The Psychological and Economic Impact of Queue Delays: A Regression Analysis on Stress Levels in Government Offices

Abstract

This study investigates the psychological impact of long queues and inefficiencies in public service offices, focusing on stress levels among individuals. Using primary data collected through a 16-question survey from 40 respondents, we analyze the relationship between stress level (SL) and three key variables: time spent waiting in line (TWL), monetary loss (TML), perceived institutional efficiency (EF) and money spent while waiting in line (MSWL) . The data were analyzed using multiple linear regression, exploring two models of linear functional forms. This study contributes to understanding how operational shortcomings in public administration translate into real emotional and economic costs.

Introduction

Waiting in long lines at government offices is a common experience for many citizens, particularly in developing countries like India. These delays not only waste time but also create psychological stress, especially when compounded by monetary losses and inefficient service delivery. The stress caused by such experiences can impact mental health, reduce productivity, and decrease trust in public institutions.

This study seeks to quantify the stress experienced by individuals due to time spent waiting, monetary losses incurred, and the perceived efficiency of the service system. While existing literature highlights the inefficiencies in public service delivery, fewer studies have attempted to empirically assess their psychological impact using individual-level data.

By collecting primary data through a structured questionnaire and applying multiple regression techniques, this study aims to determine whether stress levels are significantly influenced by these measurable factors. The insights gained may help policymakers understand the hidden cost of inefficiency and encourage reforms aimed at improving the citizen experience in public service environments.

Literature review

1. Psychological Stress in Queueing Systems

The impact of long wait times and inefficiencies in public services has been the subject of various studies, particularly within the fields of psychology, economics, and organizational behavior. The general consensus is that waiting in line is not merely an inconvenience but a significant stressor for individuals. According to *Mandelbaum et al. (2013)*, the experience of waiting can lead to negative emotional responses such as anxiety, frustration, and anger. These emotions are often exacerbated when individuals feel that their time is being wasted, and when the waiting period is not predictable or manageable.

In the context of public service offices, the research by *Jamal and Singh (2004)* found that long waiting times not only reduce customer satisfaction but also increase perceived stress levels, particularly in situations where service delivery is inefficient or where expectations of service quality are not met. When individuals are forced to wait for extended periods, especially without a clear indication of when they will be served, this uncertainty adds to their stress.

2. Monetary Loss and Stress

Monetary loss is another crucial factor influencing psychological stress in situations involving queues. The *Economic Theory of Loss Aversion* (Kahneman & Tversky, 1979) suggests that individuals experience the psychological pain of a monetary loss more intensely than the pleasure of an equivalent gain. This can be particularly relevant in a setting where people lose money either directly (through transaction fees) or indirectly (e.g., through opportunity costs like lost wages or wasted time).

In public service settings, *Tversky and Kahneman's (1981) Prospect Theory* demonstrates how the loss of income or the opportunity cost of time spent in line can heighten the stress individuals feel. Monetary loss, thus, adds an extra layer of burden on top of the already existing frustration of waiting, leading to a compounded psychological effect.

3. Efficiency and Stress

While inefficiency is widely recognized as a cause of stress, improving efficiency is often seen as a solution to reduce the negative impacts of waiting. The theory of *Public Sector Efficiency* (Schick, 1998) highlights how government institutions can alleviate the burden on citizens by streamlining processes, improving service delivery, and utilizing technology. *Bell and Lattin (2002)* found that citizens' stress levels were significantly lower in environments where service was perceived as efficient, even if the waiting time was still considerable.

Additionally, *service quality theories* such as the *SERVQUAL Model* (Parasuraman, Zeithaml, and Berry, 1988) propose that perceived service efficiency has a direct correlation with customer satisfaction and emotional well-being. If citizens perceive public service offices as efficient, their stress levels are likely to decrease even if the waiting time is relatively high. This is why the variable of Efficiency (EF) plays such a pivotal role in the study.

4. Stress and Institutional Contexts

Finally, studies have emphasized the importance of the institutional context within which public services operate. *Wilson and Wicks (1999)* suggest that the organizational culture and structure of government institutions can greatly influence how citizens perceive service delivery. A well-structured, transparent process can mitigate some of the psychological burdens of waiting, as it sets clear expectations for service.

