruit more women with additional combat and survival skills and deploy them to some vital areas to improve the effectiveness of the peacekeeping operations.

In reality, the UN DPO deploys many female peacekeepers to fulfill the staff officer or remote leadership role in controllable establishments (Karim, 2017). These safer stations restrict their potential to contribute more effort to the missions' broader dimensions and limit the FPR due to the few job opportunities available in those workplaces. In this case, female peacekeepers cannot maximize their detectable signal and latent variable as their comparative advantage to help women and children in war-torn locations.

C. EXPANDING THE LABOR POOL TO HIRE MORE QUALIFIED PEACEKEEPERS

The UN wants more women to join the peacekeeping operations because the organization expects to expand the labor pool and recruit more qualified peacekeepers. The organization wants to prove that promoting female inclusion can stop gender discrimination in the missions. This action plan can increase the size of the labor pool and accommodate more talented candidates to solve novel issues in the peacekeeping areas.

Shifting the supply curve to the right means expanding the supply for specific goods or services. The increase in supply can help increase the number of products available in the competitive market. The factors that contribute to the supply curves are the input prices, technology, expectations, and the number of sellers (Mankiw, 2018). The input price is all cost of some items or ingredients to produce a specific good or service. The input price is

negatively related to the supply of a product. The innovation of technology positively affects supply and significantly boosts production. The future expectation also has a positive influence on the supply curve. The production rate will increase when there is an expectation of value rising in the market. The number of sellers and producers also becomes the most significant factor in shifting the supply curve. The entering of new players will make the market more competitive and increase the supply of the products.

The concept of shifting the supply curve allows the UN DPO to acquire more talented peacekeepers in the peacekeeping contingents. Expanding the supply of peacekeepers also decreases the UN DPO's willingness to accept unqualified candidates. The organization will have more power to select more motivated and talented peacekeepers from any gender. The movement of the supply curve also has a potential effect on the cost of peacekeepers. Adding more peacekeepers to the pool means reducing the cost of hiring talented workers into the missions. By recognizing the gender signal and latent variable as comparative advantages of female peacekeepers to male peacekeepers, I can analyze why the UN DPO should hire more females in the missions.

Figure 4 gives a comprehensive illustration of why adding more women in peacekeeping operations matters. This model helps me understand the movement of the supply curve, which can increase the quantity and reduce the cost of peacekeepers. The supply curve S intersects the demand curve D at an equilibrium quantity Q and equilibrium cost C . When the UN successfully shifts the supply curve to the right, the equilibrium quantity will increase to Q' , and the equilibrium cost will drop to C' . This transformation gives the UN DPO more candidates in the labor pool with more extensive human resources in talent acquisition. Mathis (2019) emphasizes that talent acquisition aims to ensure an adequate supply of qualified people to fill jobs in a company based on the nature of the workforce, job design, and job analysis.

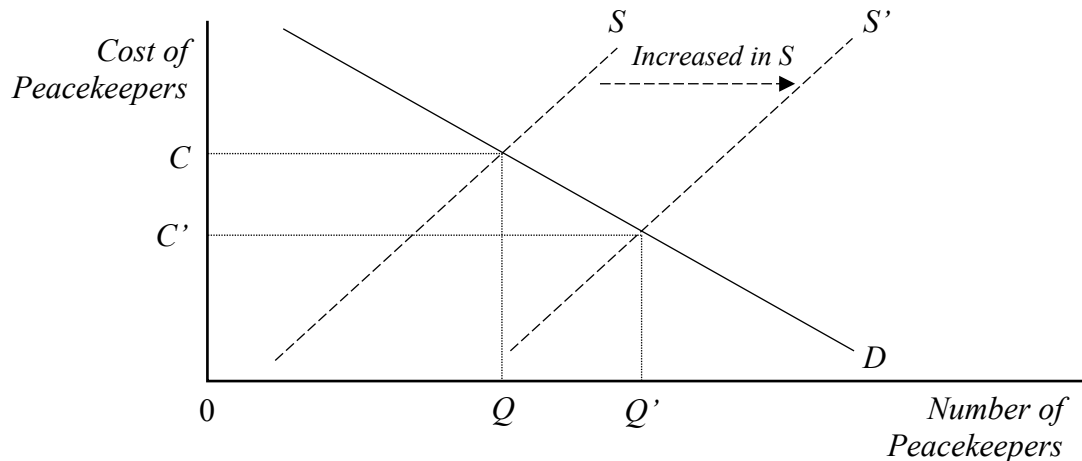


Figure 4. Shifting the supply curve to the right through recruiting more peacekeepers of any gender.

An adequate labor supply means having enough human resources to execute specific duties, especially in resolving fundamental problems in the force. The spilled number of qualified employees in a firm causes production gain and improves the organization's goals achievement. A sufficient number of talented workers in the organization also boosts the effectiveness and efficiency of operation. The contributing countries may increase the labor force supply by eliminating gender-discriminatory preferences and policies during the recruitment and selection of female candidates. The enlarged labor pool benefits the UN DPO in recruiting and deploying more female peacekeepers in mission areas.

V. DESCRIPTION OF DATA

This thesis uses data from the UN DPO Gender Statistics database. This database is a great source to conduct a time series analysis. The data currently consists of 184 monthly gender parity statistics of UN peacekeepers who served worldwide from August 2006 to November 2021 (UN Peacekeeping, 2021b). The summary format has experienced different adjustments to fulfill the gender analysis needs during those periods. I notice that female numbers have a positive trend over time, and this movement is an excellent signal that female participation may expand for the last fifteen years. I find a small amount of missing and poorly presented data in the whole database, but I can still observe a clear pattern in every UN peacekeeper's job. The UN DPO divides the dataset into four job categories: Military Troop, Military Observer and Staff Officer (MOSO), Formed Police Unit (FPU), and Individual Police Officer (IPO).

A. UN PEACEKEEPERS' JOB CATEGORIES

The UN military troops are the fundamental military personnel working under the UN flag. UN troops are primarily members of their national armed forces and then assigned to work under the command and control of the UN missions at a specific time of service. These troops usually work in the same military group, such as battalions, companies, platoons, or units. The UN deploys these groups as the front line of the peacekeeping operation in inhospitable, remote, and dangerous environments. UN Peacekeeping (2021a) mentions that “the UN military troops have some responsibilities, such as protecting civilians and other UN employees, supervising a disputed border, observing peace processes in post-conflict areas, and providing security across a conflict zone or during elections” (“What UN military personnel do”). On some occasions, the contingents also help train in-country military personnel and support local ex-combatants in implementing the peace agreements.

The UN MOSO consists of the Military Observer (MO) and the Staff Officers (SO). UN MO has a crucial role in monitoring and supervising ceasefires, truces, and armistices in a complex operational environment. The UN deploys MOs as individual experts on a

mission. MOs commonly carry no weapons and operate in remote areas with fragile security conditions. These challenges are the main reason why UN MOs must undergo a more robust pre-deployment training program by DPO's Operational Readiness Assurance and Performance Standards. The SOs are commissioned officers serving as the commanders, service, or headquarters staff. The TCCs select their military candidates to be deployed by the UN DPO to fulfill the staff roles in peacekeeping operations. The SOs must have completed their national introductory military staff course. Their functions include administrative, secretarial, clerical support, and specialized positions such as personnel, intelligence, operations, logistic, planning, communications, training, finance, and Civil-Military Cooperation (CIMIC). These positions are crucial to the organization's smooth operation. The higher the job level, the more complex the functions become.

IPO is a police officer selected by the PCC as an expert to serve under the UN flag and conduct specific policing tasks in peacekeeping areas (UN Police, 2017). The PCCs select the police candidates who meet the UN DPO Police Division (PD) criteria. UN Police (2017) mentions that IPOs have specific professional policing tasks such as protecting refugees in the UN camps, training local police officers to accomplish law enforcement duties, and dealing with transnational crime in conflict areas.

UN Police (2021) creates an FPU as an organized group of polices who work under the UN flag to support policing tasks in a large operation area. The UN usually deploys these units in certain regions with a higher risk of crime and violence in society. UN Police (2021) states that "this group has three core duties: public order management, UN personnel and facilities protection, and support to such police operations that require a concerted response but not responding to military threats" ("Formed police units (FPUs)").

B. STATISTICAL SUMMARY

Table 1 gives the summarized pictures of the whole number of participants in the UN peacekeeping operation since 2006. I find that UN DPO started recording the military contingent (Troops and MOSOs) by gender in August 2006 and the police contingent (FPUs and IPOs) in November 2009. In November 2021, the military troops had an outstanding contribution by 85.6% of UN peacekeepers. The troops also supplied the most

women in the mission, who comprised 4.8% of all peacekeepers. The growth of this portion most likely affects total gender parity in the mission area. Both MOSOs and IPOs shared the force's lowest women ratio by 0.8%.

Table 1. Summary statistics of gender by UN jobs. Source: UN Peacekeeping (2021).

Job Categories	Date available	Proportion of the force (Nov 2021)	Number of people per month			Obs (Months)	Missing obs	Remarks
			Mean	Min	Max			
Mil Troops	Aug 2006-Nov 2021	0.856	78,737	63,334	92,848	180	4	No available data in
Male	Aug 2006-Nov 2021	0.808	76,285	59,945	90,086	180	4	May 2011, Sep 2014, Aug 2018, and Nov 2019
Female	Aug 2006-Nov 2021	0.048	2,451	955	3,762	180	4	
FPU s	Nov 2009-Nov 2021	0.075	7,523	5,634	9,470	140	5	No available data in
Male	Nov 2009-Nov 2021	0.064	6,973	4,773	8,801	140	5	May 2011, Sep 2014, Aug 2018, Nov 2019, and Sep 2020
Female	Nov 2009-Nov 2021	0.011	550	252	959	140	5	
MOSO s	Aug 2006-Nov 2021	0.043	2,754	1,739	4,030	180	4	No available data in
Male	Aug 2006-Nov 2021	0.035	2,548	1,657	3,893	180	4	May 2011, Sep 2014, Aug 2018, and Nov 2019
Female	Aug 2006-Nov 2021	0.008	206	64	637	180	4	
IPO s	Nov 2009-Nov 2021	0.026	4,392	1,688	7,139	140	5	No available data in
Male	Nov 2009-Nov 2021	0.018	3,654	1,189	6,366	140	5	May 2011, Sep 2014, Aug 2018, Nov 2019, and Sep 2020
Female	Nov 2009-Nov 2021	0.008	739	499	1,066	140	5	

I also observe a different significant progression in the number of women by each job. Female MOSOs have developed almost ten times from their lowest observation, while female IPOs have doubled. Military Troop and FPU move up by nearly six times and four times, but the added number of women appreciably strengthens the force for the last decade. Those datasets almost have the same missing values due to unavailable data in May 2011, September 2014, August 2018, and November 2019. Fortunately, the police contingent also had additional missing data in September 2020.

