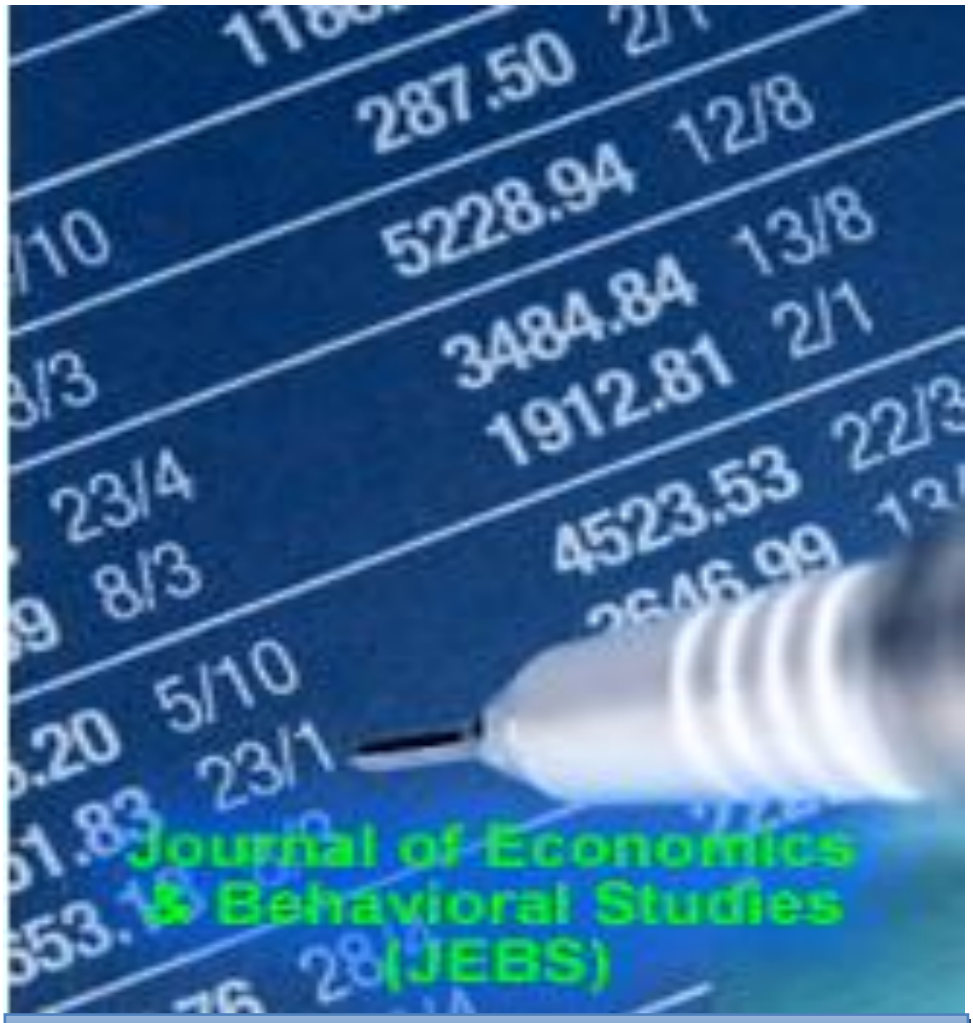

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Editorial

Journal of Economics and Behavioral Studies (JEBS) provides distinct avenue for quality research in the ever-changing fields of economics & behavioral studies and related disciplines. Research work submitted for publication consideration should not merely limited to conceptualization of economics and behavioral developments but comprise interdisciplinary and multi-facet approaches to economics and behavioral theories and practices as well as general transformations in the fields. Scope of the JEBS includes: subjects of managerial economics, financial economics, development economics, finance, economics, financial psychology, strategic management, organizational behavior, human behavior, marketing, human resource management and behavioral finance. Author(s) should declare that work submitted to the journal is original, not under consideration for publication by another journal and that all listed authors approve its submission to JEBS. Author (s) can submit: Research Paper, Conceptual Paper, Case Studies and Book Review. Journal received research submission related to all aspects of major themes and tracks. All submitted papers were first assessed by the editorial team for relevance and originality of the work and blindly peer-reviewed by the external reviewers depending on the subject matter of the paper. After the rigorous peer-review process, the submitted papers were selected based on originality, significance, and clarity of the purpose. The current issue of JEBS comprises papers of scholars from Germany, Nigeria, Malaysia and Ghana. On Point Predictions and Reference Dependence in Behavior-Based Pricing Experiments, Tax Revenue and Economic Growth, Quantitative Study on Expenditure Behavior among Public and Private University Students, The Relationship between Bank Deposits and Macroeconomic Variables and Tax Morale and its Drivers were some of the major practices and concepts examined in these studies. The current issue will therefore be a unique offer where scholars will be able to appreciate the latest results in their field of expertise and to acquire additional knowledge in other relevant fields.

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PAPERS

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On Point Predictions and Reference Dependence in Behavior-Based Pricing Experiments

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Abstract: It has been shown that the comparative static results of two-period behavior-based pricing models hold in laboratory experiments, while point predictions do not. This study aims to check whether these findings replicate and to evaluate why observed prices deviate from point predictions. We report observed prices in conformity with point predictions through: (1.) a uniform pricing benchmark, (2.) a replication of a behavior-based pricing experiment, and (3.) a follow-up experiment in which we consider the second period disjointed from the first period. By disjoining the two periods, we show that reference dependence toward first-period prices shifts the second-period pricing behavior of participants upwards. In a post hoc analysis, we show that considering consumers' myopic instead of strategic explains a downward shift in first-period prices and rationalizes prior experimental findings. Volatile price levels affect price-based welfare measures – such as seller profits and total customer costs. We show that transport costs are a robust welfare measure that alleviates the impact of distorted prices. Ultimately, our findings are relevant for the design and assessment of multi-period pricing experiments.

Keywords: *Behavior-based pricing, forward-looking customers, laboratory experiment, myopic customers, reference dependence*.

1. Introduction

Most papers on behavior-based pricing originated from Fudenberg and Tirole (2000, henceforth F&T).[1] Most commonly, the models in these papers are characterized by a two-period structure, where a continuum of consumers are served by two sellers at uniform prices in the first period, and at differentiated prices in the second period. The second-period prices are differentiated according to the first-period purchasing decisions of consumers. Early successors of F&T include Chen and Pearcy (2010) and Shin and Sudhir (2010), who studied the role of varying degrees of preference dependence. As a second dimension, Chen and Pearcy (2010) evaluated the ability of firms to commit to future prices, while Shin and Sudhir (2010) incorporate customer heterogeneity. Behavior-based pricing reemerged as a relevant topic over recent years with the rise of digital markets and associated distribution channels. Recent academic contributions cover behavior-based pricing and advertising.

(Shen and Miguel Villas-Boas, 2018; Esteves and Cerqueira, 2017), behavior-based pricing with vertical differentiation (Garella et al., 2021; Umezawa, 2022), the observability of behavior-based pricing (Li et al., 2020), and fairness concerns when behavior-based pricing practices are observed (Li and Jain, 2016). In response to recent developments in data protection regulations, behavior-based pricing is studied when firms can personalize prices and products (Capponi et al., 2021; Esteves, 2022; Laussel and Resende, 2022), the ability of firms to share customer information (De Nijs, 2017; Choe et al., 2022, 2023), and consumer control over their data (Choe et al., 2018). While there are empirical studies on behavior-based pricing

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[1]See Fudenberg and Villas-Boas (2006) and Esteves et al. (2009) for comprehensive literature surveys of earlier contributions. Behavior-based pricing is also covered in Armstrong's review of recent developments in price discrimination (Armstrong, 2006).

(Asplund et al., 2008; Cosguner et al., 2017), it might prove problematic to disentangle the aforementioned factors and explicitly verify the mechanics of theoretical models. Laboratory experiments allow fine control and adjustment of market features and grant first insights into market dynamics.

However, to our knowledge, only two experiments that explicitly featured behavior-based pricing have been conducted thus far.[2] Brokesova et al. (2014, henceforth BDP) implemented the model of Chen and Pearcy (2010) experimentally by varying the ability of sellers to pre-commit to future prices and the persistence of consumer preferences. Their first case directly corresponds to simple short-term contracts with independent preferences from F&T, while their second case corresponds to poaching under short-term contracts (behavior-based pricing) from F&T. By employing computerized buyers (while participants act as sellers), their set-up closely resembles the structure of underlying theoretical models and is suited to explicitly test point predictions. Mahmood and Vulkan (2018, henceforth M&V) had participants play only the second period of a behavior-based pricing market as sellers against computerized competitors, following a predetermined first period. With their results, BDP and M&V supported the comparative static predictions of F&T and Chen and Pearcy (2010). However, their observed prices are significantly larger than the point predictions of the model. BDP's observed profits and customer costs and the profits in M&V are driven by skewed price levels and predominantly do not reflect theoretical predictions.

The contribution of this paper is twofold. First, we explore why game-theoretic point predictions of prices in behavior-based pricing models do not hold in laboratory experiments and whether there are circumstances under which they do. Second, we show that transport costs are a suitable welfare measure whenever price predictions do not hold (albeit comparative static results do). To this end, we derive the subgame perfect prices of a parameterized version of F&T's model. We then test the predictions of the model by implementing a laboratory experiment where student participants take the role of sellers and interact with computerized buyers. In a benchmark uniform pricing treatment, we observe convergence toward price predictions in both periods. This contrasts the first case of BDP, where participants chose lower second-period prices than were predicted. In our second treatment, where behavior-based pricing is permitted, we observe that first-period prices converge toward price predictions in contrast with BDP's second case, while second-period prices diverge from price predictions in line with BDP. In a follow-up experiment, we only consider the second period using simulated first-period cutoffs.

This resembles the set-up of M&V, albeit allowing for a wider range of first-period cutoffs and not featuring computerized sellers. In contrast to both M&V and our second treatment, we do not observe a divergence in second-period prices. The most puzzling discrepancy is the difference in first-period prices between the second case of BDP and our behavior-based pricing treatment. Unlike BDP, we observe higher prices and a peak in the distribution at the theoretical point prediction. The most likely explanation for this difference is that BDP implemented myopic instead of strategic consumers and participants used experimentation rather than deduction in their pricing decisions. We show that assuming myopic consumers leads to a theoretical prediction, which is in line with observed prices in BDP's second case. Welfare measures – such as customer costs and profits – are directly derived from prices. When prices are volatile and prone to behavioral biases, these measures are directly affected. We show that transport costs serve as a robust welfare measure, which is independent of price levels but captures the impact of price dispersion and poaching efforts by sellers.

2. An Experiment on Uniform and Behavior-Based Pricing

BDP analyzed behavior-based pricing while varying two dimensions: the ability to price pre-commit and the extent of preference dependence. We step back from this by contrasting whether sellers can employ

[2]Mahmood (2014) conducted an experiment motivated by Shin and Sudhir (2010) with participants taking the roles of sellers and buyers. However, their experimental set-up is rather reminiscent of a heterogenous goods Bertrand competition. Instead of a continuum of consumers they consider two discrete locations. Due to this there are no pure strategy equilibria.

behavior-based pricing or otherwise. We do not consider price pre-commitment and only consider perfectly dependent preferences. Taken together, our set-up consists of a comparison of uniform and behavior-based pricing, as detailed by F&T. We proceed by deriving subgame perfect prices for both pricing regimes, which serve as predictions for our experiment. We then introduce our experimental design and close by discussing the results.