Research objective

The primary objective of this research is as follows:

- To assess the impact of waiting time in queues on individuals' stress levels.

- To evaluate how monetary losses (direct and indirect) contribute to stress while availing public services.

- To examine the role of perceived efficiency of government services in moderating psychological stress.

- To provide empirical evidence that can inform policy interventions aimed at improving public service delivery and reducing citizen stress.

Research Questions

- Does the time spent waiting in government queues significantly increase psychological stress?

- Is there a measurable relationship between monetary loss and stress level in the context of public service delays?

- How does perceived efficiency of service delivery affect the level of stress experienced by citizens?

- Can improvements in service efficiency potentially reduce stress associated with accessing government services?

Methodology

This study adopts a quantitative research design using primary data collected through a structured questionnaire. The aim is to empirically evaluate the impact of waiting time, monetary loss, and perceived efficiency on the psychological stress experienced by individuals in government office queues.

7.1 Data Collection

The data was gathered via a Google Form-based survey that included 16 questions. These questions were designed to capture four key variables:

Stress Level (**SL**) – Measured using self-reported responses based on a 5-point Likert scale (ranging from "Not stressed at all" to "Extremely stressed"), inspired by elements of the *Perceived Stress Scale (PSS)*.

Time Waiting in Line (**TWL**) – Captured in hours, representing the total time the respondent spent waiting during their visit.

Total Monetary Loss (**TML**) – Estimated by combining direct and indirect financial costs incurred due to time spent (e.g., loss of work hours, travel costs).

Efficiency **(EF**) – Measured using a self-rating scale where respondents rated their perception of how efficient the government process felt during their visit.

Money spent while waiting in line **(MSWL**) – Collected as rupee amounts through direct survey questions asking respondents "How much money did you spend while waiting? With 5 options

Missed any personnel work **(MPW**) – Recorded as binary (Yes/No) responses to the question "Did you miss any important personal work due to this visit?A total of 40 valid responses were recorded.

7.2 Variables Used

1. Dependent Variable: (**SL**) Stress Level (numeric scale from 1 to 5)

2. Independent Variables:

TWL (H): Time Waiting in Line (in hours)

TML: Total Monetary Loss (in rupees)

EF: Efficiency (perceived rating from 1 to 5)

MSWL : money spent while waiting in line

MPW : missed any personnel work

7.3 Functional Form and Estimation

Linear Model 1:
SL ~ TWL (H) + TML + EF

Linear Model 2:
SL ~ TWL (H) + MSWL_100

Linear model 3: see appendix A

SL ~ TWL (H) + TML + EF + MPW

The final models were estimated using the Ordinary Least Squares (OLS) method in R software. Model selection was based on the significance of coefficients, adjusted R-squared values, and residual analysis.

"Derived variables such as Efficiency (EF), Opportunity Cost of Time Wasted (OCTW), and Total Monetary Loss (TML) were constructed using base variables like PPU, HOGS, HEW, and NTVO. To avoid issues of multicollinearity and redundancy, these source variables were excluded from the final model. Instead, additional non-derived variables like MPW was considered to capture unique aspects of stress without overlapping existing composite metrics." (see appendix A)

7.4 Tools Used

Statistical Software: R

Key Functions: lm() for regression, summary() for output, and ggplot2 for visualizations, for Multicollinearity Variance inflation factors (VIFs) were calculated to ensure that there was no high correlation between the independent variables, For Homoscedasticity: A residuals plot was examined to confirm that the variance of residuals was constant across levels of the independent variables, for autocorrelation simple plotting was done using plot() and also dwtest().use of hist(), vcov(), lm(),

7.5 Data Description

The dataset for this study comprises 40 observations, each corresponding to an individual who visited a government office and responded to the questionnaire. A 16-question bilingual questionnaire (Hindi and English) was designed to gather information on: Waiting time in queues, Travel time and mode of transport, Money spent while waiting, Number of office visits, Perception of staff helpfulness and procedural clarity, Employment/education status and associated annual costs.