C. THE TREND OF MALE VERSUS FEMALE PEACEKEEPERS BY JOB

Figure 5 comprises four-panel graphs that draw the line trend of male versus female peacekeepers for each UN job. Panel (a) and (c) perform almost similar movements. Panel (b) displays suspicious drops from November 2009 to April 2017. I investigate this collapse and find out that the SO original dataset experiences long-term missing data during that period. Those missing values cause unclear progress, but the total numbers moved significantly in the last four years. Panel (d) has shown strength in UN peacekeeping missions since November 2009, but their participation is slowly decreasing and shows different patterns between male and female officers.

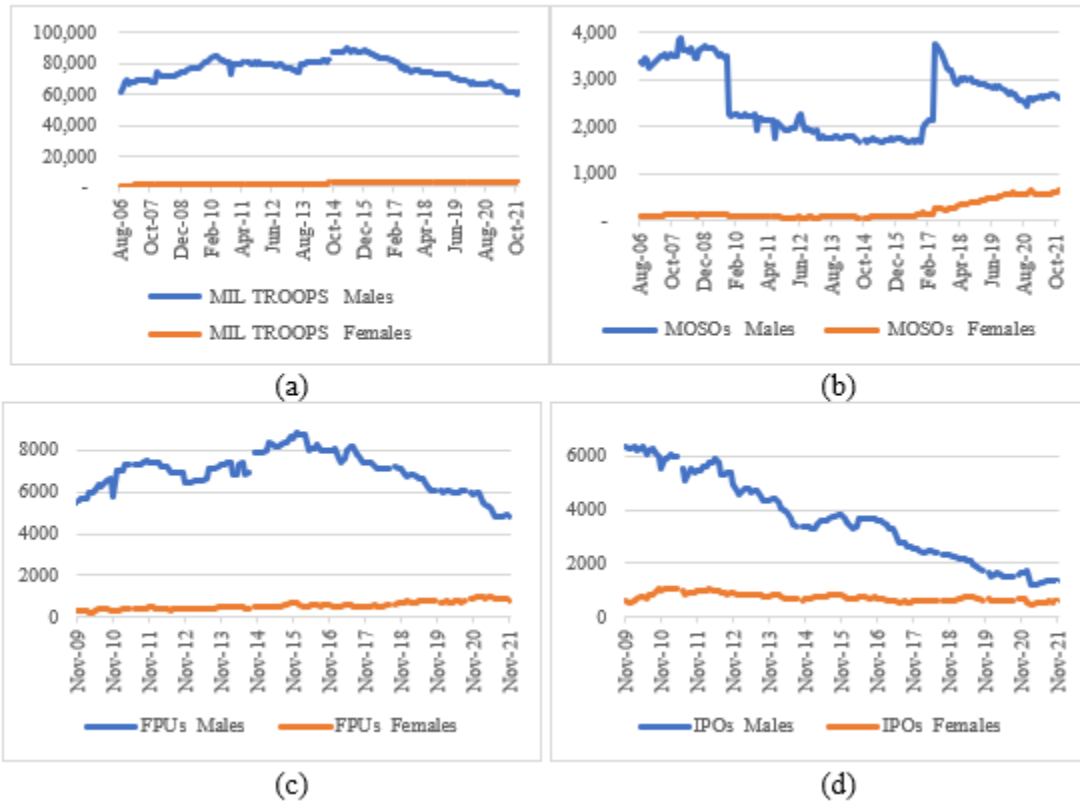


Figure 5. UN peacekeepers gender parity by jobs. (a) Military troops; (b) MOSOs; (c) FPUs; (d) IPOs. Source: UN Peacekeeping, 2021.

The number of men displays different trends for each job. The Military Troops and FPUs have less movement, while the IPO line significantly drops. Male troops grew from 62,179 in August 2006 to the highest record of 90,086 in April 2015 but decreased to 61,322 in November 2021. The male FPU increased from 5,460 to 8,801 from November 2009 to December 2015 but lessened to 4,862 in November 2021. The MOSO line shows me the significantly decreasing number of men from 2006 to 2021. The number of men has no significant movement before November 2009 but slightly falls after April 2017. The highest record of male MOSOs was 3,893 in February 2008, and the lowest number was 1,657 in June 2016, during the period of missing SO data. Male IPOs reached 6,366 in November 2009 but shrank to 1,361 in November 2021.

The numbers of women indicate positive trends during the last fifteen years. Female troops increased more than three times, from 1,155 in August 2006 to 3,667 in November

2021. The female FPU group also improved slowly from 276 in November 2009 to 831 in November 2021. The female MOSOs had a minor contribution of 64 in July 2012 during missing SO data but slightly increased after April 2017. The number grew ten times to 637 in November 2021. The contribution of female IPOs was stationary from 598 in November 2009 to 586 in November 2021.

VI. TIME SERIES ANALYSES

Time series analysis is a particular method of analyzing the sequence of UN data points gathered over a specific time interval. UN DPO records gender data points at consistent monthly intervals over a certain period. The month is my crucial variable because the time variable indicates how the female numbers change across points. Time provides additional sources of information and the order of dependencies between the data. I measure current data trends and predict future values based on this movement.

The analysis of the number of female peacekeepers in UN missions is essential to measure the progress of the UN WPS campaign. I want to show how the UN female peacekeeper numbers have changed over time. The analysis result provides empirical evidence on the current female inclusion effort and trends in different UN jobs. I examine whether the UN female advertisement works well for specific groups but does not affect other categories. I also predict the future female growth to give a perspective on how substantial the female contribution is in the UN missions.

Some UN contingents need special attention and effort to increase female participation. To preview my results, I find that the female numbers have a positive trend during the last two decades, but the movement still has some room for improvement in the future. Female troops have the highest growth of thirteen female peacekeepers during the previous decade, followed by female MOSOs for eight peacekeepers and female FPUs for four peacekeepers per month. The number of female IPOs decreases by two peacekeepers per month, a negative indicator of the UN female inclusion campaign. The forecasting analysis predicts that by the end of 2023, the female troops will increase by 8.6% (319 peacekeepers) of the current strength, the female FPUs are 11.6% (96 peacekeepers), and the female MOSOs are 29.9% (191 peacekeepers). The female IPOs will decline by 10.6% (losing 62 peacekeepers). These predictions also have confidence intervals to provide elasticity in each forecasting result.

A. METHODOLOGY

I use four steps in conducting my time series analysis. They are data analysis, model selection and fitting, model validation, forecasting model deployment and monitoring the performance

1. Data Analysis

Data analysis helps me to visualize the correct measured variables. This step can also identify whether the dataset contains missing values, outliers, gaps, trends, or seasonality by analyzing the scatterplot matrix. The visualization constructs a systematic relationship in the model.

2. Model Selection and Fitting

The initial step of this process determines whether the data is stationary. A stationarity check helps me find any potential systematic change in mean, variance, or periodic variations removal (Seagren, 2020a). A stationary dataset must have significant positive autocorrelation in early lags and shape exponential decay or a damped sinusoid in the later lags in its Autocorrelation Function (ACF) and The Partial Autocorrelation Function (PACF) graphs. Any trend or seasonal makes a data not stationary, so the dataset needs further adjustment. The remedial action for the non-stationary dataset due to a trend is differencing. Differencing is a method of altering a time series dataset by removing changes in the time series level and stabilizing the mean of the data. The differencing sometimes does not work on a non-stationary dataset because this method makes the ACF completely uncorrelated and destroys any signal in the dataset.

The alternative way to repair the non-stationary data is trend removal. Trend removal amputates any aspects from the data that cause alteration. I perform an ordinary linear regression on the numbers of female peacekeepers by months. I characterize the linear part of the data, which is the fitted values. Next, I perform a time series analysis on the residuals of the Ordinary Least Square (OLS). If the residual is stationary, I proceed with the Autoregressive Integrated Moving Average (ARIMA) method and apply some smoothing models.

ARIMA is a method in regression analysis that calculates the strength of one independent variable relative to other dependent variables (Hayes, 2021). This model examines the differences between values in the series instead of actual values. I recognize the ARIMA model by defining the three factors: Autoregression (AR), Integrated (I), and Moving Average (MA). “AR” shows a changing variable that regresses on its own lagged or initial values. “I” represents the differencing of raw observations to allow the time series to become stationary. “MA” incorporates the dependency between an observation and a residual error from a moving average model applied to lagged observations.

Smoothing models are the alternative methods to conduct a time series analysis when the data is not stationary, and the ARIMA model is less applicable. These models use the weighted average of a past observation to predict or forecast future values. Smoothing models are well suited for time series data that have fewer deviations with time. There are three smoothing models I can apply in time series analysis: simple exponential smoothing (SES), double exponential smoothing (DES) or Brown’s method, and linear exponential smoothing (LES) or Holt’s method.

3. Model Validation

The model validation helps me select the best model that fits my following forecasting process. The Akaike Information Criterion (AIC) predicts error and the relative quality of statistical models for a given data set. The Schwarz Bayesian Information Criterion (SBC) estimates the selection of a finite set of models, and the Mean Absolute Error (MAE) calculates the average of the squared forecast error values. The lower AIC, SBC, and MAE, the better. The Degree of Freedom (DF) indicates the range of divergence of specific values in an analysis without breaking the constraints (Ganti, 2021). The adjusted R-squared is an adapted version of R-squared that corrects for predictors that are not significant in a regression model. The higher DF and Adjusted R-squared are better.

Cross-validation helps me test how authentic the dataset is. The validation assists me in deciding the most valid model between two or more fit models. The technique also determines whether my models are feasible or workable. In addition, I can get a sense of whether my model is experiencing overfitting. I split the dataset into two groups: a test set

and a training set. I build my models on the data in the training set and compare how well each model predicts the data in the test set. The test set usually is the last one-tenth to one-third of my original dataset. I run all fit model candidates on the training set to find the predicted values. I calculate the Sum of Squares due to Error (SSE) between the actual value of the original data and the training set's predicted value. The SSE shows me the total deviation of the predicted values from the fit model to the actual values. The best-validated model has the lowest SSE (Seagren, 2020b).