Theoretical Background: The market structure underlying this experiment closely follows F&T. Two sellers $i, j \in \{A, B\}$ with $i \neq j$ are located at endpoints of a linear city model in the manner of Hotelling with length $\bar{\theta}$. We assume that A is located at 0 and B is located at $\bar{\theta}$. Both sellers produce nondurable goods at constant marginal costs of c over two periods $n \in \{1,2\}$. Consumers are distributed uniformly over the interval $[0, \bar{\theta}]$ and demand a maximum of one unit per period. Consumer valuation of the good is v, and they incur transport costs which correspond to the distance travelled. Thus, a consumer located at $\hat{\theta}$ receives utility $v - p_A - \hat{\theta}$ when buying from seller A, and $v - p_B - (\bar{\theta} - \hat{\theta})$ when buying from a seller B. Both sellers and consumers do not discount the second period. Throughout, we assume v is sufficiently high to ensure full market coverage.

Uniform Pricing: In the first case, both sellers post a uniform price p_i^n in each period n. After observing prices p_A^n and p_B^n, there is a consumer at θ_n who is indifferent between buying from A or B. The location of the indifferent consumer is:

$$\theta_n = \frac{p_B^n - p_A^n + \bar{\theta}}{2}. \#(1)$$

In each period, sellers face a static optimization problem:

$$\text{Seller A: } \max_{p_A^n} (p_A^n - c) \cdot \theta_n, \quad \text{Seller B: } \max_{p_B^n} (p_B^n - c) \cdot (\bar{\theta} - \theta_n). \#(2)$$

Solving the maximization problems, we find the following symmetric equilibrium prices:

$$p_i^n = \bar{\theta} + c. \#(3)$$

This aligns with the theoretical prediction for Case 1 "Independent preferences and no price pre-commitment" of BDP, as every price is the one-shot Nash equilibrium price.

Behavior-Based Pricing: In the second case, both sellers post a uniform price in period 1 (p_A^1 and p_B^1) and employ behavior-based pricing in period 2. Behavior-based pricing allows them to set differentiated prices for old customers (p_A^O and p_B^O) and new customers (p_A^N and p_B^N), dependent on the first-period purchasing decisions. A consumer who purchased from firm i in the first period is considered an old customer for firm i and a new customer for firm j – and vice versa. We solve the game via backward induction. When entering the second period, first-period prices p_A^1 and p_B^1 determines the location of the indifferent consumer θ_1, which sellers observe. Consumers on the interval $[0, \theta_1]$ bought from seller A in period 1 and are denoted as A's turf, while consumers on the interval $[\theta_1, \bar{\theta}]$ bought from firm B and are denoted as B's turf. Both sellers charge the old customer price (p_A^O and p_B^O) toward their turf and the new customer price (p_A^N and p_B^N) toward the other seller's turf.

Given these prices, the locations of the indifferent consumers on A's and B's turf are

$$\theta_A = \frac{p_B^N - p_A^O + \bar{\theta}}{2}, \qquad \theta_B = \frac{p_B^O - p_A^N + \bar{\theta}}{2}. \#(4)$$

In the second period, sellers solve the following optimization problems as functions of θ_1:

$$\text{Seller A: } \max_{p_A^O, p_A^N} (p_A^O - c) \cdot \theta_A + (p_A^N - c) \cdot (\theta_B - \theta_1),$$

$$\#(5)$$

$$\text{Seller B: } \max_{p_B^O, p_B^N} (p_B^O - c) \cdot (\bar{\theta} - \theta_B) + (p_B^N - c) \cdot (\theta_1 - \theta_A).$$

Using the first-order conditions we can derive the optimal second-period prices as:

$$p_A^O = \frac{1}{3}(2\theta_1 + \bar{\theta} + 3c), \qquad p_A^N = \frac{1}{3}(3\bar{\theta} - 4\theta_1 + 3c),$$

$$\#(6)$$

$$p_B^O = \frac{1}{3}(3\bar{\theta} - 2\theta_1 + 3c), \qquad p_B^N = \frac{1}{3}(4\theta_1 - \bar{\theta} + 3c).$$

In the first period, forward-looking consumers can anticipate these pricing strategies. The first-period cutoff θ_1 denotes the consumer who is indifferent between *i*) buying from seller A in the first period and switching to seller B in the second period and *ii*) buying from seller B in the first period and switching to seller A in the second period. Following F&T, using p_A^N and p_B^N from (6), we find that the location of the indifferent consumer is

$$\theta_1 = \frac{3}{8}(p_B^1 - p_A^1) + \frac{\bar{\theta}}{2}. \#(7)$$

In the first period, forward-looking sellers face the following optimization problems:

$$\text{Seller A: } \max_{p_A^1} (p_A^1 - c)\theta_1 + (p_A^O - c)\theta_A + (p_A^N - c)(\theta_B - \theta_1),$$

$$\#(8)$$

$$\text{Seller B: } \max_{p_B^1} (p_B^1 - c)(\bar{\theta} - \theta_1) + (p_B^O - c)(\bar{\theta} - \theta_B) + (p_B^N - c)(\theta_1 - \theta_A).$$

We insert the expressions for θ_1 from (7) and for p_A^O, p_A^N, p_B^O and p_B^N from (6), and solve the resulting first-order conditions for p_A^1 and p_B^1 to yield the symmetric equilibrium prices as:

$$p_i^1 = \frac{4}{3}\bar{\theta} + c \qquad p_i^O = \frac{2}{3}\bar{\theta} + c \qquad p_i^N = \frac{1}{3}\bar{\theta} + c. \#(9)$$

This is equivalent to Case 2 "Constant preferences and no price pre-commitment" of BDP.

Experimental Design: We implemented an experiment in line with BDP using two treatments, corresponding to our two cases from Section 2.1. Similarly to BDP, we chose $\bar{\theta} = 120$ and $c = 50$, so that results are easily comparable. As shown in Table 1, our predictions for Treatment 1 "Uniform pricing" correspond to the predictions of Case 1 of BDP, where the two-afternoon prices (*Price for loyal customers* and *Price for new customers*) of BDP are condensed into the singular *Second-period price*. Treatment 2 "Behavior-based pricing" is a replication of BDP's Case 2.[3]

Table 1: Comparison of Price Predictions

Treatment	**1 Uniform pricing**	**2 Behavior-based pricing**	**Case Buyer Preferences Price pre-commitment**	**1-Baseline Independent No**	**2 Fixed No**
Introduction price	170	210	*Morning price*	170	210
Old customer price		130	*Price for loyal customers*	170	130
New customer price		90	*Price for new customers*	170	90
Second-period price	170				
(a) Price predictions by Treatment.			**(b) Excerpt from Table 1 in BDP.**		

There are two minor differences between our experiment and that of BDP. First, BDP framed the task as "ice-cream vendors on a beach", whereas we kept the task general, where the participants assume the role of a seller who is positioned at location 0 of a line, with another seller at the opposing end (at 120). As in BDP, sellers learned that they were competing for computerized buyers who were uniformly distributed along the line. They were informed that buyers make decisions considering prices and transport costs of both periods and seek to minimize their total expenditures.[4] Second, in contrast to BDP which used matching groups of 4, we used the whole group of 20 participants in the first and 18 participants in the second treatment as matching groups. As in BDP, participants played over 20 rounds, where one round lasted for two periods and corresponded to the theoretical market.

Hence, in our experiment, participants were matched with each other slightly more than once on average, decreasing reputation effects that could lead to tacit collusion. The experiment was programmed and conducted with the experiment software z-Tree (Fischbacher, 2007). We conducted the experiment in the

[3]Our *Introduction price* corresponds to the *Morning price*, our *Old customer price* corresponds to the *Price for loyal customers* and our *new customer price* corresponds to the *Price for new customers*.
[4]Instructions and review questions were handed out in print and are available upon request.

experimental laboratory at TU Berlin in November 2016, with student participants drawn from the WZB ORSEE pool (Greiner, 2015), with experiments lasting around 90 minutes. On average, participants earned €7.20 in the first treatment and €7.75 in the second, in addition to a €5 show-up fee. Participants were aged 25 on average, with around one-third of the participant female. Around two-thirds of all participants were in currently enrolled in undergraduate studies, with industrial engineering and natural sciences as the most common fields of study.

3. Results

Table 2 shows aggregated behavior between our two treatments on the left and two cases of BDP on the right, where *p*-Values are based on Random Effects GLS regressions on the difference between observed and predicted prices at the subject level. While BDP observed no significant difference in their "Case 1" between both second-period prices, they did find a difference between second-period prices and the first-period price (see *Afternoon price effect* in Table 3b). We do not find a significant difference between the corresponding introduction price and the second-period price in Treatment 1 (see Table 3a). Likewise, the distributions of introduction and second-period prices are extremely similar in our Treatment 1 (as shown in Figure 1a) in contrast to Case 1 of BDP (as shown in Figure 1b).

Table 2: Comparison of Observed Prices

Treatment	**1 Uniform pricing**	**2 Behavior-based pricing**	**Case Buyer Preferences Price pre-commitment**	**1-Baseline Independent No**	**2 Fixed No**
Introduction price			*Morning price*		
Observed mean	147.3	174.2	Observed mean	141.5	138.2
Model prediction	170	210	Model prediction	170	210
p-Value	<0.001	<0.001	*p*-Value	0.002	<0.001
Old customer price			*Price for loyal customers*		
Observed mean		149.77	Observed mean	119.7	129.2
Model prediction		130	Model prediction	170	130
p-Value		0.013	*p*-Value	0.002	<0.001
New customer price			*Price for new customers*		
Observed mean		114.6	Observed mean	116.5	114.1
Model prediction		90	Model prediction	170	90
p-Value		<0.001	*p*-Value	0.002	<0.001
Second-period price					
Observed mean	141.4				
Model prediction	170				
p-Value	<0.001				
(a) Observed prices by treatment.			**(b) Excerpt from Table 2 in BDP.**		

Table 3: Comparison of Price Effects

	Uniform pricing	**Behavior-based pricing**	**Follow-up experiment**	**Case Buyer Preferences Price pre-commitment**	**1-Baseline Independent No**	**2 Fixed No**
Second-period price Effect	-5.890 (4.484)	-59.54*** (5.393)		Afternoon price effect	-25.028** (7.227)	-24.041*** (3.094)
Old customer price Effect		35.13*** (5.751)	41.41*** (4.371)	Loyal customer price effect	3.250 (7.889)	15.022** (3.857)

Constant	147.3***	174.2***	83.65***
	(3.795)	(7.104)	(3.685)
Observations	800	1080	796

Standard errors are in parentheses. Estimation by OLS regression with standard errors clustered at the subject level. ***denotes significance at the 0.1% level.

(a) Analysis of prices within treatments.

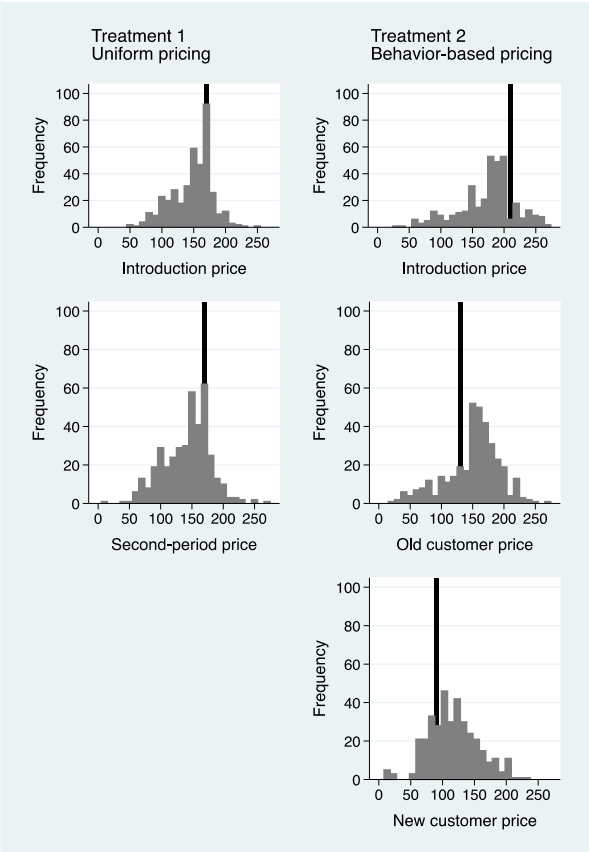
Constant	141.512***	138.172***
	(9.363)	(1.306)
observations	960	960

Standard errors, clustered by matching group, are in parentheses. ** and *** denote significance at the 1% and 0.1% level, respectively.