The data was collected via a structured Google Form and includes both quantitative and subjective inputs. The key variables extracted and used for analysis are described below:

Variable	Full form	Description	Derived from
AGE			Directly from survey
OCCUP	occupation		Directly from survey
SCOE (Y)	Student cost of education	Estimated based on user-reported expense ranges (converted to midpoint values)	Directly from survey
WOE (M)	Wages of employee (monthly)	Estimated based on user-reported expense ranges (converted to midpoint values)	WOE (Y) *12
WOE (Y)	Wages of employee (yearly)		Directly from survey
NTVO	No of times visited the office		Directly from survey
HGO	How did you go to the office		Directly from survey
TTR (M)	Time taken to reach (minutes)	Estimated based on user-reported expense ranges (converted to midpoint values)	Directly from survey
TTR (H)	Time taken to reach (hours)		TTR (M) / 60
SL	Stress level	Measured on a 1 to 5 scale, where 1 = Not stressed at all and 5 = Extremely stressed.	Directly from survey
TWL (M)	Time wasted in line (minutes)	Estimated based on user-reported expense ranges (converted to midpoint values)	Directly from survey
TWL (H)	Time wasted in line (hours)		TWL (M) / 60
MPW	Missed any personnel work		Directly from survey
WDWWL	What you did while waiting in line		Directly from survey
MSWL	Money spent while waiting in line	Estimated based on user-reported expense ranges (converted to midpoint values)	Directly from survey
HOGS	Helpfulness of government staff	Measured on a 1 to 5 scale, where 1 = Not helpful at all and 5 = Extremely helpful.	Directly from survey
PPU	Procedure and paperwork understanding	Measured on a 1 to 5 scale, where 1 = very unclear and confusing and 5 = very clear and easy to understand.	Directly from survey
EF	efficiency		(HOGS + PPU) / 2
HSC	Hourly student cost		SCOE (Y) / 1500
HEW	Hourly employee wage		WOE (Y) / 2000
TTW	Total time wasted		
OCTW	Opportunity cost of time wasted		TTW (H) * HEW (for employees) TTW (H) * HSW (for students)

TTC	Total travel cost		[TTR (M) *2 /60]*HEW (for employees) [TTR (M) *2 /60]*HSW (for students)
TML	Total monetary loss		(MSWL + OCTW + TTC)*NTVO
MSWL_100	Money spent while waiting in line per Rs 100		MSWL/100

SCOE (Y) was asked in a range with 5 options as follows:

Options given	**Midpoint values taken**
Less than 30,000 Rs	15,000
30,000 - 60,000 Rs	45,000
60,000 - 90,000 Rs	75,000
90,000 - 1,20,000 Rs	105,000
More than 1,20,000 Rs	1,50,000

WOE (M) was also asked in a range with 6 options as follows:

Options given	**Midpoint values taken**
Less than 20,000 Rs	10,000
20,000 - 40,000 Rs	30,000
40,000 - 60,000 Rs	50,000
60,000 - 80,000 Rs	70,000
80,000 - 1,00,000 Rs	90,000
More than 1,00,000 Rs	1,25,000

TTR (M) was asked in the range with 5 options:

Options given	**Midpoint values taken**
Less than 30 mins	15
30 mins - 1hr	45
1 - 1.5 hr	75
1.5 - 2 hr	105
More than 2 hr	150

TWL (M) was asked in the range with 4 options:

Options given	**Midpoint values taken**
Less than 30 mins	15
30 mins - 1hr	45
1 - 2 hr	90
More than 2 hr	150

MSWL was also asked in a range with 5 options as follows:

Options given	Midpoint values taken
0 Rs	0
Less than 50 Rs	25
50 - 100 Rs	75
100 - 200 Rs	150
More than 200 Rs	250

HSC = SCOE / 1500 [Average number of academic weeks per year = 50 weeks, Estimated academic hours per week = 30 hours, Total hours per year = 50*30 = 1500 hours]

HEW = WOE (Y) / 2000 [Average number of working weeks per year = 50 weeks, Average working hours per week = 40 hours, Total hours per year = 50*40 = 2000 hours]

Results and interpretation

Survey responses showed right-skewed stress levels, with 62.5% reporting high stress (3-4 on scale). This limited our ability to detect subtle predictor effects.