I check the parameter estimate of the chosen model to see whether the coefficient is statistically significant and to validate the residual by checking the correlation in its ACF and PACF, the distribution, and the variance. The ACF and PACF must be uncorrelated, and the residuals must be normally distributed and exhibits constant variance or a shotgun pattern in the overlay plot. This final check determines whether the chosen fit model complies with fundamental assumptions.

4. Forecasting Model Deployment and Monitoring the Performance

The final step is to deploy my chosen fit model and predict the future values. After removing the line's effect, I fit the chosen model to the leftover signal. I must add the contributions of the predicted OLS line and the fit model selected to make combined predictions. I build the combined forecast by summing the two predicted signal components. I can also provide a confidence interval on my future observations. The fit model forecast has confidence intervals based on standard errors.

B. MILITARY TROOPS ANALYSIS

The female military troop has four missing values in May 2011, September 2014, August 2018, and November 2019 and four outliers in January, March, April, and May 2016. These missing numbers exist due to unavailable data on those periods, and the outliers may appear due to the wrong input number to the database at those periods. I fix these missing numbers and the outliers by filling the cells with the mean value between the previous and following observations.

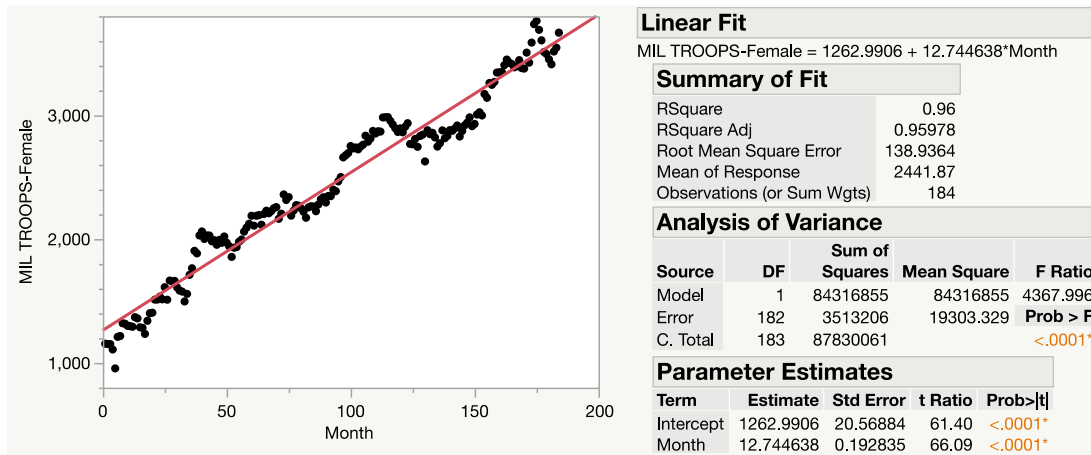


Figure 6. Fit model of female troops by months.

Figure 6 shows that the female military troop data has a positive trend and has increased significantly in the last two years. In the summary fit, I find that the linear equation is:

$$Troops_female = 1262.991 + 12.745*Month. \quad (10)$$

Equation 10 suggests that the number of female troops increases by thirteen peacekeepers per month. The *R-square* value, which represents a measure of the amount of variation that the linear model explains, is high (0.96), the *F-test* and the coefficient of *Month* are highly significant ($p < 0.001$). Those factors indicate a strong linear relationship between female troops and months.

The time series modeling displays that the dataset is not stationary due to the trend. I also try the differencing, but its ACF becomes uncorrelated, as shown in Figure 7.

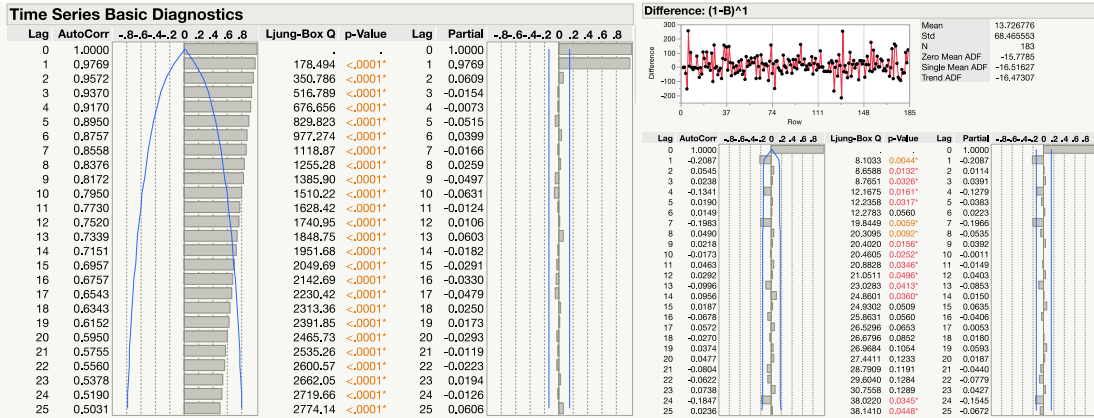


Figure 7. Stationarity check and differencing on the female military troops.

I run the time series modeling on the residuals data of female military troops. Figure 8 shows that the residuals have positive autocorrelation in the first six lags—the ACF exhibits slight exponential decay. The PACF shows a minor exponential decay and cuts off at lag 1, so AR(1) and ARMA(1,1) are excellent options. I may include SES, DES, and LES to give more alternatives to the model selection.

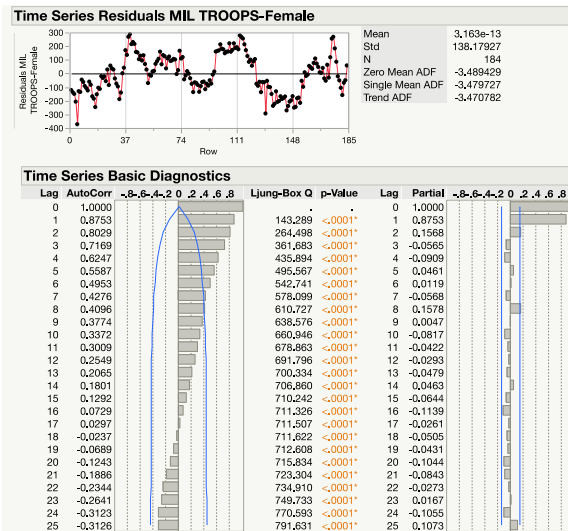


Figure 8. Stationarity check on the female military troops' residual.

Table 2 displays the result of female troops' model comparison and cross-validation. The result shows that Holt and SES are excellent candidates. To find the most

valid model, I split the female troops' dataset into 150 observations in the training set and the last 34 in the test set. I compare the SSE of each fit model and find that Holt is the best model. I also validate the residuals, and find that the residuals are uncorrelated, normally distributed, and exhibit constant variance or a shotgun pattern in the overlay plot, as shown in Figure 9.

Table 2. Model comparison and cross-validation result of female troops.

Model	DF	AIC	SBC	RSquare	MAE	SSE
Linear (Holt) ES	180	2057.853	2064.261	0.753	50.354	2,748,974.45
Simple ES	182	2060.510	2063.720	0.765	49.386	8,883,582.01
ARMA(1, 1)	181	2068.871	2078.515	0.772	49.187	10,129,391.76
AR(1)	182	2070.807	2077.237	0.767	50.153	10,995,389.06

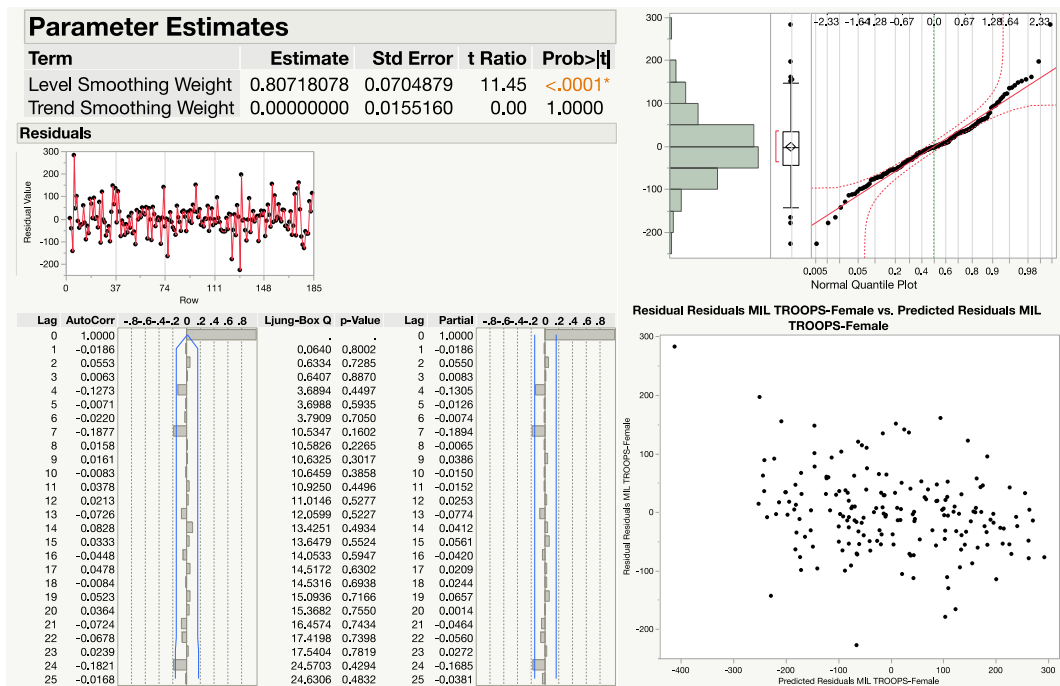


Figure 9. Model validation for Holt model in female troops.

Table 3 shows me the result of the Holt model in forecasting the number of female troops. The forecasting result predicts the number of female troops by 3,968 with a confident

interval between 3,446 and 4,526 at the end of 2023. The forecasting analysis indicates that the female troops will rise to 8.6% (319 peacekeepers) for the next twenty-five months. Figure 10 provides the prediction graph of the future trend of the female troops.

Table 3. The predicted model for forecasting the female troops.