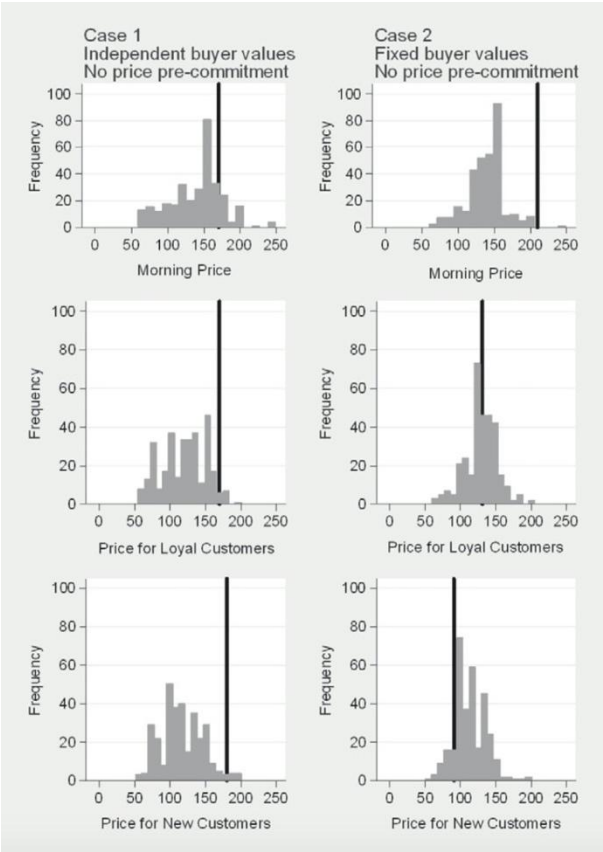
(b) Excerpt from Table 2 in BDP.

We observe a substantially larger average introduction price in our Treatment 2 compared with Case 2 of BDP. In addition, we observe a larger old customer price, but a similar new customer price. As shown in the distribution of prices in Figure 1a, we observe similar patterns for the introduction prices in both our treatments, with a left-skewed distribution whose peak is close to the respective theoretical prediction. This is not the case in BDP, as seen in Figure 1b. Accordingly, as shown in Table 3, we observe a much larger second-period price effect compared with BDP's corresponding *Afternoon price effect*, and a larger old customer price effect compared with BDP's corresponding *Loyal customer price effect*. The introduction price in Treatment 2 is significantly larger than in Treatment 1 (see Table 4), confirming a treatment effect on the first-period price in line with the comparative static prediction of the model. This effect was absent in BDP. In contrast to BDP, we see a larger rightwards shift for old customer prices and a wider spread for new customer prices.

Figure 1: Comparison of Distributions of Prices (solid lines represent predicted prices)



(a) Distribution of prices by treatment.



(b) Excerpt from Figure 2 in BDP.

Table 4: Analysis of Prices Between Treatments

	Introduction price	Old customer price	New customer price
Behavior-based pricing	26.85***	24.71**	30.94***
	(7.936)	(8.281)	(7.191)
Constant	147.3***	125.1***	83.69***
	(3.749)	(2.672)	(3.652)
Base case	Uniform pricing	Follow-up experiment	Follow-up Experiment
Observations	760	758	758

Standard errors are in parentheses. Estimation by random-effects GLS regressions with standard errors clustered at the subject level. ** and *** denote significance at the 1% and 0.1% level, respectively.

We find that prices converge toward their prediction in Treatment 1 by performing round-wise OLS regressions on the difference between observed and predicted prices (see Table 5). By the last round, this difference is close to (and insignificantly different from) zero for both the introduction price and the second-period price. We observe a similar pattern for the introduction price in Treatment 2. However, we find a different pattern for second-period prices in Treatment 2. Both old and new customer prices are not significantly different from their predictions in the beginning, but significantly larger than their predictions in the second half of the experiment.[5] In the spirit of backward induction, we first explore the apparent divergence from predicted levels of second-period prices in behavior-based pricing experiments, which are observed in both BDP and our experiment. Subsequently, we will show a potential explanation for the disparity of first-period prices between BDP and our experiment.

Table 5: Regressions on Difference between Observed and Predicted Prices Per Round and Treatment

	Treatment 1 Uniform pricing		Treatment 2 Behavior-based pricing			Treatment 3 Follow-up experiment	
	Introduction price	Second-period price	Introduction price	Old customer price	New customer price	Old customer price	New customer price
Round							
1	-46.40***	-51.60***	-69.17***	0.444	7.444	-6.944	-10.56**
	(7.294)	(7.399)	(10.76)	(10.59)	(8.632)	(7.839)	(5.269)
2	-41.75***	-52.30***	-69.78***	2.833	14.97	1.500	-3.750
	(7.820)	(8.163)	(10.40)	(11.90)	(11.98)	(8.390)	(7.626)
3	-39.65***	-43.00***	-60.39***	9.333	9.111	-14.85*	-13.55*
	(7.093)	(7.408)	(12.72)	(14.25)	(10.85)	(7.953)	(7.033)
4	-28.85***	-40.90***	-50.89***	15.22	11.58	0.400	-5.250
	(7.071)	(7.376)	(11.11)	(12.01)	(8.244)	(6.517)	(10.09)
5	-27.75***	-47.55***	-53.06***	3.333	25.31*	-2.000	-5.700
	(6.486)	(8.890)	(13.16)	(13.83)	(14.77)	(8.470)	(10.78)
6	-33.35***	-40.50***	-50.22***	6.778	17.78	-1.300	-3.250
	(6.932)	(6.771)	(10.60)	(11.94)	(10.81)	(6.641)	(7.775)
7	-27.80***	-38.15***	-36.89***	15.50	26.47***	-5.550	-5.675
	(6.296)	(8.601)	(11.05)	(11.40)	(9.035)	(7.881)	(8.784)
8	-28.65***	-40.10***	-40.56***	17.83	20.11	-3	-6.800
	(7.536)	(9.523)	(10.72)	(11.16)	(13.32)	(5.468)	(4.351)
9	-28.80***	-29.90***	-47.17***	2.444	12.97	-8.000	-6.900
	(7.019)	(8.034)	(11.54)	(10.91)	(9.963)	(5.462)	(8.724)

[5]Results in Table 5 use the subgame corrected predictions which are introduced in Section 3.1 and are even stronger when not using the correction.

10	-20.40**	-23.10**	-39.22***	14.11	32.78***	1.300	-5.450
	(8.451)	(10.73)	(7.870)	(8.999)	(10.80)	(6.227)	(5.879)
11	-18.40**	-24**	-27.39***	17.33	36.00***	-7.750	-7.525
	(9.240)	(11.33)	(7.903)	(12.82)	(11.17)	(7.772)	(9.521)
12	-19.15***	-19.15***	-18.39**	31.61***	45.72***	-7.800*	-10
	(6.986)	(7.304)	(7.867)	(11.82)	(12.40)	(4.690)	(8.398)
13	-16.85**	-14.85**	-27.56***	28.61***	22.78**	-8.150	-4.750
	(6.944)	(7.495)	(9.107)	(9.617)	(11.18)	(5.697)	(10.49)
14	-14.90**	-19.60**	-31.56**	15.78	21.86*	-10.75	-6.650
	(7.376)	(7.917)	(12.19)	(14.08)	(12.56)	(7.283)	(6.883)
15	-11.35*	-21.75***	-21**	17.33	24.36**	-10.40*	-8.000
	(6.140)	(7.465)	(9.986)	(11.94)	(11.01)	(5.540)	(5.410)
16	-16.20**	-20.40**	-18.39***	28.17***	26**	-19.05***	-13.90**
	(7.649)	(8.408)	(7.001)	(9.779)	(11.44)	(6.669)	(6.912)
17	-13.60**	-13.60*	-21.89**	20.11*	22.00**	-8.150	-7.650
	(6.076)	(7.237)	(9.465)	(11.42)	(10.77)	(5.430)	(6.580)
18	-6.850	-11.15	-17.44**	31.44***	28.42***	-1.700	2.200
	(4.343)	(6.787)	(7.375)	(10.51)	(10.96)	(9.692)	(12.20)
19	-7.000*	-11.30**	-11.94	35.94***	38.56***	-7.750	-8.450
	(3.669)	(5.590)	(8.432)	(12.01)	(11.64)	(5.786)	(5.496)
20	-5.950	-8.550	-3.667	30.17**	22.94**	-9.500	-11
	(4.529)	(5.196)	(10.68)	(12.98)	(11.23)	(5.784)	(7.498)

Standard errors are in parentheses. Estimation by round-wise OLS regressions. Coefficients are the difference between observed and predicted prices. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

4. Reference Dependence Impacts Second-Period Prices

In the below section we, explore why second-period prices seemingly diverge from their predictions in Treatment 2 by limiting our attention to the second period. We begin by showing that theoretical subgame predictions for second-period prices increase whenever the cutoff is insufficiently centered, but that this increase does not account for observed second-period prices in both BPD and our experiments. We then present the design and results of a follow-up experiment where we simulate the first-period cutoffs based on our previous findings. Using this, we keep the model predictions constant but eliminate the first-period price as a potential reference point for participants when choosing second-period prices.

Theoretical Preamble: In the following section we attempt to rule out asymmetric market shares as the sole driver for the higher than predicted second-period prices in our Treatment 2 and Case 2 of BDP. The equilibrium in (9) is symmetric and implies $\theta_1 = \bar{\theta}/2$. In Treatment 2, we observe first-period cutoffs between the full range of 0 and $\bar{\theta} = 120$, while only 3.89% of the observed cutoffs are exactly $\bar{\theta}/2 = 60$. Hence, we need to check whether first-period cutoffs of $\theta_1 \neq \bar{\theta}/2$ affects second-period prices.
Let us fully specify the optimal second-period prices from (6) for both firms:

$$p_A^O = \begin{cases} \frac{1}{3}(2\theta_1 + \bar{\theta} + 3c) & \text{if } \theta_1 \geq \frac{1}{4}\bar{\theta} \\ \bar{\theta} - 2\theta_1 + c & \text{if } \theta_1 < \frac{1}{4}\bar{\theta} \end{cases}, \; p_A^N = \begin{cases} \frac{1}{3}(3\bar{\theta} - 4\theta_1 + 3c) & \text{if } \theta_1 \geq \frac{3}{4}\bar{\theta} \\ c & \text{if } \theta_1 < \frac{3}{4}\bar{\theta} \end{cases},$$

$$p_B^O = \begin{cases} \frac{1}{3}(3\bar{\theta} - 2\theta_1 + 3c) & \text{if } \theta_1 \geq \frac{3}{4}\bar{\theta} \\ 2\theta_1 - \bar{\theta} + c & \text{if } \theta_1 < \frac{3}{4}\bar{\theta} \end{cases}, \; p_B^N = \begin{cases} \frac{1}{3}(4\theta_1 - \bar{\theta} + 3c) & \text{if } \theta_1 \geq \frac{1}{4}\bar{\theta} \\ c & \text{if } \theta_1 < \frac{1}{4}\bar{\theta} \end{cases}. \quad \#(10)$$

Now, we denote the average prices for *old* and *new* customers respectively as $\bar{p}^O = (p_A^O + p_B^O)/2$ and $\bar{p}^N = (p_A^N + p_B^N)/2$ dependent on θ_1 and get:

$$(\bar{p}^O, \bar{p}^N) = \begin{cases} \left(\bar{\theta} - \frac{4}{3}\theta_1 + c, \frac{\bar{\theta}}{2} - \frac{2}{3}\theta_1 + c\right) & \text{if} \quad \theta_1 < \frac{1}{4}\bar{\theta} \\ \left(\frac{2}{3}\bar{\theta} + c, \frac{\bar{\theta}}{3} + c\right) & \text{if} \quad \frac{1}{4}\bar{\theta} \leq \theta_1 \leq \frac{3}{4}\bar{\theta}. \ \# \ \#(11) \\ \left(\frac{4}{3}\theta_1 - \frac{\bar{\theta}}{3} + c, \frac{2}{3}\theta_1 - \frac{\bar{\theta}}{6} + c\right) & \text{if} \quad \theta_1 > \frac{3}{4}\bar{\theta} \end{cases}$$

A change in the first-period cutoff does not affect the average old and new customer prices while $\theta_1 \in [\bar{\theta}/4, 3 \cdot \bar{\theta}/4]$. When correcting the model predictions for Treatment 2, according to (10) we would expect an average old customer price of 132.55 instead of 130, and an average new customer price of 91.275 instead of 90.[6] The results presented in Table 5 are created under these corrected model predictions. Thus, we can rule out asymmetric first-period market shares as a driver for higher second-period prices as the increase in predicted prices is not substantial and does not explain observed higher prices.