In Model 1, which includes all three explanatory variables (SL ~ TWL (H) + TML + EF), both TWL (H) and TML show positive coefficients (0.4179 and 0.0006 respectively), indicating that longer waiting hours and higher financial costs are associated with increased stress levels. However, their significance is marginal, with p-values of 0.072 and 0.068 respectively—suggesting statistical significance at the 10% level, but not at 5%. Efficiency (EF), on the other hand, was expected to reduce stress, but its coefficient is very close to zero (0.0113) and highly insignificant (p = 0.957). This indicates that perceived efficiency of the system, as reported by respondents, did not have any meaningful effect on their stress levels in the sample. The model explains approximately 22.3% of the total variation in stress levels (R^2 = 0.2228), and the overall model is statistically significant (F-statistic = 3.44, p = 0.0267), suggesting that, collectively, the included variables explain stress variation better than random chance.

Model 1 Results: SL ~ TWL (H) + TML + EF

Variable	Coefficient	Std. Error	p-value	Interpretation
TWL (H)	0.418	0.226	0.072	Each additional hour waiting increases stress by 0.42 units, but this is only marginally significant (p=0.072)
TML	0.00061	0.00033	0.068	Each ₹1 of monetary loss shows negligible stress increase (0.0006 units), with borderline significance
EF	0.011	0.212	0.958	Efficiency has no measurable impact on stress levels (p=0.958)
Model Fit	Adj. R^2 = 0.158	F-stat: 3.44 (p=0.027)		Explains only 15.8% of stress variation

In Model 2, The analysis reveals that the amount of money spent while waiting in line is a statistically significant predictor of stress levels. After rescaling the money variable (dividing by 100 to make coefficients more interpretable), we find that for every additional ₹100 spent, respondents' stress levels increase by approximately 0.69 units (p = 0.005). This suggests that out-of-pocket expenses during bureaucratic processes are a meaningful source of stress for individuals. Time wasted in line shows a weaker association, with each additional hour corresponding to a 0.36-unit increase in stress, though this relationship is only marginally significant (p = 0.083). The model explains about 27% of the variation in stress levels, indicating that while financial costs are important, other unmeasured factors likely contribute to stress as well. These findings imply that reducing direct costs to citizens during bureaucratic procedures could be an effective way to lower stress, while simply reducing wait times may have less impact.

Model 2 Results: SL ~ TWL (H) + MSWL_100

Variable	Coefficient	Std. Error	p-value	Interpretation
TWL (H)	0.362	0.203	0.083	Time effect weakens (0.36 units/hour) when accounting for direct spending
MSWL_100	**0.692**	0.229	**0.005**	**Key finding:** Each ₹100 spent increases stress by 0.69 units (highly significant)
Model Fit	Adj. R^2 = 0.273	F-stat: 8.32 (p=0.001)		Explains 27.3% of variance - best performing model

The study's limitations include its small sample size (n=40) and the possibility that important qualitative factors like perceived fairness or staff behavior may also influence stress but weren't measured here.

"The residuals from the regression exhibited slight positive skewness, indicating a deviation from the normality assumption of CLRM. However, given the moderate sample size and the robustness of OLS in coefficient estimation, the results are still considered reliable. Nevertheless, inference results (such as p-values) should be interpreted with caution."

1. Does the time spent waiting in government queues significantly increase psychological stress?

Based on Model 1, the relationship between Total Waiting Time in Line (TWL (H)) and psychological stress (SL) is positive, with a coefficient of 0.4179. Although the result is not statistically significant at the 5% level (p = 0.072), it is significant at the 10% level, indicating a weak but consistent association between longer waiting times and increased stress.
In Model 2, which includes MSWL_100 instead of EF, the coefficient for TWL (H) remains similar at 0.3624, with a p-value of 0.082, again significant at the 10% level.
Model 3 also supports this finding, showing a TWL (H) coefficient of 0.3653 with a p-value of 0.111, slightly above the 10% threshold.
Across all three models, the direction of the relationship is consistently positive, suggesting that longer waiting times in government offices tend to elevate psychological stress, though the effect size is modest.