Month-Year	Pred Value	Pred Residual	Upper CL Residual	Lower CL Residual	Combined Value	Lower CL Value	Upper CL Value
Jan-23	3,786	50	457	(358)	3,836	3,428	4,244
Feb-23	3,799	50	472	(371)	3,850	3,428	4,271
Mar-23	3,812	51	486	(384)	3,863	3,428	4,298
Apr-23	3,825	52	500	(396)	3,877	3,429	4,325
May-23	3,837	53	513	(407)	3,890	3,430	4,351
Jun-23	3,850	54	527	(419)	3,904	3,431	4,377
Jul-23	3,863	55	539	(430)	3,918	3,433	4,402
Aug-23	3,876	56	552	(441)	3,931	3,435	4,428
Sep-23	3,888	57	564	(451)	3,945	3,437	4,453
Oct-23	3,901	57	576	(461)	3,959	3,440	4,477
Nov-23	3,914	58	588	(471)	3,972	3,443	4,502
Dec-23	3,927	59	600	(481)	3,986	3,446	4,526

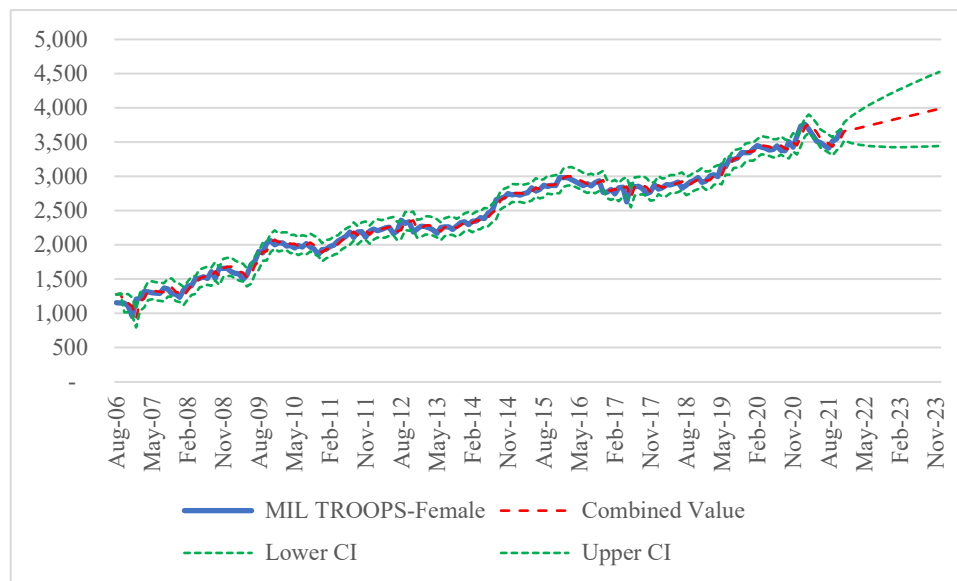


Figure 10. The forecasting graph of the female troops.

C. FORMED POLICE UNIT ANALYSIS

The UN DPO started recording the police contingent in its gender database in November 2009. The female FPU dataset has five missing values in May 2011, September 2014, August 2018, November 2019, and September 2020. These missing numbers exist due to unavailable data for those periods. I fix these missing numbers by filling them with the mean value between the previous and following observations.

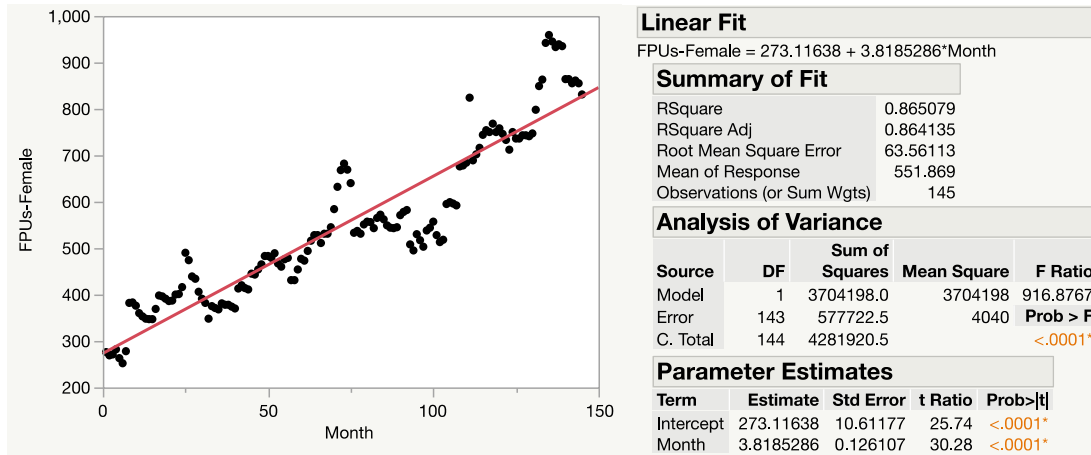


Figure 11. Fit model of female FPUs by months.

Figure 11 shows that the female FPU data has a positive trend and has increased in the last decade. In the summary fit, I find that the linear equation is:

$$FPU_female = 273.11638 + 3.819*Month \quad (11)$$

Equation 11 suggests that female FPUs increase by only four peacekeepers per month. The *R-square* value is relatively high (0.87), the *F-test* and the coefficient of *Month* are highly significant ($p < 0.001$). Those factors indicate a strong linear relationship between female FPUs and months.

The time series modeling shows that the dataset is not stationary due to the trend. When I try the differencing, its ACF becomes completely uncorrelated, as shown in Figure 12.

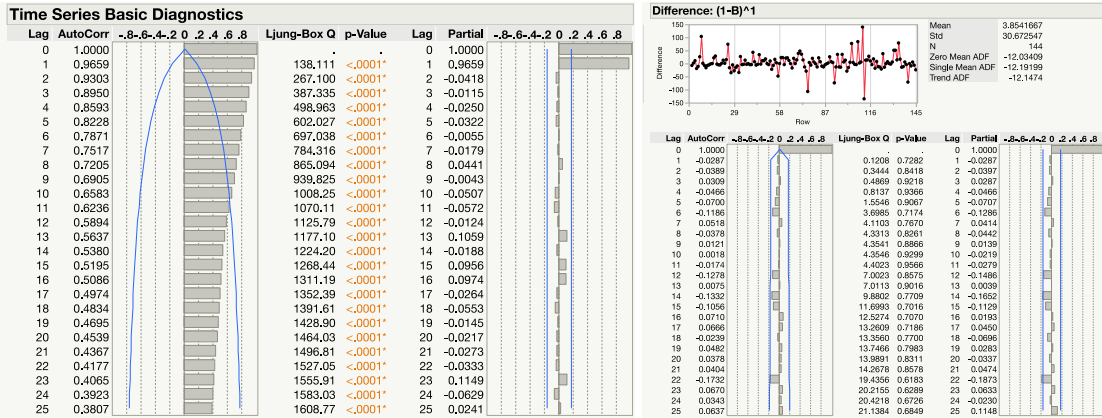


Figure 12. Stationarity check and differencing on the female FPU.

I run the time series modeling on the residuals data. Figure 13 shows that the residuals have positive autocorrelation in the first five lags—the ACF exhibits slight exponential decay. The PACF shows a minor exponential decay and cuts off at lag 1, so AR(1) and ARMA(1,1) are excellent options. I include SES, DES, and LES to give more alternatives to the model selection.

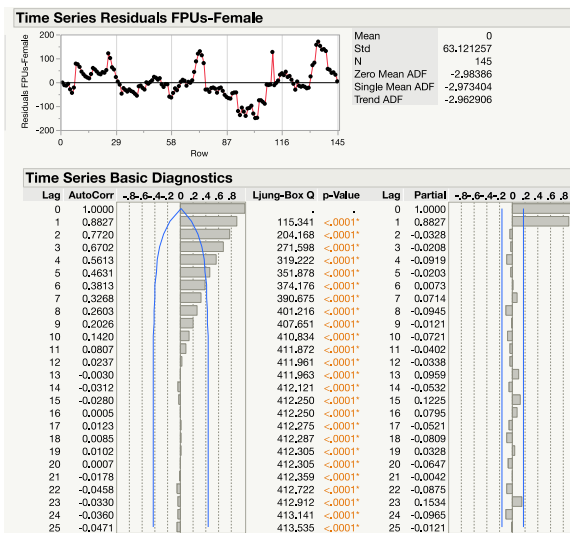


Figure 13. Stationarity check on the female FPU's residual.

Table 4 displays the result of the female FPU model comparison and cross-validation. The result shows that Holt and SES perform better scores than others. To find

the most valid candidates, I split the female FPU dataset into 120 observations in the training set and the last 25 in the test set. I compare the SSE of each fit model and find that Holt is the best model. I also validate the residuals, and find that the residuals are uncorrelated, normally distributed, and exhibit constant variance or shotgun pattern in the overlay plot, as shown in Figure 14.

Table 4. Model comparison and cross-validation result of female FPUs.