Experimental Follow-Up: We conducted an additional Treatment 3 "Follow-up experiment" in which we omitted the first period of Treatment 2. We provided participants with the required information – the first-period cutoff – without providing them the theoretically unnecessary information on first-period prices. Similar to the previous experiment, participants took the role of sellers and posted prices for "near" and "far" customers. The near customers correspond to the old customers, while the far customers correspond to the new customers in Treatment 2.[7] Participants were presented with randomly simulated first-period cutoffs and learned that these were derived from earlier experiments. Using a Q-Q plot, Shapiro-Wilk tests, and Shapiro-Francia tests, we confirmed that the first-period cutoffs follow normal distributions – both overall and for each period. However, around 60% of the observations were multiples of 3.75, which occur whenever the difference of chosen prices is a multiple of 10. To account for this, we drew the according share of cutoffs from a truncated normal distribution of multiples of 3.75, and the rest from a normal distribution of multiples of 0.375.[8]

Furthermore, we accounted for the fact that 3.75 is a multiple of 0.375 when specifying the respective shares. We did this by first drawing from a uniform distribution on the interval [0,1] to determine from which of the two normal distributions to draw given a critical value. The critical value is derived from the observed share of cutoffs which are multiples of 3.75 named s_{10}, and those that are not s_{-10} by solving the following system of equations:

$$s_{10} = s_{10}^{crit} + \frac{s_{-10}^{crit}}{10},$$
$$s_{-10} = \frac{9}{10} s_{-10}^{crit}, \#(12)$$
$$s_{-10} = 1 - s_{10}^{crit}.$$

For example, if for a given round the first-period price difference was a multiple of 10 in 6 out of 10 markets, i.e., $s_{10} = 0.6$, we would find the critical cutoff value $s_{10}^{crit} = 0.\overline{55}$. To keep the draws as close to the original observations as possible and avoid situations for the participants that did not occur in the original experiment, we fixed the mean at 60.

However, we varied the lower bound, upper bound, standard deviation, and the critical value s_{10}^{crit} for each round according to the original experimental values of the respective round. Truncated normal distributions

[6]First-period cutoffs were not sufficiently centered in 1/6 of our observations and caused a change in the predicted average prices.

[7]For the remainder of this paper, we will refer to the customers in Treatment 3 as "old" and "new" customers.

[8]The most common integer step of differences between two prices is $\frac{3}{8} \cdot 10 = 3.75$. The smallest integer step of differences between two prices is $\frac{3}{8} \cdot 1 = 0.375$.

are achieved by redrawing an observation when it is either below the lower bound or above the upper bound. Given that the lower bounds (upper bounds) are well below (above) the mean at a considerably low standard deviation, this approach is highly efficient (see Robert, 1995; Chopin, 2011). The follow-up experiment was conducted in October 2018 in the experimental laboratory at TU Berlin. As with the first two treatments, student participants were drawn from the WZB ORSEE pool and shared similar demographic characteristics (age, gender, and field of study). The experiment was slightly shorter in duration (at 60 minutes) as no first period was played. 20 participants earned €6.24 on average, in addition to a €5 show-up fee. The exchange rate was increased so that the total payment remained comparable to the first two treatments.

Findings: Comparisons of aggregate prices in Table 6 and the distribution of prices in Figure 2 reveal that second-period prices are not significantly different from their model prediction, at a 5% significance level in Treatment 3.[9] Both second-period prices are significantly lower in Treatment 3 compared with Treatment 2 (see Table 4). These findings contrast with those of M&V, who observed that prices are significantly higher than model predictions in a similar experiment – also limited to the second period.

Figure *2*: Distribution of Prices (Follow-Up)

Table 6: Observed Prices (follow-up)

Treatment	**2 Behavior-based Pricing**	**3 Follow-up experiment**
Old customer price		
Observed mean	149.77	125.06
Model prediction	130	130
p-Value	0.013	0.068
New customer price		
Observed mean	114.6	83.65
Model prediction	90	90
p-Value	<0.001	0.088

For the subsequent discussion, we correct model predictions by calculating second-period predictions following (10). However, we only find the marginal impact of these corrections with an average predicted old customer price of 131.53, and an average predicted new customer price of 90.76. We have shown that, in

[9]Again, *p*-Values are based on random-effects GLS regressions on the difference between observed and predicted prices at the individual level.

Treatment 2, second-period prices increase along with the introduction price. In Treatment 3 (where the first period is absent) there is no considerable change in prices over rounds, as shown by the round-wise OLS regressions in Table 5. We only observe two rounds in which both the old and new customer prices are significantly different from their predictions and three instances where one of the two prices is significantly different from the prediction.[10] We still observe a significant old customer price effect with a similar effect size (as in the behavior-based pricing treatment), as shown in Table 3a. This indicates that the presence of the first period does impact overall price levels in the second period but does not affect poaching efforts.

Myopic Consumers Induce Lower First-Period Prices

While we have shown that the upwards price shift in the second period is driven by the availability of the first-period prices, there are remarkable differences between the chosen first-period prices in Case 2 of BDP compared with the second treatment in our experiment. In the following discussion, we conjecture that this may have been driven by a faulty fraction in the computation of the first-period cutoff in the code of BDP's program. We argue that this represents a case of "Behavior-based pricing with myopic consumers". To support this argument, we first derive the subgame perfect prices of a myopic consumer variation of F&T's model. We then show that the result is a better prediction of BDP's observations.

Behavior-Based Pricing with Myopic Consumers: Whether consumers are naïve or strategic only alters their actions in the first period. Hence, we can readily skip the analysis of the second period as it is identical to the case of behavior-based pricing in section 2.1. Due to the naivety of consumers, the location of the indifferent consumer in period one $\theta_1^{'}$ is akin to the location of the indifferent consumer under uniform pricing, i.e.,

$$\theta_1^{'} = \frac{p_B^n - p_A^n + \bar{\theta}}{2}. \#(13)$$

The maximization problems of firms are like (8) with $\theta_1^{'}$ inserted instead of θ_1:

$$\text{Seller A: } \max_{p_A^1} (p_A^1 - c)\theta_1^{'} + (p_A^O - c)\theta_A + (p_A^N - c)\left(\theta_B - \theta_1^{'}\right),$$

$$\#(14)$$

$$\text{Seller B: } \max_{p_B^1} (p_B^1 - c)\left(\bar{\theta} - \theta_1^{'}\right) + (p_B^O - c)(\bar{\theta} - \theta_B) + (p_B^N - c)\left(\theta_1^{'} - \theta_A\right).$$

Solving the maximization problems for p_A^1 and p_B^1 with consideration of $\theta_1^{'}$ from (13) and optimal second-period prices from (6), where we replace θ_1 by $\theta_1^{'}$, yields:

$$p_i^1 = \bar{\theta} + c. \#(15)$$

This result is identical to the result under uniform pricing in (3).[11] Case 1 of BDP and the case of "Behavior-based pricing with the myopic consumer" both share the term $(p_B^1 - p_A^1 + \bar{\theta})/2$ as a first-period cutoff. Case 2 of BDP and our behavior-based pricing case are different in this term, as shown in (7) where the difference in prices $p_B^1 - p_A^1$ is multiplied by 3/8 instead of 1/2. For Treatment 1 and Treatment 2 in our experiment (as well as for Case 1 of BDP), we observe a peak in the price distribution close to the model prediction whenever a uniform price is chosen in the first period (see Figure 1). This only fails for Case 2 of BDP, where prices are similar to their Case 1 and our Treatment 1, with a peak in the price distribution at a similar point – just below 170. However, this would be in line with the price prediction in (15). While this does not fit the instructions of BDP – according to which consumers are strategic in their first-period decision.

It is a surprising testament to how powerful price predictions are in this model. It should be noted that BDP's instructions are somewhat vague concerning buyer behavior in the first period. Buyers are described as minimizing their total expenditures with their first-period decision (considering their location and the current prices) while anticipating optimally chosen prices in the second period. On the other hand, second-

[10]Four out of the seven significant differences only hold at a complaisant significance level of 90%.
[11]The uniform pricing benchmark is identical for myopic and strategic consumers, due to the independence of the periods.

period behavior is described explicitly, covering precise calculations of the location of the indifferent consumer and the resulting cutoff. It may not be immediately apparent to an uninformed participant that the strategic decision of a consumer in the first period involves a lowered willingness to buy from a far seller. Rather than relying on instructions, participants appeared to have experimented over the course of the experiment to optimize their pricing decisions.

Transport Costs as a Robust Welfare Measure

As discussed previously, chosen prices are prone to distortions. Therefore, we hold reasonable doubt regarding the reliability of consumer costs and profit as welfare measures, as used by BDP. Both measures are easily shifted by price levels and mask the efficiency of the market. Instead, we propose to measure total welfare directly by means of transport costs. While this is not necessarily the preferred welfare measure in terms of policy recommendations, it is superior when assessing the efficiency of an experimental market. This is sensitive to comparative static implications (such as poaching and efficiency losses due to price dispersion), but insensitive to distorted price levels. Under uniform pricing the transport costs are:

$$T = \int_0^{\theta_1} \theta \, d\theta + \int_{\theta_1}^{\bar{\theta}} (\bar{\theta} - \theta) \, d\theta + \int_0^{\theta_2} \theta \, d\theta + \int_{\theta_2}^{\bar{\theta}} (\bar{\theta} - \theta) \, d\theta. \#(16)$$

Transport costs under behavior-based pricing are:

$$\tilde{T} = \int_0^{\theta_1} \theta \, d\theta + \int_{\theta_1}^{\bar{\theta}} (\bar{\theta} - \theta) \, d\theta + \int_0^{\theta_A} \theta \, d\theta + \int_{\theta_A}^{\theta_1} (\bar{\theta} - \theta) + \int_{\theta_1}^{\theta_B} \theta \, d\theta + \int_{\theta_B}^{\bar{\theta}} (\bar{\theta} - \theta) \, d\theta. \#(17)$$

It is noteworthy that gains are independent of consumer purchasing decisions when the market is fully covered. Hence, it is sufficient to consider losses in the form of transport costs in (16) and (17) to evaluate welfare effects. In Table 7, we show how profits for sellers and total costs for consumers were lower under uniform pricing compared with behavior-based pricing in the first period, in contrast to BDP which found no effect. This finding is driven by higher introduction prices in our Treatment 2 (compared with Case 2 of BDP). However, transport costs were not significantly different in the first period between both treatments. The difference in total costs can be entirely explained by the difference in prices paid (i.e., product costs). Second-period profits and total costs are larger in Treatment 1 compared with Treatment 2 – oppositional to the findings of BDP. Transport costs are significantly different between the uniform pricing and behavior-based pricing treatments in the second period. In contrast, there are no differences in transport costs between the follow-up experiment and the behavior-based pricing treatment, while profits and total costs were significantly smaller in the follow-up experiment compared with the behavior-based pricing treatment. This is a direct consequence of the lower prices chosen by participants.