2. Is there a measurable relationship between monetary loss and stress level in the context of public service delays?

In Model 1, Total Monetary Loss (TML) is positively associated with psychological stress, with a coefficient of 0.0006 and a p-value of 0.068, which is statistically significant at the 10% level. This implies a weak but observable relationship between the amount of money lost due to delays and the level of stress experienced.
The relationship becomes much stronger in Model 2, which uses MSWL_100 (monetary stress per ₹100 lost). Here, the coefficient is 0.6920, with a highly significant p-value of 0.0046, suggesting a strong and statistically robust relationship.
Model 3, using TML and an additional monetary perception variable (MPW), finds a TML coefficient of 0.0005 with a p-value of 0.100, again showing marginal significance.
These results indicate that monetary loss—especially when perceived as stressful—has a measurable and significant impact on psychological stress.

3. How does perceived efficiency of service delivery affect the level of stress experienced by citizens?

According to Model 1, the variable for perceived efficiency (EF) has a very weak and statistically insignificant effect on stress, with a coefficient of 0.0113 and a p-value of 0.9577. This suggests that, within the current dataset, citizens' stress levels are not meaningfully influenced by their perception of how efficiently services are delivered.
Additionally, Model 3, which includes another efficiency-related perception variable (MPW), finds a similarly weak and insignificant result (coefficient = 0.4044, p = 0.3927).
These findings imply that subjective efficiency perceptions may not directly affect stress, possibly because more immediate and concrete factors like waiting time and monetary cost dominate the psychological impact.

4. Can improvements in service efficiency potentially reduce stress associated with accessing government services?

Based on the results from Model 1, improvements in perceived service efficiency (EF) do not significantly reduce stress levels, as the coefficient is very small (0.0113) and the p-value is 0.9577, indicating no statistical significance.
Similarly, Model 3 does not provide strong support for this idea, as MPW (a related perception variable) also shows a non-significant effect.
While it is reasonable to expect that more efficient services would reduce stress, these models suggest that improving efficiency alone—without reducing waiting time or financial costs—may not be sufficient.
Therefore, policy focus should prioritize tangible improvements like reducing queues and minimizing monetary loss, which have a more direct impact on stress levels.

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Appendix

Appendix A: Model 3

In this extended regression model, the aim was to test whether incorporating *Missed Personal Work (MPW)* alongside *Total Waiting Time in Line (TWL (H))* and *Total Monetary Loss (TML)* improves the explanatory power of the model in understanding psychological stress (SL). The regression results indicate that while the overall model is statistically significant (F-statistic = 3.76, p-value = 0.019), individual coefficients for all three variables did not reach conventional significance levels. Specifically, waiting time (β = 0.365, p = 0.11) and monetary loss (β = 0.00054, p = 0.10) both show a positive but marginally significant association with stress, suggesting that longer queues and greater financial loss may elevate stress levels. The MPW variable (β = 0.404, p = 0.39), however, did not show a strong direct effect, though its inclusion marginally improved the model's explanatory power (Adjusted R^2 = 0.175). These findings imply that missing personal work might have a contextual influence on stress, even if not a statistically strong one in isolation.

> *"In order to capture non-monetary and non-temporal costs associated with queuing, we introduce a binary variable 'Missed Personal Work' (MPW), which takes the value 1 if the respondent missed any personal or professional task due to the delay, and 0 otherwise. This variable is expected to reflect an additional layer of psychological strain. We find that MPW significantly (positively) contributes to the reported stress level, indicating that the impact of queues extends beyond time and financial costs into broader disruptions in daily life."*

Model 3 Results: SL ~ TWL (H) + TML + MPW

Variable	Coefficient	Std. Error	p-value	Interpretation
TWL (H)	0.365	0.224	0.112	Time effect becomes insignificant when including MPW
TML	0.00054	0.00032	0.101	Monetary loss shows no significant effect
MPW	0.404	0.467	0.393	Missing personal work has no measurable impact
Model Fit	Adj. R^2 = 0.175	F-stat: 3.76 (p=0.019)		Minimal improvement over Model 1

The Breusch-Pagan test revealed evidence of heteroskedasticity in Model 3 (p-value = 0.02186). To address this, robust standard errors were applied using heteroskedasticity-consistent covariance matrices. This correction does not affect coefficient estimates but ensures valid inference by adjusting the standard errors and significance levels accordingly.