Model	DF	AIC	SBC	RSquare	MAE	SSE
Linear (Holt) ES	141	1394.866	1400.792	0.759	19.799	109,227.19
Simple ES	143	1396.456	1399.426	0.766	19.257	288,429.00
AR(1)	143	1399.995	1405.949	0.779	18.848	604,968.90
ARMA(1,1)	142	1401.855	1410.785	0.779	18.837	555,098.75

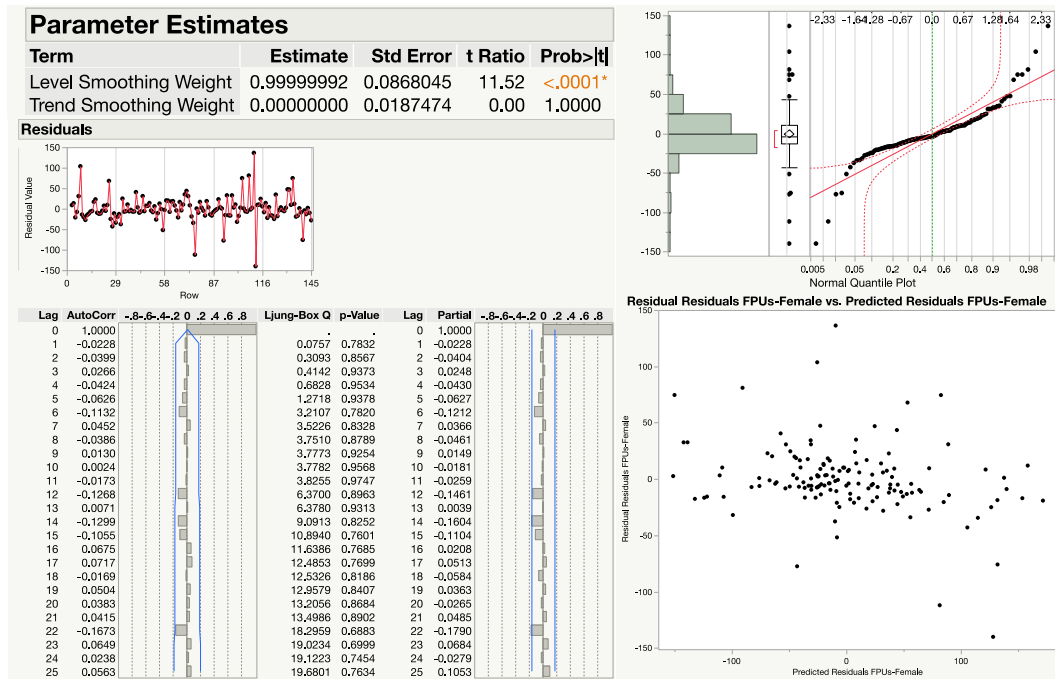


Figure 14. Model validation for Holt model in female FPUs.

Table 5 shows me the result of the Holt model in forecasting the number of female FPUs. The forecasting result predicts the number of female FPU by 927 with a confident

interval between 624 and 1,231 at the end of 2023. The forecasting analysis indicates that the female FPU's will increase 11.6% (96 peacekeepers) for the next twenty-five months. Figure 15 provides the prediction graph of the future trend of the female FPU's.

Table 5. The predicted model for forecasting the female FPU's.

Month-Year	Pred Value	Pred Residual	Upper CL Residual	Lower CL Residual	Combined Value	Lower CL Value	Upper CL Value
Jan-23	880	5	232	(223)	885	658	1,112
Feb-23	884	5	240	(231)	889	654	1,124
Mar-23	888	5	248	(238)	893	650	1,136
Apr-23	892	5	255	(246)	897	646	1,147
May-23	896	5	263	(253)	900	643	1,158
Jun-23	899	5	270	(260)	904	639	1,169
Jul-23	903	5	277	(267)	908	636	1,180
Aug-23	907	5	283	(273)	912	634	1,190
Sep-23	911	5	290	(280)	916	631	1,201
Oct-23	915	5	296	(286)	920	628	1,211
Nov-23	918	5	303	(293)	924	626	1,221
Dec-23	922	5	309	(299)	927	624	1,231

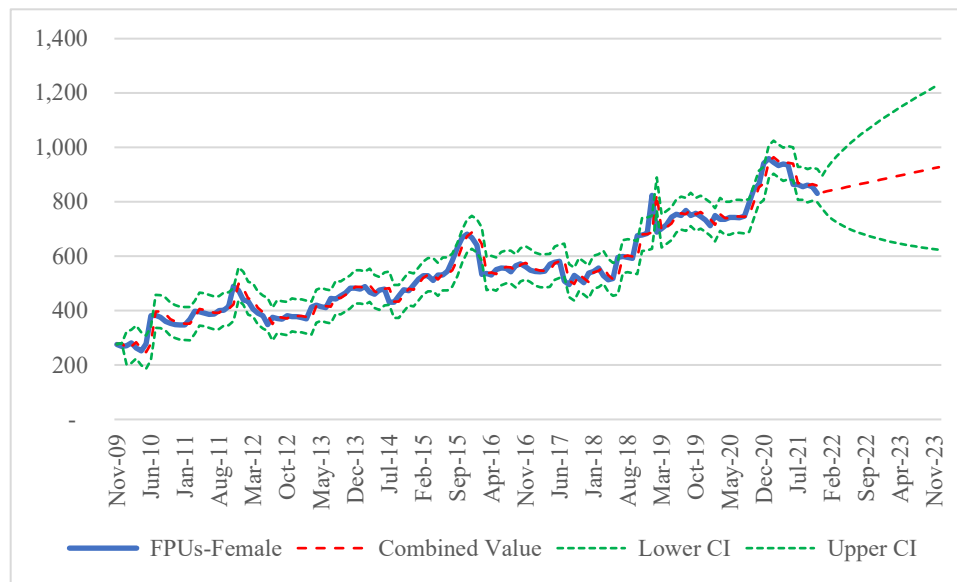


Figure 15. The forecasting graph of the female FPU's.

D. MILITARY OBSERVER AND STAFF OFFICER ANALYSIS

Female MOSOs' dataset has a long period of missing data for SOs from November 2009 to April 2017. I exclude this time frame from the analysis and focus on the post-May 2017 period, so I only have 55 observations with two missing observations on August 2018 and November 2019. I fill these missing numbers with the mean value between the previous and following observations.

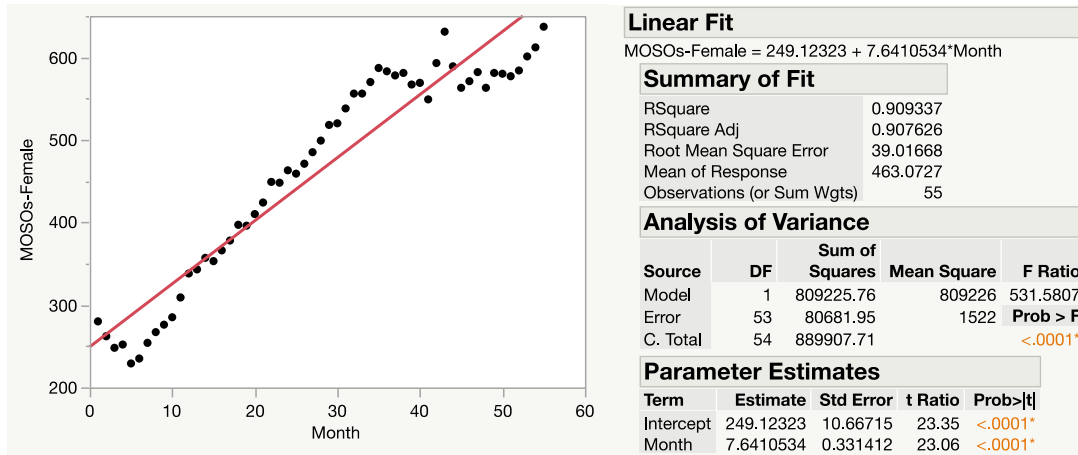


Figure 16. Fit model of female MOSOs by months.

Figure 16 shows that the female MOSOs data has a positive trend but slightly drops in 2020. The Covid-19 pandemic may cause this deflation of the workforce in this job category. In the summary fit, I find that the linear equation is:

$$MOSOs_female = 249.12323 + 7.641*Month. \quad (12)$$

Equation 12 suggests that female MOSOs increase by eight peacekeepers per month. The *R-square* value is high (0.91), the *F-test* and the coefficient of *Month* are highly significant ($p < 0.001$). Those factors indicate a strong linear relationship between female MOSOs and months.

The time series modeling displays that the dataset is not stationary due to the trend. When I try the differencing, its ACF becomes completely uncorrelated, as shown in Figure 17.

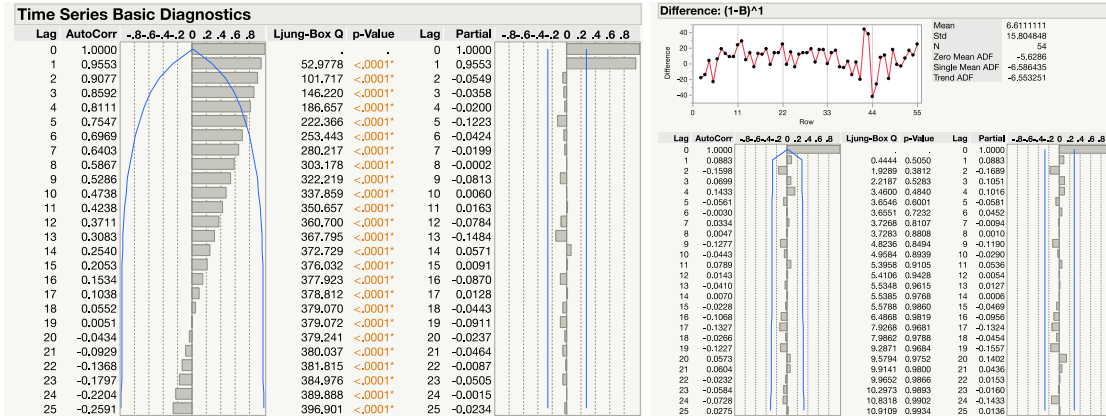


Figure 17. Stationarity check and differencing on the female MOSOs.

I run the time series modeling on the residuals data of female MOSO. Figure 18 shows that the residuals have positive autocorrelation in the first three lags—the ACF exhibits exponential decay. The PACF shows a minor exponential decay and cuts off at lag 1, so AR(1) and ARMA(1,1) are good options. I also include SES, DES, and LES to give more alternatives to the model selection.

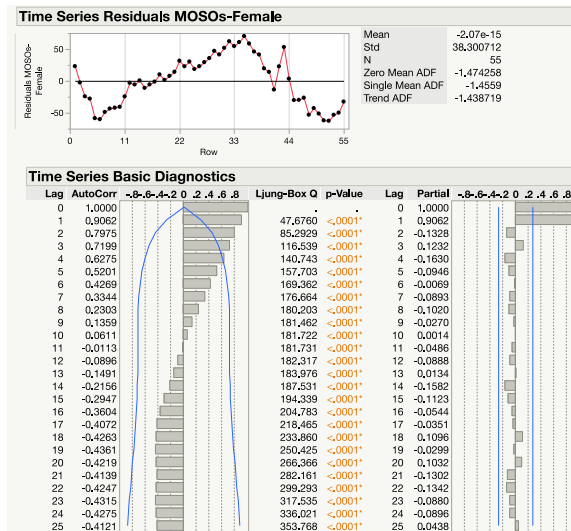


Figure 18. Stationarity check on the female MOSOs' residual.