Table 7: Treatment Effects on Welfare Measures in the First And Second Period

	Seller's Profit	**Customers' Total costs**	**Transport costs**	**Seller's Profit**	**Customers' Total costs**	**Transport costs**
Treatment 1	-1374.7***	-2820.8***	-71.48	572.2**	386.1	-758.2***
	(158.5)	(366.8)	(73.40)	(174.0)	(405.9)	(90.28)
Treatment 3				-1396.2***	-2821.9***	-29.46
				(151.6)	(342.5)	(95.54)
Constant	5150.0***	20339.9***	4039.9***	3844.9***	18344.3***	4654.5***
	(324.6	(876.5)	(114.7)	(243.0)	(627.1)	(132.6)
Base case	Treatment 2	Treatment 2	Treatment 2	Treatment 2	Treatment 2	Treatment 2
Considered period	First	First	First	Second	Second	Second
Observations	760	380	380	1158	579	579

Standard errors are in parentheses. Estimation by OLS regressions with round fixed effects. Analysis is done on the individual level for sellers and market level for customers. Treatment 1 - Uniform pricing, Treatment 2 - Behavior-based pricing, Treatment 3 - Follow-up experiment. ** and *** denote significance at the 1% and 0.1% level, respectively.

We show the effect of disjoining the decision process in Table 8. There, we calculated mean profits, mean total costs and mean transport costs for three cases. The first and second case corresponds to the first and second treatment. In the third case, we hypothetically combine the second-period findings of the follow-up experiment with the results of the first period of the behavior-based pricing treatment. Both mean profits and total costs are lower in the combined case compared with the uniform pricing treatment, whereas they were originally larger in the behavior-based pricing treatment (compared with the uniform pricing treatment). In contrast, the sign and the magnitude of the differences in transport costs between both the behavior-based pricing and the uniform pricing treatment and the combined case and the uniform pricing treatment remain similar. This shows that price-based measures (profits and total costs) are volatile and can mask efficiency. Transport costs are independent of prices and reflect the efficiency of the market without distortion.

Table 8: Sum of Mean Profits, Total Costs and Transports Costs Between Cases

Considered treatment in	**First period** **Second period**	**Uniform pricing** **+** **Uniform pricing**	**Behavior-based pricing** **+** **Behavior-based pricing**	**Behavior-based pricing** **+** **Follow-up experiment**
Sum of mean	profits	10485.44	11287.95	9895.11
	total costs	20498.92	21716.29	20308.95
	transport costs	4013.48	4428.334	4413.841

5. Conclusion

We designed an experiment using the theoretical basis provided by F&T and a previous experiment by BDP. In contrast to BDP, we can confirm the positive first-period price effect of behavior-based pricing over uniform pricing, validating an additional comparative static result from F&T's model. We find that, in the case of behavior-based pricing, second-period prices are driven upwards when participants play the first period themselves – but not when both periods are disjointed and played by different participants. This also contrasts with the findings of M&V, who observed significantly larger-than-predicted prices when participants play a disjoint second period against computerized competitors. While our study does not require direct policy recommendations, it questions the circumstances that necessitate policy recommendations drawn from experimental studies, and to what extent. Separating the decisions of the first and second period reveals particular volatility within the chosen strategies. Going forward, this insight can be helpful in the fundamental design of experiments. For multi-period experiments, separating the individual stages may be necessary to reveal conclusively whether participants play according to predictions.

Furthermore, when volatility is anticipated, welfare measures should be chosen carefully. In the case of behavior-based pricing experiments, we have shown that transport costs are a welfare measure that is robust to confounding factors. Some pertinent questions remain and could be investigated further in future research. It remains unclear precisely how first-period prices drive second-period prices up in the behavior-based pricing cases in BDP and our experiment. It is possible that prices are interpreted as signals and change beliefs toward second-period behavior. Another possibility is that first-period prices have an anchoring effect; this could be resolved by showing either first-period prices of past experiments (along with the first-period cutoffs) or irrelevant numbers of the same magnitude (that serve as anchors for participants) in a follow-up experiment. Moreover, we cannot explain why participants in BDP's Case 1 chose lower prices in the second period. They may not have understood that, because consumers have independent preferences, the two resulting markets can be treated as two separate markets. Again, this question could likely be answered by separating the confounding factors and conducting an experiment in which participants are confronted with two independent markets in the second period.

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Tax Revenue and Economic Growth: Empirical Evidence from Nigeria

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Abstract: Organizations reduced their tax revenue through tax evasion and avoidance, thereby affecting the economic growth of the country. In an attempt to further stress this assertion, this study aims to empirically examine the effects of tax revenue on economic growth in Nigeria. Tax revenue was a proxy with PPT, CIT, VAT and CTD, while economic growth was proxy with GDP. Ex post facto research design was employed, while time series quarterly data were collected from the statistical bulletins of CBN and FIRS for 10 years (2011-2020). Data collated were analyzed using descriptive analysis, unit root test, bounds cointegration test and ARDL. The findings revealed that PPT, CIT, VAT and CTD had positive insignificant effects on economic growth. The study concluded that tax revenue had insignificant effects on the economic growth of Nigeria and therefore, recommended that proper tax audit should constantly be carried out to reduce tax evasion and avoidance.

Keywords: *Tax revenue, Economic growth, Company income tax, Value added tax, Petroleum profit tax, Custom and excise duties, Gross domestic product.*

1. Introduction

The collection of taxes and fees is a vital means through which government generates public revenues in quantum to enable her to finance several of her investments in human capital, infrastructure, as well as citizens' services and businesses. Taxation is a very important tool for managing the economy as it spurs up public goods financing, regulate consumption pattern, direct production of desired commodities, and above all protect infant industries. Taxation also reduces discrepancies in income distribution (Okoye, 2014). According to Offiong (2013), tax is a compulsory levy on individuals and organizations to the government by established standards for which no direct or specific benefits are accrued to the taxpayer. Ayeni and Omodero, (2022) opine that a greater portion of the nation's responsibilities is funded through taxes. The amount to be paid as tax, the citizen who is due to pay tax, the basis of taxation, the period to pay tax as well as the items on which tax should be paid is solely the responsibility of the government, through the tax agents to decide. Gale (2014) posits that a nation's tax system determines the extent of its economic growth. This corroborates Etim, Nsima, Austin, Samuel and Anselem, (2021) who noted that taxation plays a crucial role in the economic growth of the nations, adding that this benefit of taxes is yet to be harnessed among many developing countries.

This implies that the payment of taxes by individuals and companies usually impacts the level of economic activities in the country, including productivity, consumption, the propensity to save and invest, and the expenditure side of the government. Economic growth is described as an increase in the value of goods and services of a given country over a given period of time. This is measured via GDP. It is a determinant of peoples' living standards. Keynes thought that higher government expenditure will be followed by higher economic growth and also that consumers demand is the primary driving force in an economy. According to the theory of economic growth, for long-term employment in a nation's economic activities, two major conditions must be met. The amount of investment to income must be commensurate with the amount of employment savings. In the same manner, the natural growth rate must equate economy's growth rate for the nation to experience full employment. He further singled out the deficiency of aggregate effective demand as the devil that causes stagnation and unemployment in a nation. Keynes maintained that massive government spending targeted at expanding aggregate demand would be the only way out of economic stagnation.

Government expenditures depend on the revenue accruing through taxation, including petroleum profit tax, company income tax, value-added tax, customs and excise duties (Gbeke & NKak, 2021). In Nigeria, the government is yet to actualize the projected revenue that they expected from taxes which serves as a medium to increase the accrued government revenue and the country's gross domestic products (Etim, Umoffon &

Ekanem, 2020). Tax evasion and avoidance by taxpayers can also result in a reduction in government revenue, which further reduces government expenditure, which amounts to low economic activities as well as poor economic growth. Tax administration and the challenge of information technology have been significant issues affecting the tax system in Nigeria. These include a lack of data management, the diversity of taxes, outdated tax laws, unfavorable tax reforms, tax evasion, tax avoidance and corrupt practices (Ajala & Adegbie, 2020). Proponents of tax cuts claim that lowering the tax rate will spur greater economic growth and prosperity. Opponents maintain that lower taxes will favor the rich who may gain all the profits since they will pay most of the taxes.

The imposition of high tax rates results in the reduction of disposable income of taxpayers, payment of high tax rates reduces their expenditure on necessaries which are to be consumed for the sake of improving efficiency on economic growth. Related empirical studies have been carried out, despite the robust techniques, methods and design adopted by the researchers, the outcomes are nothing but varied findings and conflicting results that are not consistent at all. While some found a positive statistically significant relationship between PPT, CIT, VAT, CED and economic growth (Onakoya & Afintinni 2016; Edewusi & Ajayi; 2019; Olushlola, Oliver, Okon & Osang, 2020; Ewa, Adesola & Essien, 2020; Anisere-Hameed, 2021; Yaro & Adeiza, 2021), others have evidence that the variables have a significant negative effect on economic growth (Asaolu, Olabisi, Akinbode & Alebiosu, 2018; Sani & Ahmad, 2019; Agunbiade & Idebi, 2020; Onoja & Ibrahim, 2020), while some find no significant relationship among the variables (Onoja & Ibrahim, 2020). This necessitated a more thorough work with recent data, hence the study of tax revenue and economic growth in Nigeria using quarterly data from 2011 to 2020.

Objectives of the Study: Specifically, the following objectives will be considered:

- To assess the effects of petroleum profit tax (PPT) on the gross domestic product (GDP) in Nigeria.
- To evaluate the effects of company income tax (CIT) on the gross domestic product (GDP) in Nigeria.
- To assess the effects of value-added tax (VAT) on gross domestic products in Nigeria.
- To examine the effects of customs and excise duties (CTD) on gross domestic products in Nigeria.

Research Hypotheses: Flowing from the objectives, the null hypotheses were equally formed:
Ho_1: There is no significant effect of petroleum profit tax on GDP in Nigeria.
Ho_2: Company income tax has no significant effect on GDP in Nigeria.
Ho_3: There is no significant effect of value-added tax on GDP in Nigeria.
Ho_4: Custom and excise duties have no significant effects on GDP in Nigeria.

2. Literature Review

Conceptual Review: Tax is assessed following a certain framework of apportionment on certain categories of individuals or property in a given tax jurisdiction. Okafor (as cited in Osho, Omotayo & Ayorinde, 2018) viewed the tax as the charges levied on the wealth and income of a person or firm for the social, common and economic benefit of the masses or public. Tax a mandatory and unrequited transfer of wealth to the public sector by individuals or corporate bodies, is charged based on certain yardsticks. Classical economists have the notion that the essence of tax is to raise revenue for the government, however, this notion no longer holds as taxes are used not just for revenue generation but for a number of other things ranging from directing production and consumption pattern to the distribution of wealth that will lead to achieving social welfare through economic development. Meanwhile, the economic relevance of different taxes changes over time, though a strong link exists between a nation's tax structure and its economic growth, (Ihenyen & Ogbise, 2022). Dibia and Onwuchekwa (2019) stated that a well-structured tax system plays many vital roles in encouraging economic growth and development.

The macroeconomic variables responsible for economic growth and development are grossly influenced by the efficacy of the tax system. This is particularly true of developed and developing economies. This implies that the economic development of a nation is a function of the nation's tax base. Therefore, tax reforms, policies and strategies need to change in line with the changing degree of economic development and technology (Kiabel & Nwokah, as cited in Edewusi & Ajayi, 2019). Tax revenue is a dynamic source of revenue and as such can be manipulated to reflect the dynamic micro and macroeconomic circumstance of a nation,

which have the capacity to boost economic growth (Ihenyen & Ogbise, 2022). Tax policies substantially impact economic capacity at both the micro and macro levels, necessitating a crucial stabilizing instrument by monetary authorities. The amount of taxable income in any country has a significant impact on the behavioral pattern of the people economically, thereby affecting their economic decision in terms of choice of work, saving and even investment, this tells on the country's economy. Furthermore, higher tax collection raises the cost of individual welfare, but it also has a significant impact on consumer expenditures by reducing disposable income.

Edewusi and Ajayi (2019) asserted that in numerous developing nations. While the government struggles with budgetary challenges of the increase in government expenditure, not much has been done to improve revenue generation from tax. The government has access to a variety of tax instruments that may be used to generate sufficient income. These tax instruments include corporate and personal taxes, value-added taxes, customs and excise charges, capital gain tax, Withholding Tax, and so on. Nwachukwu, Nwoha and Inyama (2022) aligned with the above statement, noting that government can explore any of the several tax tools to raise funds for its projects. Despite the challenges faced by the Nigerian economy the federal government through its liberation plan announced Nigeria as becoming a better place for business investment. However, tax revenue is indispensable to the growth and development of any nation since is able to spur rural and urban development (Edewusi & Ajayi, 2019). According to Odusola (2006), Petroleum Profit Tax (PPT) as a tax is peculiar to upstream operations in the oil industry, noting that PPT applies to rents, royalties, margins, and profit-sharing, charged oil mining, prospecting and exploration leases.

Petroleum Profit Tax Act (PPTA), notably described Petroleum operations as involving petroleum exploration, sale of crude oil, production and development. Ogbonna (as cited in Onoja & Ibrahim, 2020) opines that the place of the petroleum industry in Nigeria's economic development is significant and strategic in providing the needed revenue to the government. Ani (2004), described CIT as a direct tax charged on companies' gains. Companies Income Tax is chargeable on the profit of any companies incorporated under the Companies and Allied Matters Act, 1990 as amended. This is in line with the presets of section 8(1) of the Companies Income Tax Act (CITA), that CIT is payable upon profits of a company regardless of whether the profit is made in Nigeria, received by the corporation in Nigeria or both. VAT is an indirect tax levied on the consumption pattern of the people (Okoye & Ani, as cited in Onoja & Ibrahim, 2020). Federal Inland Revenue Service (FIRS) described VAT as a consumption tax with strong features of contributing significantly to economic variables, making it easy to administer, collect and difficult to evade.

Theoretical Review: Two philosophical theories such as "The Expediency Theory" and "Benefit Received Theory" were reviewed to underpin the study. The Expediency theory was propounded by Bhartia in 2009. Otu and Adejumo (2013) using this theory emphasized the practicality test as the government option in considering a tax proposal. The theory corroborated the canon of taxation as it buttresses the principles of effectiveness, the efficiency of tax collection, the economic and social objectives of the state and the effects of a tax system should be treated as irrelevant. The Premise of expediency theory lies in the connection between tax liability and state activities. It believes that citizens of a state should be made to pay for services provided to them, hence the need to collect taxes from them (Kiabel & Nwokah, as cited in Edewusi & Ajayi, 2019). It further added that the efficiency of a tax system lies in the ease of administration and collection otherwise it does not what it is. This is because pressures from economic, social and political groups abound where each group tries to structure or lobby the restructuring of tax to suit their group.

Tax is an efficient robust tool for policy decision-making and management of social disturbances by the authorities of the society (Ihenyen & Ebipanipre, 2014). Benefit Received Theory is a theory propounded by Cooper in 1994. The premise of this theory lies in what is called a transactional relationship between the state and the dwellers of the state, such that the state plays a role in satisfying the need of the dwellers (citizens) through the provision of public goods and services as part of its obligation while the citizen, in turn, pays the state for its services through payment of tax to the tone of the benefit enjoyed (Ayuba, 2014). This means that the only reason for the payment of tax by the people is because of the notion that the revenue from the tax is properly engaged towards better amenities and societal development that leads to economic growth. Therefore, the theory sees the benefit of tax from the angle of the quantum of infrastructure available in society as well as the growth level. In practice, however, the implementation of this theory is difficult

following the impossibility of determining the benefits of government services including diffuse benefits like the defense of citizens, resident and non-resident taxpayers (Ahuja, 2012).

Empirical Review: Onakoya and Afintinni (2016) examined the cointegration relationship between tax revenue and economic growth in Nigeria. Engle-Granger Cointegration test and The Vector Error correction model were employed and the result revealed a long-run relationship between taxation and economic growth in Nigeria. It also, suggested a significant positive relationship among PPT, CIT and GDP, whereas economic growth reacted negatively with customs and Excise Duties. Asaolu, et al. (2018), examined the nexus between tax revenue (VAT, PPT, CIT and CED) and economic growth in Nigeria. Data spanning from 1994 to 2015 were gathered and analyzed with Auto Regressive Distributed Lag (ARDL) as estimation techniques while post estimations were done the study found, VAT and CED to have a significant relationship with economic growth, while CIT negatively but significantly related with economic growth, while no significant relationship existed between PPT and economic growth. Sani and Ahmad (2019) examined the impact of tax revenue on aggregate and disaggregate economic growth in Nigeria for the period 1979-2018. ARDL model was employed and the result showed Petroleum Profit Tax and Company Income Tax have a negative but statistically significant impact on economic growth, while custom and excise duties have a positive and statistically significant impact on economic growth performance in the short-run. In a related study by Edewusi and Ajayi (2019), the nexus between tax revenue (PPT, CIT and VAT) and economic growth in Nigeria was investigated.

Data collated were analyzed using multiple regression analysis, co-integration, as well as post estimation tests were done and the study found petroleum profit tax, company income tax and VAT to have a positive significant impact on economic growth. Also, Agunbiade and Idebi (2020) studied tax revenue and economic growth in Nigeria for a period of 38 years (1981–2019). Companies Income Tax, Value Added Tax and Petroleum Profits Tax were the variables of interest. Having analyzed the data using the Vector Error Correction Model (VECM) and other post-estimation tools the study documented a causal relationship between Real GDP and the tax components. The result also showed that the direct tax (CIT and PPT) effect on GDP was low, whereas the indirect tax (VAT) effect on GDP is significantly increased over the period. The dynamic relationship between tax revenue, infrastructural development and economic growth in Nigeria was examined by Ayeni and Afolabi (2020) using time series data covering the period from 1981 to 2018. Vector autoregression (VAR) and other robust estimation tools were employed and the study found that while tax revenue influences economic growth and infrastructure, infrastructure on the other hand does not influence economic growth, though it significantly impacts tax revenue collected.

In the same year, Onoja and Ibrahim (2020) investigated Tax Revenue (PPT, VAT and CIT) and Nigeria's Economic Growth. Secondary data collected were analyzed with regression analysis and the study affirmed no significant but positive relationship between economic growth and Petroleum Profit Tax. While Value Added Tax and Companies Income Tax (non-oil Tax Revenue) revealed a significant relationship with Nigeria's Economic Growth. Subsequently, Olushlola, et al. (2020) assessed tax revenue and economic growth with an econometric approach. Secondary data was employed and analyzed using a multiple regression model and the result suggested a positive relationship between tax revenue and economic growth. Furthermore, in the work of Ewa, et al. (2020), the impact of taxation proceeds (company profits, petroleum profit and value-added tax) on the development of the Nigerian economy covering a period from 1994 to 2018 was determined. The study adopted Ordinary Least Square and found a significant effect of CIT and Value Added Tax on Gross Domestic Product Growth, Petroleum profit tax has little or no effect on Gross Domestic Product growth in Nigeria. In a recent work by Anisere-Hameed (2021), the impact of taxation (PPT, CGT and CIT) on the growth and development of the Nigerian economy was examined.

Data was obtained and analyzed via the Ordinary least square (OLS) regression method and the result showed CGT and PPT as insignificant towards the economic growth of Nigeria. Whereas CIT has a significant effect on economic growth in Nigeria. Similarly, Yaro and Adeiza (2021) investigated the relationship between taxation and economic growth in Nigeria. A simple percentage method was used and the results revealed a positive significant impact of both non-oil revenue and profit tax on the growth of Nigeria. Nwachukwu, Nwoha and Inyama (2022), examined the effect of taxation on economic growth in Nigeria. Secondary data was gathered and analyzed using OLS and other inferential tools. The results reveal that PPT,

VAT, CIT and PIT have a positive and significant effect on the economic growth parameters. Nwobodo, Adegbie and Fakunmoju (2022) examined indirect taxes and the economic growth of Nigeria. The study gathered secondary data on VAT, CED and GDP, using ARDL; the study found that VAT and CED influence GDP positively. Ihenyen and Ogbise, (2022) examined the effect of tax revenue generation on economic growth in Nigeria. Secondary data was obtained from reliable sources, using multiple linear regression, the study found that PPT, CIT and VAT have a positive impact on Nigeria's economic growth while customs and excise duties have a negative impact on Nigeria's economic growth.

3. Research Methods

An ex-post facto design was adopted for this study, while secondary quarterly data were obtained from the CBN Statistical Bulletin, FIRS and National Bureau of Statistics covering the period from 2011 to 2020. The dependent variable is the economic growth proxy by GDP while the independent variable is the tax revenue proxy by PPT, CIT, VAT and CTD. The preliminary analysis includes descriptive statistics and pre-tests which include the unit roots test and co-integration test. Regarding the estimation, the study adopted panel Autoregressive Distribution Lag (ADRL) using pooled mean group (PMG) to examine the short-run and long-run relationship. To evaluate the statistical reliability of the estimates obtained and the adequacy of the model estimated, the post estimation tests such as the serial cross-sectional dependence test and normality test were conducted. The hypotheses were tested at the conventional level of significance of 1%, 5% and 10% were applicable.

The model is specified below:

$$RGDP_t = f(PPT_t, CIT_t, VAT_t, CTD_t) \quad (1)$$

The regression model is expressed as follows:

$$RGDP_t = \beta_0 + \beta_1 PPT_t + \beta_2 CIT_t + \beta_3 VAT_t + \beta_4 CTD_t + \mu_t \quad (2)$$

The econometric form of the model after expressing the same in log-linear form is specified in equation 3:

$$lnRGDP_t = \beta_0 + \beta_1 lnPPT_t + \beta_2 lnCIT_t + \beta_3 lnVAT_t + \beta_4 lnCTD_t + \mu_t \quad (3)$$

Where:

PPT= Petroleum Profit Tax
CIT = Companies Income Tax
VAT =Value Added Tax
CTD = Custom and Excise Duty
β_0 = constant
β_1- β_4 = partial slope co-efficient
μ = error term
t = time

4. Results and Findings

Descriptive Statistics: Table 1 displays the summary statistics of the variables being examined in the study. It could be observed that the measure of variation, given as the standard deviations, is less than the respective averages for the variables. This suggests that there is moderate or less dispersion in the values or observations of the variables over the quarterly sampled period. Meanwhile, customs and excise duties (*CTD*) are observed to have the largest average value of about ₦1065.59 billion over the considered sample period. On average, this takes about 6.42 percent of the real GDP for the period of 40 years. By implication, *CTD* has the largest contribution to tax revenue among the selected tax revenue sources. Following *CTD* is the petroleum profit tax (*PPT*) with an average of ₦536.48 billion which is about 3.23 percent of real GDP. Value-added tax (*VAT*) appears to have the least average value of ₦199.26 billion for the given sample period. Meanwhile, all the variables appear to be positively skewed (long right tail) having positive coefficients of skewness. Correspondingly, all the variables such as *RGDP*, *PPT*, *CIT*, *VAT* and *CTD* appear to have flat-topped distributions (platykurtic) relative to the normal distribution, having their kurtosis coefficients less than the threshold of 3 in the case of moment distribution. Remarkably, the Jarque-Bera statistics for the normality test yield insignificant results for all the variables such that their respective *p*-values are greater than the 5% level of significance. This implies that all the variables are normally distributed.