Table 6 displays the result of the female MOSO model comparison and cross-validation. The result shows that Holt and SES are good candidates. I split the female

MOSO dataset into 45 observations in the training set and the last 10 in the test set to find the most valid candidates. I compare the SSE of each fit model and find that SES is the best model. I also validate the residuals, and the residuals are uncorrelated, normally distributed, and exhibit constant variance or a shotgun pattern in the overlay plot, as shown in Figure 19.

Table 6. Model comparison and cross-validation result of female MOSOs.

Model	DF	AIC	SBC	RSquare	MAE	SSE
Linear (Holt) ES	51	451.981	455.921	0.821	13.137	13,746.34
Simple ES	53	453.588	455.577	0.831	12.058	10,996.00
Double (Brown) ES	52	454.586	456.556	0.804	12.848	63,220.52
AR(1)	53	462.901	466.916	0.831	11.936	15,853.96
ARMA(1, 1)	52	463.335	469.357	0.836	11.829	21,276.14

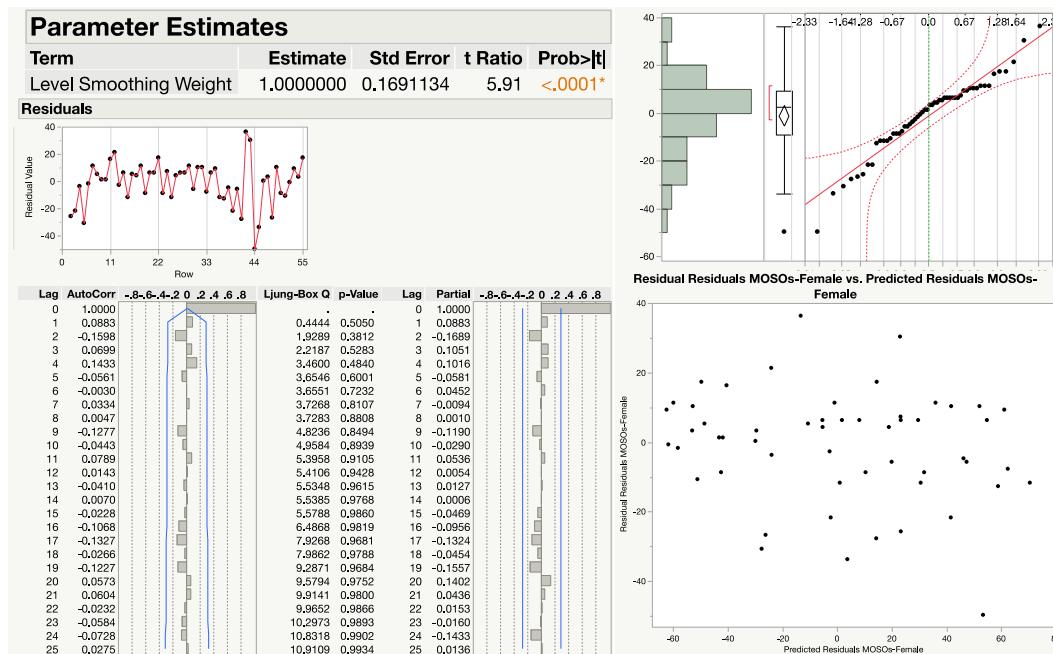


Figure 19. Model validation for SES model in female MOSOs.

Table 7 shows me the result of the SES model in forecasting the number of female MOSOs. The forecasting result predicts the number of female MOSO by 828 with a

confident interval between 671 and 985 at the end of 2023. The forecasting analysis indicates that the female MOSOs will result in 29.9% (191 peacekeepers) for the next twenty-five months. Figure 20 provides the prediction graph of the future trend of the female MOSO.

Table 7. The predicted model for forecasting the female MOSOs.

Month-Year	Pred Value	Pred Residual	Upper CL Residual	Lower CL Residual	Combined Value	Lower CL Value	Upper CL Value
Jan-23	776	(32)	85	(150)	744	627	861
Feb-23	784	(32)	89	(154)	752	630	873
Mar-23	792	(32)	93	(158)	759	634	885
Apr-23	799	(32)	97	(162)	767	638	896
May-23	807	(32)	101	(165)	775	642	907
Jun-23	815	(32)	104	(169)	782	646	919
Jul-23	822	(32)	108	(173)	790	650	930
Aug-23	830	(32)	111	(176)	797	654	941
Sep-23	837	(32)	115	(179)	805	658	952
Oct-23	845	(32)	118	(183)	813	662	963
Nov-23	853	(32)	121	(186)	820	667	974
Dec-23	860	(32)	124	(189)	828	671	985

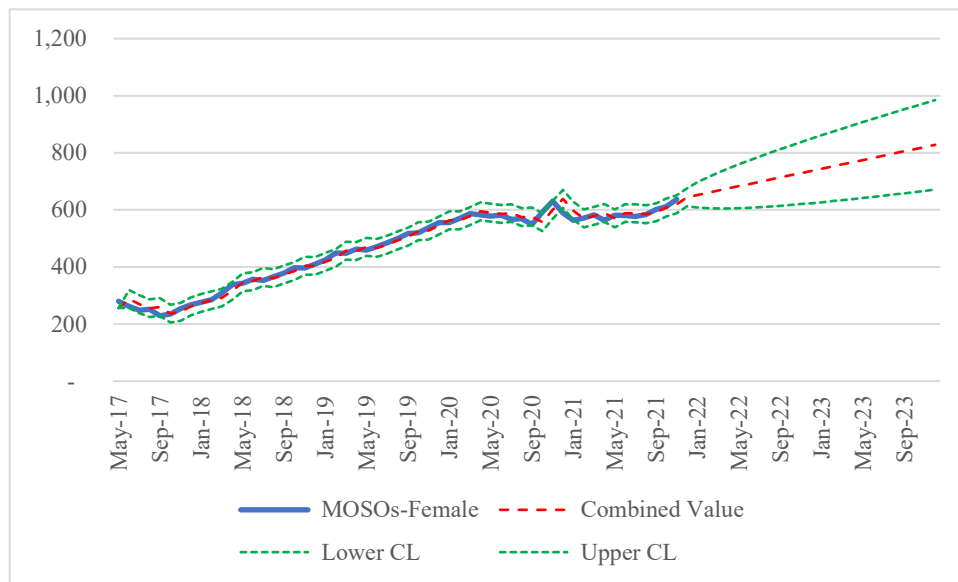


Figure 20. The forecasting graph of the female MOSOs.

E. INDIVIDUAL POLICE OFFICER ANALYSIS

The female IPO dataset has five missing values in May 2011, September 2014, August 2018, November 2019, and September 2020. These missing numbers exist due to unavailable data on those periods. I fix these missing numbers by filling them with the mean value between the previous and following observations.

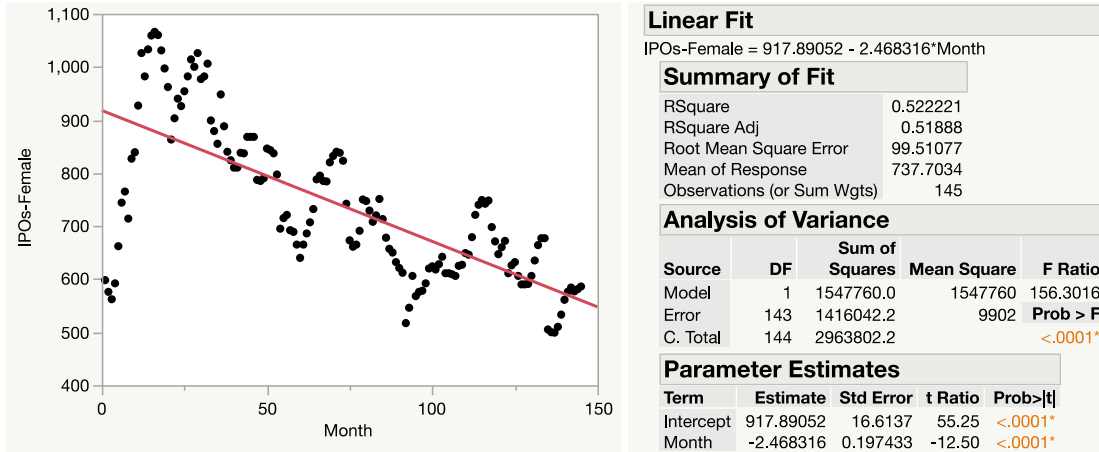


Figure 21. Fit model of female IPOs by months.

Figure 21 shows that the female IPO data has a negative trend and is slightly decreasing. In the summary fit, I find that the linear equation is:

$$IPOs_female = 917.89052 - 2.468*Month. \quad (4)$$

Equation 4 suggests that female IPOs drop by three peacekeepers per month. The *R-square* value is not so high (0.52), but the *F-test* and the coefficient of *Month* are highly significant ($p < 0.001$). Those factors indicate a worthy linear relationship between female IPOs and months.

The time series modeling shows that the dataset is not stationary due to the trend. I try the differencing, but its ACF becomes completely uncorrelated, as shown in Figure 22.

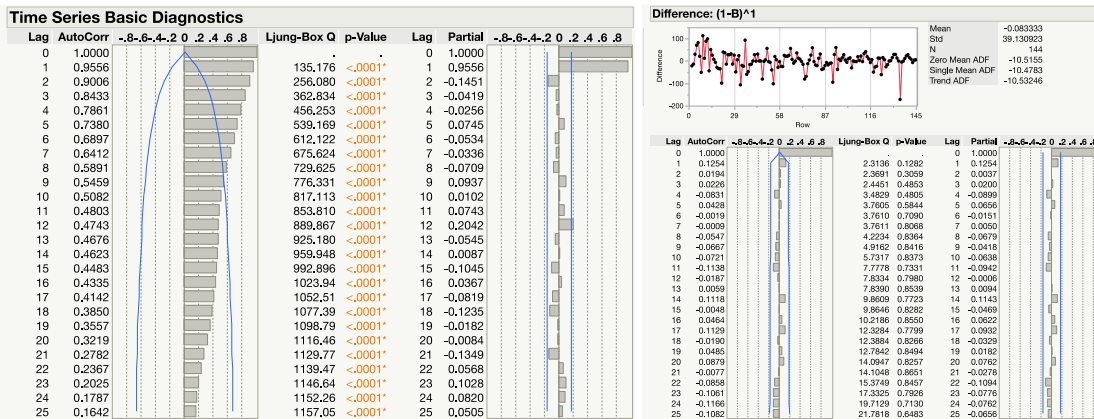


Figure 22. Stationarity check and differencing on the female IPOs.