Table 1: Summary Statistics Sample Period-: 2011Q1 – 2020Q4

Statistics	Variable RGDP	PPT	CIT	VAT	CTD
Mean	16610.65	536.48	281.25	199.26	1065.595
Median	16444.46	524.68	272.43	191.78	947.5838
Maximum	19550.15	888.23	556.27	454.69	1624.340
Minimum	13450.72	176.75	112.36	73.23	741.8300
Std. Dev.	1560.889	195.16	119.6676	98.4194	262.5085
Skewness	0.0412	0.0660	0.6357	0.5976	0.8962
Kurtosis	2.3674	2.0488	2.6231	2.7340	2.4656
Jarque-Bera	0.6782	1.5371	2.9310	2.4989	5.8308
P-value	0.7124	0.4637	0.2310	0.2867	0.0542
Obs.	40	40	40	40	40

Source: Authors' computation (2022).

Pre-Estimation Tests: This section provides the pre-tests results such as unit root and cointegration tests to examine the statistical properties (such as stationarity and linear combination respectively) of the variables being examined.

Unit Root Tests: Table 2 shows the result of the unit test using the ADF unit root test. Thus, the results reveal that only *RGDP* appears to be integrated of order zero, in other, it is an *I(0)* series. This also implies that it is stationary in its level form. Meanwhile, all the tax revenue variables such as *PPT*, *CIT*, *VAT* and *CTD* are integrated of order one, that is, they are *I(1)* processes. This suggests the need for differencing the series to achieve stationarity. Thus, the combinations of *I(0)* and *I(1)*) orders of integration of the variables validate the use of bounds co-integration test to assess the presence of linear combination among the variables.

Table 2: Unit Root Test Results Sample Period: 2011Q1 – 2020Q4

Variable	Test form	ADF- Statistics Constant	Constant & Trend	None	*I(d)*
RGDP	***Level***	-2.6796*	-1.9752	0.6875	***I(0)***
	1st Difference	-	-	-	
PPT	***Level***	-1.0987	-1.6579	-0.3177	***I(1)***
	1st Difference	-5.5918***	-5.5792***	-5.5694***	
CIT	***Level***	-2.0215	-2.4215	1.4533	***I(1)***
	1st Difference	-14.5163***	-14.7208***	-14.142***	
VAT	***Level***	-0.3585	-3.2344	2.9259	***I(1)***
	1st Difference	-6.2309***	-6.1623***	-5.2459***	
CTD	***Level***	0.0310	-2.1385	1.5058	***I(1)***
	1st Difference	-2.4557	-2.5855	-1.9246*	

Source: Authors' computation (2022). Note: ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Bounds Cointegration Test*:* Since the variables under consideration have different orders of integration, it is, therefore, paramount to test for possible linear combinations or steady state of equilibrium among the variables. Thus, having different orders of integration suggests the use of the bounds co-integration test (the ARDL bounds test) to examine the existence of the steady state of equilibrium among the variables. Table 3 shows the outcome of the bound's co-integration test of the ARDL approach. However, because F-statistic (6.3759) is greater the critical values of the upper bounds at 1%, 5% and 10% levels of significance. This suggests that there is evidence of a long-run relationship or linear combination among the variables. In other words, real GDP (*RGDP*), petroleum profit tax (*PPT*), company income tax (*CIT*), value-added tax (*VAT*) and custom and excise duties (*CTD*) appear to have a long-run relationship despite having different orders of integration among the variables. Thus, there is a non-existent spurious relationship among the variables.

Table 3: Bounds Co-Integration Test Result Sample Period: 2011Q1 – 2020Q2

F – Statistic:	6.3759	
Level of Significance	**Lower Bounds – I(0)**	**Upper Bounds – I(1)**
1%	3.29	4.37
5%	2.56	3.49
10%	2.2	3.09

Source: Authors' computation (2022).

Model Estimation: Since there is the existence of a linear combination among the variables being examined, the model estimation includes both long-run and short-run estimates. Furthermore, the natural logs of the variables were in the estimation. Therefore, the estimates obtained are expressed as partial elasticity coefficients.

Estimation of ARDL Short-Run Coefficients: Table 4 shows the short run form of the ARDL result. The coefficient (-0.9492) of the *ECT* term called the speed of adjustment is negative and statistically significant (*p*-value = 0.0000) at a 1% level of significance. As expected, the coefficient lies between -1 and 0 for convergence. Thus, this implies that *RGDP* adjusts to *PPT*, *CIT*, *VAT* and *CTD* in the long run. In other words, the system corrects its disequilibrium in the previous period at a speed of 94.92%, thereby restoring it to equilibrium in the current period. Therefore, equilibrium or long-run relationship has been restored among the variables. Meanwhile, *PPT* and *CTD* are not captured in short-run estimation judging by the optimally selected lag. However, most of the short-run coefficients have a statistically significant impact on *RGDP* (economic growth). The explanatory power (adjusted R-squared) of the model is considerably high (92.35%) and thus, suggests that *PPT*, *CIT*, *VAT* and *CTD* are good predictors of the growth of the economic growth in Nigeria in the short-run for the given sampled period.

Table 4: Estimated ARDL Short Run Coefficients Sample Period: 2011Q1 – 2020Q4 Dependent Variable: *RGDP*

Independent Variable	**Coefficient**	**Std. Error**	**t-Statistic**	***p*-value**
$\Delta GGDP_{t-1}$	0.6416***	0.1527	4.2010	0.0004
ΔCIT_t	0.1035***	0.0187	5.5288	0.0000
ΔCIT_{t-1}	-0.0795**	0.0347	-2.2889	0.0326
ΔCIT_{t-2}	-0.0117	0.0262	-0.4462	0.6600
ΔCIT_{t-3}	-0.0446**	0.0197	-2.2608	0.0345
ΔVAT_t	0.1082**	0.0419	2.5846	0.0173
ΔVAT_{t-1}	-0.0898*	0.0459	-1.9560	0.0639
ΔVAT_{t-2}	-0.0861	0.0505	-1.7061	0.1027
ΔVAT_{t-3}	-0.0714	0.0543	-1.3132	0.2033
ECT_{t-1}	-0.9492***	0.1815	-5.2293	0.0000
R-squared	0.9432			
Adjusted R-squared	0.9235			

Source: Authors' computation (2022). *Note: ***, ** and * denote statistical significance at 1%, 5% and 10%* respectively.

Estimation of ARDL Long Run Coefficient: Table 5 reports the result of the long run equation of the ARDL. Thus, the statistical tests of the significance of the individual coefficients are provided below:

Petroleum Profit Tax and GDP in Nigeria: As shown in Table 5, changes in petroleum profit tax (*PPT*) result in a positive impact on economic growth (*RGDP*) with a partial regression coefficient of 0.0294. This implies that a 1% rise (fall) in *PPT* will on average, lead to a rise (fall) in *RGDP* by about 0.029% in the long run holding other variables constant. Statistically, the changes in *PPT* exert a positive significant impact (p-values = 0.0973 < 0.1) on the growth of the Nigerian economy in the long run. Seemingly, the statistically significant effect of *PPT* on *RGDP* may be considered to be weak having a *p*-value (0.0973) close to a 10% (0.1) level of significance. Nevertheless, the null hypothesis that "petroleum profit tax has no significant impact on economic growth in Nigeria" can be rejected. Furthermore, *RGDP* appears to be inelastic with respect to *PPT* since the partial elasticity coefficient (0.029%) is less than 1%. That is, the percentage in *RGDP* is less than the

percentage in *PPT*. However, economic growth responds positively and significantly to petroleum profit tax for the given sampled period.

Company Income Tax and GDP in Nigeria: As shown in Table 5, changes in company income tax (*CIT*) yield a positive impact on economic growth (*RGDP*) with a partial regression coefficient of 0.1815. This implies that a 1% rise (fall) in *CIT* will on average, lead to a rise (fall) in *RGDP* (economic growth) by about 0.18% in the long run holding other variables constant. Statistically, the changes in *CIT* exert a positive significant impact (p = 0.0001 < 0.01) on economic growth in Nigeria in the long run. Thus, the null hypothesis that "company income tax has no significant impact on economic growth in Nigeria" can be rejected. Nevertheless, *RGDP* is *CIT* inelastic since the elasticity coefficient (0.1815%) is less than 1%. That is, the percentage in *RGDP* is less than the percentage in *CIT*. Nevertheless, economic growth responds positively but insignificantly to company income tax for the given sampled period.

Value-Added Tax and GDP in Nigeria: As revealed in Table 5, changes in value-added tax (*VAT*) result in a positive impact on economic growth (*RGDP*) with a partial regression coefficient of 0.0837. This implies that a 1% rise (fall) in *VAT* will on average, lead to a rise (fall) in *RGDP* (economic growth) by about 0.084% in the long run while holding other variables constant. Statistically, the changes in *VAT* exert a positive significant effect (p-values = 0.0124 < 0.05) on Nigeria's economic growth in the long run. Thus, the null hypothesis that "value-added tax has no significant effect on economic growth in Nigeria" can be rejected. In addition, *RGDP* is *VAT* inelastic having a partial elasticity coefficient (0.0837%) being less than 1%. In other words, the relative change in *RGDP* is less than that of *VAT*. Nevertheless, Nigeria's economic growth responds positively and significantly to value-added tax for the considered sample period.

Custom and Excise Duties and GDP in Nigeria: As shown in Table 5, changes in custom and excise duties (*CTD*) yield a positive impact on economic growth (*RGDP*) with a partial regression coefficient of 0.1298. This implies that a 1% rise (fall) in *CTD* will on average, lead to a rise (fall) in *RGDP* (economic growth) by about 0.13% in the long run holding other variables constant. Statistically, the changes in *CTD* exert a positive significant impact (p-values = 0.0001 < 0.01) on economic growth in Nigeria in the long run. Thus, the null hypothesis that "custom and excise duties have no significant impact on economic growth in Nigeria" is rejected. Numerically, *RGDP* appears to be inelastic with respect to *CTD* since the elasticity coefficient (0.1298%) is less than 1%. That is, the percentage in *RGDP* is less than the percentage in *CTD*. Nevertheless, economic growth responds positively and significantly to custom and excise duties for the considered sampled period.

Table 5: Estimated ARDL Long Run Coefficients Sample Period: 2011Q1 – 2020Q4 Dependent Variable: *RGDP*

Independent Variable	Coefficient	Std. Error	t-Stat.	*p*-value
PPT	0.0294*	0.0170	1.7358	0.0973
CIT	0.1815***	0.0374	4.8519	0.0001
VAT	0.0837**	0.0306	2.7354	0.0124
CTD	0.1298**	0.0540	2.4042	0.0255
C	9.3672***	0.2017	46.445	0.0000

Source: Authors' computation (2022)**.** *Note: ***, ** and * denote statistical significance at 1%, 5% and 10% respectively*.