I run the time series modeling on the residuals data of female IPOs. Figure 23 shows that the residuals have positive autocorrelation in the first four lags—the ACF exhibits slight exponential decay. The PACF shows a minor exponential decay and cuts off at lag 1, so AR(1) and ARMA(1,1) are good options. I also include SES, DES, and LES to give more alternatives to the model selection.

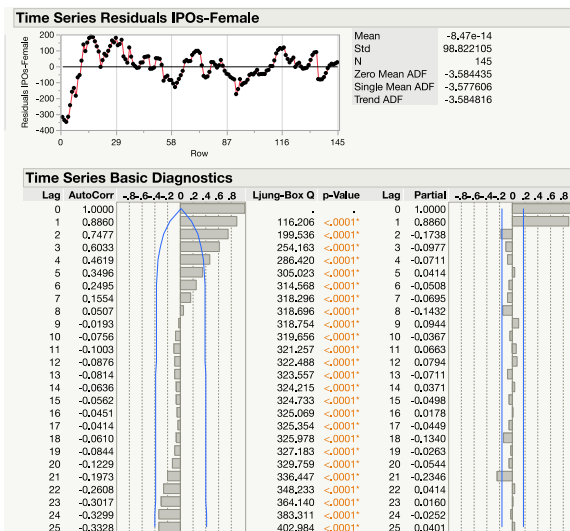


Figure 23. Stationarity check on the female IPOs' residual.

Table 8 displays the result of the female IPO model comparison and cross-validation. The result indicates that Holt and SES are better candidates. To find the most valid candidates,

I split the female IPO dataset into 120 observations in the training set and the last 25 in the test set. I compare the SSE of each fit model and find that SES is the best model. I also validate its residuals, and the residuals are uncorrelated, normally distributed, and exhibit constant variance or a shotgun pattern in the overlay plot, as shown in Figure 24.

Table 8. Model comparison and cross-validation result of female IPOs.

Model	DF	AIC	SBC	RSquare	MAE	SSE
Linear (Holt) ES	141	1464.486	1470.412	0.807	28.137	162,097.47
Simple ES	143	1467.259	1470.229	0.832	27.473	142,810.00
ARMA(1, 1)	142	1476.785	1485.715	0.794	28.346	313,621.57
AR(1)	143	1478.660	1484.614	0.793	29.033	272,441.10
Double (Brown) ES	142	1484.908	1487.871	0.778	31.371	2,177,010.98

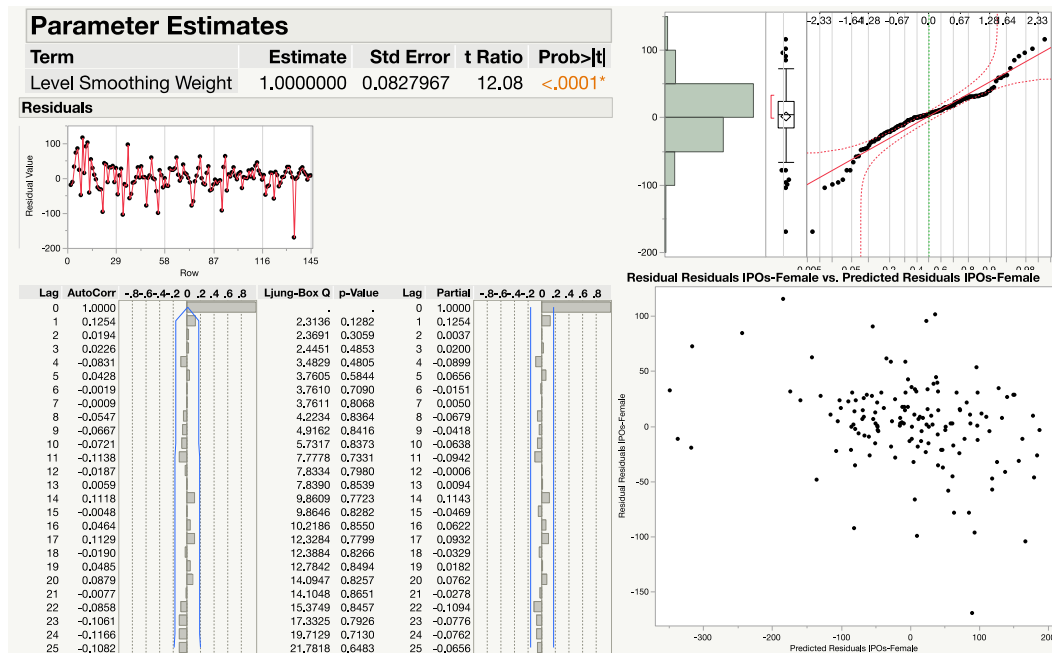


Figure 24. Model validation for SES model on female IPOs.

Table 9 shows me the result of the SES model in forecasting the number of female IPO. The forecasting result predicts the number of female IPOs by 524 with a confident interval between 139 and 910 at the end of 2023. The forecasting analysis indicates that

the female IPOs will drop to 10.6% (decreased by 62 peacekeepers) for the next twenty-five months. Figure 25 provides the prediction graph of the future trend of female IPOs.

Table 9. The predicted model for forecasting the female IPOs.

Month-Year	Pred Value	Pred Residual	Upper CL Residual	Lower CL Residual	Combined Value	Lower CL Value	Upper CL Value
Jan-23	525	26	315	(262)	551	263	840
Feb-23	523	26	325	(273)	549	250	848
Mar-23	520	26	334	(282)	547	238	855
Apr-23	518	26	344	(292)	544	226	862
May-23	516	26	353	(301)	542	214	869
Jun-23	513	26	362	(310)	539	203	875
Jul-23	511	26	371	(319)	537	192	881
Aug-23	508	26	379	(327)	534	181	888
Sep-23	506	26	388	(336)	532	170	893
Oct-23	503	26	396	(344)	529	159	899
Nov-23	501	26	404	(352)	527	149	904
Dec-23	498	26	412	(360)	524	139	910

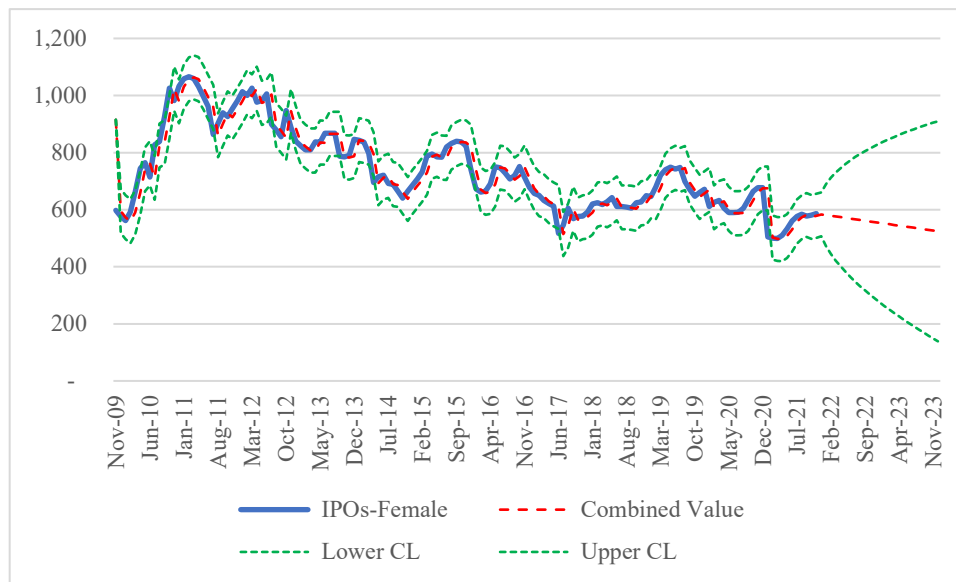


Figure 25. The forecasting graph of the female IPOs.

VII. RESULTS

A. FINDINGS

In the theoretical analysis, I find two factors affecting the low number of female peacekeepers: the discrimination of primary stakeholders at a societal level and the risk preferences of women at an individual choice level. The peacekeeping stakeholders consciously and unconsciously discriminate against women who want to join UN peacekeeping operations. This gender discrimination certainly makes recruitment more difficult for women to pass the selection process and reduces their chances of participating in UN peacekeeping missions, which affects the supply pool of peacekeepers in UN missions. The small number of candidates reduces the UN's option to select more talented and qualified peacekeepers to solve many complex issues in conflict areas. The higher risk of UN jobs also affects females' preference to serve in the UN missions at an individual choice level. The female candidates feel that the UN undervalues women's contributions by not providing CWD in line with the higher risk of gender-based violence and sexual exploitation in conflict areas.

I also find that the UN recognized that women have a comparative advantage in increasing operational effectiveness. Appreciating women as a latent and observable variable may positively offer better care for women and children in local communities. This positive value of female participation must synergize with the male peacekeepers' roles in conflict areas because each gender can support each other in accomplishing the UN mission. The concept of expanding the labor pool allows the UN DPO to acquire more talented peacekeepers in the peacekeeping operations. The organization will have more power to select more motivated and qualified peacekeepers from either gender into missions.

I find a slight growth in the UN female participation for the last two decades. I use a time series analysis to investigate the monthly gender data from the official UN database. Some UN job categories increase, but the IPO group needs special attention and effort to increase female participation. Female troops have the highest growth of thirteen female

peacekeepers during the previous decade, followed by female MOSOs for eight peacekeepers and female FPU for four peacekeepers per month. The number of female IPOs decreases by two peacekeepers per month, a negative indicator of the UN female inclusion campaign. The forecasting analysis predicts that by the end of 2023, the female troops will develop 8.6% (319 peacekeepers), the female FPUs are 11.6% (96 peacekeepers), and the female MOSOs are 29.9% (191 peacekeepers). The female IPOs are declined by 10.6% (losing 62 peacekeepers). These predictions also have confidence intervals to provide elasticity in each forecasting result.

The theoretical and empirical findings support each other by establishing the conceptual framework and formulating my research hypotheses. The theoretical analysis provides some basic knowledge and models that describe why the UN has so few female peacekeepers and why the organization persists in recruiting more women to the missions. The empirical analysis uses the insight from the theoretical models to answer the research questions based on the forecasting result of the time series analysis.

B. DISCUSSION

The UN and TCCs/PCCs should eliminate any gender-discriminatory preferences during the peacekeeper recruitment, selection, and deployment if the organization wants more women participating in the missions. All peacekeeping stakeholders also should provide better workplaces for female peacekeepers by reducing the risk of gender-based violence and sexual exploitation in operation areas. The UN should recognize that a positive CWD exists for female peacekeepers and make safer workplaces to reduce the CWD. The alternative action is to pay the CWD for the female group if the environment is uncontrollable. This compensation helps offset the negative individual preference of female candidates to serve under the UN flag.

The UN DPO must deploy more female peacekeepers in the community to offer necessary treatment and solutions if the organization wants to maximize the female comparative advantage. The mission leaders must affirm female inclusion as a visual signal to enter limited societies and a latent variable that provides better care for women and children in conflict areas. The UN DPO should commit a fresh perspective to promote the

WPS campaign and expand the peacekeeping labor pool by attracting and selecting more qualified peacekeepers, specifically women.

The UN can develop the current sexual harassment policy: reporting methods and sanctioning components to show how transparency policies affect the rate of gender-based violence and sexual harassment in conflict areas. Cummings (2018) suggests that “the Norwegian and Israeli military have sexual assault policies that allow more victims to report their sexual assaults by providing a third party for reporting sexual assault victimizations as the primary reporting option” (p. 131). She also finds that using an independent sanctioning party also positively values the transparency of sexual exploitation and abuse prevention. The UN DPO may adopt these solutions to boost the transparency of gender-based violence and sexual harassment policies in the mission areas and prevent further sexual exploitation and abuse committed by the UN peacekeepers.

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VIII. CONCLUSION

The WPS agenda aims to protect more women in conflict areas and increase female participation in global peacekeeping operations. This campaign emphasizes women's essential role in peacebuilding to assist other women and children in conflict areas and prevent any sexual assault and harassment to the minor group in the local communities. Specifically, the UN states that women boost the effectiveness of peacekeeping operations. However, female inclusion is still low, especially in several jobs related to peacekeeping. The small proportion of female peacekeepers proves crucial evidence that women in peacekeeping operations are still a big issue in the UN WPS agenda.

I investigate essential questions about increasing female participation in UN peacekeeping operations. I focus on three critical areas: why the UN still has low female involvement in the missions, what the UN wants by adding more women to the forces, and how well the female participation campaign works so far. I collect credible works of literature and analyze those findings to construct relevant arguments. I also compile the monthly gender data from the official UN database to measure the progress of the WPS campaign. My theoretical analysis connects the relationship between popular theories and the status quo of the UN peacekeeping labor market to answer the first two research questions. This analysis explores some concepts to explain why the UN does not recruit many female candidates to the labor pool and wants more women to serve under the flag. The empirical research uses time series data, which measure the current trend of female numbers and calculate the estimated strength in the future. This chapter is crucial because the result gives me the actual numbers and calculations to prove the effectiveness of the UN WPS campaign in the last two decades.

In the theoretical section, I find two factors affecting the low number of female peacekeepers: the discrimination of primary stakeholders at a societal level and the risk preferences of women at an individual choice level. The peacekeeping stakeholders unconsciously discriminate against the opportunity of women to join the mission. The female candidates feel that the UN undervalues female contribution by not providing CWD due to the higher risk of gender-based violence and sexual exploitation in conflict areas. I

also find that the UN recognized that women have a comparative advantage in increasing operational effectiveness. Using gender as a signal, I use theory to suggest that women may have quicker access to female groups and provide relatively better care for women in conflict areas. Empirically, female participation has a slightly positive trend during the last two decades, but the movement still has some room for improvement in the future. Some UN contingents need special attention and effort to increase female participation. Both theoretical and empirical findings support each other.

LIST OF REFERENCES

- Autor, D. (2009). Lectures in the economics of discriminations I. *Massachusetts Institute of Technology*, 38. <https://economics.mit.edu/files/4095>
- Becker, G. S. (2010). *The economics of discrimination*. University of Chicago Press.
- Bridges, D., & Horsfall, D. (2009). Increasing operational effectiveness in UN peacekeeping. *Sage Publication, Inc.*, 36(1), 120–130. JSTOR. <https://www-jstor-org.libproxy.nps.edu/stable/48608863>
- Carreiras, H. (2010). Gendered culture in peacekeeping operations. *International Peacekeeping*, 17(4), 471–485. <https://doi.org/10.1080/13533312.2010.516655>
- Cohen, D. K., & Nordås, R. (2014). Sexual violence in armed conflict: Introducing the SVAC dataset, 1989–2009. *Journal of Peace Research*, 51(3), 418–428. <https://doi.org/10.1177/0022343314523028>
- Cummings, S. (2018). Military sexual assault: A comparative case study of sexual assault policies in the United States, Israel, and Norway [Criminal Justice, Bridgewater State University]. <https://vc.bridgew.edu/theses/57/>
- Dharmapuri, S. (2013). Not just a numbers game: Increasing women’s participation in UN peacekeeping. *International Peace Institute*, 32. https://www.files.ethz.ch/isn/167390/ipi_epub_not_just_a_numbers_game.pdf
- Ehrenberg, R. G., & Smith, R. S. (2015). *Modern labor economics: Theory and public policy* (12th ed.). Pearson.
- Ganti, A. (2021, October 30). Degree of freedom. *Investopedia*. <https://www.investopedia.com/terms/d/degrees-of-freedom.asp>
- Hayes, A. (2021, October 12). Autoregressive integrated moving average. *Investopedia*. <https://www.investopedia.com/terms/a/autoregressive-integrated-moving-average-arima.asp>
- Henke, M. E. (2016). Has UN peacekeeping become more deadly? Analyzing trends in UN fatalities. *International Peace Institute*, 24. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiJvsuP3InxAhXSUN4KHZG6AykQFjAAegQIAxAD&url=https%3A%2F%2Fwww.ipinst.org%2Fwp-content%2Fuploads%2F2016%2F11%2F1612_Peacekeeping-Fatalities-1.pdf&usg=AOvVaw3oJgOgCA92hQQxh8sJ_6le
- Holohan, A. (2019). Transformative training in soft skills for peacekeepers: Gaming for peace. *International Peacekeeping*, 26(5), 556–578.

- Karim, S. (2017). Reevaluating peacekeeping effectiveness: Does gender neutrality inhibit progress? *International Interactions*, 43(5), 822–847. <https://doi.org/10.1080/03050629.2017.1231113>
- Karim, S., & Beardsley, K. (2016). Explaining sexual exploitation and abuse in peacekeeping missions: The role of female peacekeepers and gender equality in contributing countries. *Journal of Peace Research*, 53(1), 100–115.
- Mankiw, N. G. (2018). *Principles of economics* (8th ed.). Cengage Learning.
- Mathis, R. L. (2019). *Human resource management* (16th ed.). Cengage Learning.
- Matthews, M., Morral, A. R., Schell, T. L., Cefalu, M., Snoke, J., & Briggs, R. J. (2021). Sexual assault and sexual harassment in the U.S. Army: Where cases are highest and why. RAND Corporation, *RB-A1013-1*, 6. <https://doi.org/10.7249/RBA1013-1>
- Purves, D., Augustine, G. J., Fitzpatrick, D., Lamantia, A.-S., McNamara, J. O., & Williams, S. M. (Eds.). (2001). *Neuroscience* (2nd ed.). Sinauer Associates.
- Seagren, C. W. (2020a). *Some basics in time-series*. Naval Postgraduate School.
- Seagren, C. W. (2020b). *Time-series: Data splitting*. Naval Postgraduate School.
- Shepherd, L. J. (2014). Advancing the women, peace and security agenda: 2015 and beyond. *NOREF Norwegian Peacebuilding Resource Centre*.
- Smit, T., & Tidblad-Lundholm, K. (2018). Trends in women's participation in UN, EU, and OSCE peace operations. SIPRI.
- Tidblad-Lundholm, K. (2020). When are women deployed? Operational uncertainty and deployment of female personnel to UN peacekeeping. *International Peacekeeping*, 27(4), 673–702. <https://doi.org/10.1080/13533312.2020.1760717>
- UN Department of Peace Operations. (2018). *Uniformed gender parity strategy 2018–2028*. United Nations. <https://peacekeeping.un.org/sites/default/files/uniformed-gender-parity-2018-2028.pdf>
- UN Peacekeeping. (2020). *Women in peacekeeping: A key to peace*. <https://peacekeeping.un.org/en/women-peacekeeping>
- UN Peacekeeping. (2021a). *UN military*. United Nations Peacekeeping. <https://peacekeeping.un.org/en/military>
- UN Peacekeeping. (2021b). *UN Peacekeeping: Gender Statistics Data*. UN Peacekeeping. <https://peacekeeping.un.org/en/gender>

- UN Police. (2017). *Mission-based police planning in peace operations*. United Nations Department of Peace Operations. https://police.un.org/sites/default/files/sgf-manual-mbpps_july.pdf
- UN Police. (2021). *UN formed police units*. United Nations Peacekeeping. <https://police.un.org/en/formed-police-units-fpus>
- UN Security Council. (2000). *UNSC resolution 1325*. UN Security Council.
- UN Security Council. (2019). Deployment of female personnel boosts effectiveness, says Secretary-General, as Security Council holds open debate on women in peacekeeping [Meeting coverage]. <https://www.un.org/press/en/2019/sc13773.doc.htm>
- Wallis, C. J. D., Jerath, A., Coburn, N., Klaassen, Z., Luckenbaugh, A. N., Magee, D. E., Hird, A. E., Armstrong, K., Ravi, B., Esnaola, N. F., Guzman, J. C. A., Bass, B., Detsky, A. S., & Satkunasivam, R. (2022). Association of surgeon-patient sex concordance with postoperative outcomes. *JAMA Surgery*, *157*(2), 146–156. <https://doi.org/10.1001/jamasurg.2021.6339>
- Wilén, N. (2020a). What’s the ‘added value’ of male peacekeepers? *Egmont Royal Institute of International Relations*, *29*(Africa Policy Brief), 10. <http://www.jstor.com/stable/resrep21378>
- Wilén, N. (2020b). Female peacekeepers’ added burden. *International Affairs*, *96*(6), 1585–1602. <https://doi.org/10.1093/ia/iiaa132>

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