Post Estimation Tests (Residual Diagnostics): The residual diagnostics include a serial correlation test, Heteroscedasticity test, normality test, linearity or specification error test (Ramsey RESET test) and stability test (CUSUM test). Table 6 presents the results of the serial correlation test, Heteroscedasticity test, normality test and linearity test. The serial correlation test, using Breusch Godfrey (BG) LM, the method yields an insignificant result since the p-values (0.3451 and 0.1485 respectively) of both the F-statistic (1.1257) and LM statistic (3.8137) are greater than the 5% level of significance, thus, the null hypothesis of no serial correlation cannot be rejected. Thus, the model is free from serial correlation for the considered sample. The heteroscedasticity test, using the autoregressive conditional heteroscedasticity (ARCH) test method, yields an insignificant result suggesting the acceptance of the null hypothesis of homoscedasticity (i.e. absence of heteroscedasticity).

Since the p-values (0.5842 and 0.5710) of both the F-statistic (0.3055) and LM statistic (0.3211) respectively are greater than a 5% level of significance. Thus, the estimated model is free from heteroscedasticity for the given sample period. Furthermore, the normality test result reveals that the residuals of the estimated model are normally distributed as the p-value (0.5601) of the Jarque-Bera statistic (0.8929) is greater than the 5% level of significance (statistically insignificant). The linearity test using the Ramsey RESET test examines whether there is the existence of a linear relationship between the dependent variable (*RGDP*) and the explanatory variables (*PPT*, *CIT*, *VAT* and *CTD*) or whether the model is correctly specified. The null hypothesis is that the model is linear and correctly specified. Thus, since the t-statistic (0.1364) and F-statistic (0.8929) are not statistically significant (that is, having their respective p-values above a 5% level of significance); the null hypothesis for linearity cannot be rejected. This suggests that the estimated model in this is linear or correctly specified.

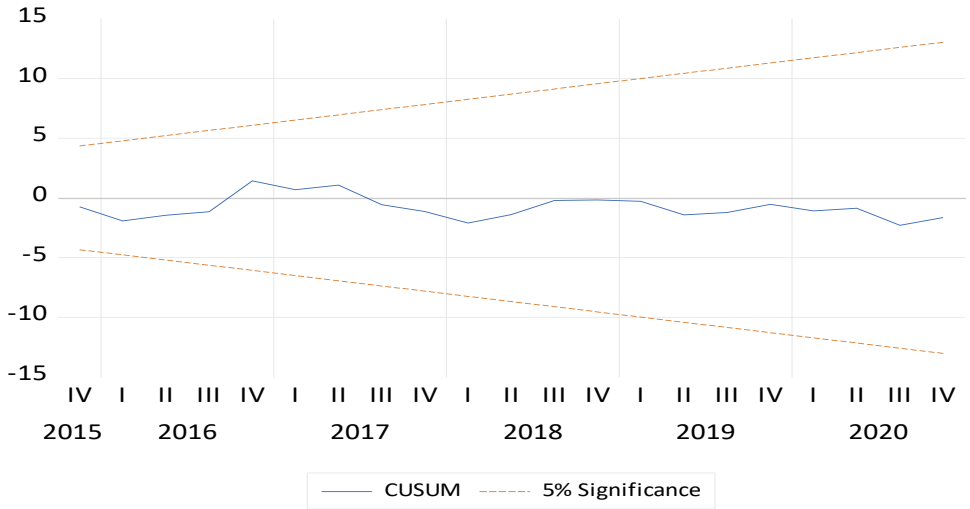
Table 6: Results of Post-Estimation Tests Sample Period: 2011Q1 – 2020Q4

Serial correlation test (BG):		***p*-value**
F-statistic	1.1257	0.3451
LM Statistic	3.8137	0.1485
Heteroscedasticity test (ARCH LM):		***p*-value**
F-statistic	0.3055	0.5842
LM Statistic	0.3211	0.5710
Normality Test:		***p*-value**
Jarque-Bera	1.1593	0.5601
Linearity Test		***p*-value**
t-statistic	0.1364	0.8929
F-statistic	0.0186	0.8929

Source: Authors' computation (2022).

Figure 1 shows the outcome of the stability test using the CUSUM criterion. Since the plot falls within the critical bounds throughout the sampled period at a 5% level of significant, thus, the model is considered to be structurally stable. In other words, the estimates obtained are stable for the selected sample period. Therefore, all the post-estimation test results suggest that the short-run and long-run estimates obtained from the estimated ARDL model are efficient and reliable for policymaking and forecasting having met the underlying assumptions of the ordinary least square (OLS) estimation method.

Figure 1: Plot of Cumulative Sum (CUSUM) of Recursive Residuals



Source: Authors' chart (2022).

Discussion of Findings

This study examined the relationship between tax revenue and Economic Growth in Nigeria from (2011-2020) using quarterly data. Gross Domestic Product was adopted as the dependent variable whereas petroleum profit tax, company income tax, value-added tax and customs and excise duties were the independent variables. The findings of the first hypothesis showed a positive insignificant effect of Petroleum Profit Tax on economic growth (GDP). This is in line with a priori expectation based on the over-dependence of the Nigerian government on petroleum products and could be seen that as an oil-producing country, taxes generated from oil has significantly affected the economic growth of the country. This finding supports some previous researchers' findings (Edewusi & Ajayi, 2019; Ayeni & Afolabi, 2020), but contradicts others (Onakoya & Afintinni, 2016; Asaolu, et al., 2018; Sani & Ahmad, 2019; Ewa, et al., 2020; Onoja & Ibrahim, 2020; Agunbiade & Idebi, 2020; Anisere-Hameed, 2021). The second hypothesis in like manners suggested positive and insignificant effects of Companies Income Tax on economic growth in Nigeria.

This finding is in line with the findings of other researchers (Edewusi & Ajayi, 2019; Ewa, et al., 2020; Olushlola, et al., 2020; Ayeni & Afolabi, 2020; Yaro & Adeiza, 2021; Anisere-Hameed, 2021) but in contrary to the findings of others (Onoja & Ibrahim, 2020; Agunbiade & Idebi, 2020; Sani & Ahmad, 2019; Asaolu, et al., 2018; Onakoya & Afintinni, 2016). Hypothesis three has evidence of the positive insignificant effects of VAT on economic growth in Nigeria. As VAT is a consumption tax, it is very difficult to evade the payment and the result is in line with a priori. This finding supports previous findings (Asaolu, et al., 2018; Edewusi & Ajayi, 2019; Ewa, et al., 2020; Olushlola, et al., 2020; Ayeni & Afolabi, 2020; Agunbiade & Idebi, 2020; Yaro & Adeiza, 2021), but contradicts Onoja and Ibrahim (2020). Finally, hypothesis four also conforms that custom and excise duties have positive insignificant effects on economic growth. It's in line with these authors' findings (Asaolu, et al., 2018; Sani & Ahmad, 2019; Olushlola, et al., 2020; Yaro & Adeiza, 2021) but negates the findings of Onakoya and Afintinni (2016).

5. Conclusion and Recommendations

The main goal of this research was to determine the effects of tax revenue on Nigerian economic growth. This research was done primarily to validate the findings of previous researchers on relevant and similar themes with recent data, as well as, to contribute significantly to the literature. Based on the findings of this study, it was concluded that petroleum profit tax, company income tax, value-added tax and customs and excise duties have a positive insignificant effect on economic growth in Nigeria. The study, therefore, recommends that government needs to articulate policy consistency, build enabling infrastructure and improve operating environment security to help companies in Nigeria thrive since their contribution in terms of payment of CIT has a positive effect on economic growth, encourages Real GDP as well as reduces unemployment, increase productivity, profitability, exportation and tax revenue generation.

Subsequently, the federal government can facilitate the provision of economic and social infrastructures that will increase the level of production in the country and create employment opportunities, to increase customs and excise duties since it affects economic growth positively. The policy that could improve the disposable income of the citizens should be advanced as a way to increase their consumption since consumption tax (VAT), has a positive effect on economic growth. A monetary policy decision that cuts interest rates can be adopted by the government, as low-interest rates make stocks more attractive, raising a household's financial assets. This will contribute to higher consumer spending, an increase in output value-added tax and ultimately an increase in economic growth. Furthermore, federal Inland Revenue Services should take a bold step to ensure that companies comply with tax payments to reduce tax evasion and avoidance since some strategies are used by companies to reduce tax payable, thereby, reducing government revenue which directly affects economic growth in Nigeria.

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A Quantitative Study on Expenditure Behavior among Public and Private University Students in Malaysia

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Abstract: The principal point of this study is to examine the relationship between the spending pattern and consumer behavior, especially as it relates to income and financial literacy, among public and private university students in Malaysia. This study adopts Keynes's Psychological Law of Consumption theory. The foremost objective of this theoretical paper was to determine whether there is any difference in spending patterns among public and private university students and the association between parental incomes and spending behavior among public and private university students, as well as to examine the relationship between financial literacy and spending behavior among public and private university students. In addition, this study seeks to determine how well students comprehend the idea of needs and desires. The association between students' degree of financial literacy as well as their income and their spending habits will next be examined using the data. The link between endogenous and exogenous variables will be determined over both the long and short terms using the Statistical Package for the Social Sciences (SPSS) version 23. The study includes the findings from earlier investigations. The study contributed to a new understanding for the researcher of financial behavior under the categories of needs and wants which outline the importance of financial literacy, parents' income, and demographic factors. The study also contributes to a new idea for policymakers: adapt financial literacy programs among parents and children.

Keywords: *Cost of living, Income, Financial Literacy, Spending Behaviour, Keynes's Psychological Law of Consumptions theory.*

1. Introduction

Most individuals regularly spend money. Economics is a term used to refer to spending as consumption, which comes from the word *consume* (Jalil, Yusof, Rambeli, Samsudin, & Zakariya, 2015). Spending is the process of transferring money into an item or service that a person wants or needs, which might take the shape of either (Petpairote, 2023). To mention a few, these include items like clothing, food, housing, and transportation. Due to several factors, how people spend differs. Age, parental income, gender, origin, family history, personality, and many other variables affect it. Spending is the most crucial activity that most people tend to do every day. From the economic point of view, this is known as the concept of paying attention to the behavior of the consumer which is the utility of consumer behavior theory. The behavior of spending differs due to various factors where social and demographic changes can have main implications too. Looking at the word *consum*e, factors of needs and wants can make their behavior during spending be affected. This is where every person wants to satisfy their need which has become part and parcel of human life.

Students are a vital part of the human capital that shapes the future of our nation. Therefore, it is important to impart useful knowledge and skills to students so that they can use their knowledge and abilities to benefit society. Understanding how to manage and use money is among the crucial information and abilities that a student needed to possess. These financial competencies are crucial for improving our social standing in the modern world. The art and science of financial management require a variety of abilities to accomplish organizational and personal accounting goals (Kassim, Tamsir, Azim, Mohamed, & Nordin, 2018). A basic comprehension of financial principles is referred to as financial literacy. Life skills are now widely regarded as crucial since customers must be able to discriminate between various goods, services, and financial product providers to properly manage their finances. Everyone must make financial judgments daily about costs and savings. Understanding how to effectively handle money is a vital life skill that is mandatory in many facets of everyday life.

Problem Statement: Money is a necessity in our daily lives. It can help run our daily affairs as well as meet our needs and wants. Money is also an important element for us to achieve our life goals. However, financial management and spending patterns are very important to ensure that money is spent wisely so that we do

not face the problem of money shortages. This is a problem that students frequently encounter, whether they attend public or private institutions of higher learning (IPTA or IPTS), particularly during the COVID-19 epidemic (Seman & Ahmad, 2017). In today's world, the younger generation has been too reckless in spending money wisely. This is visibly seen once they enter tertiary education, where they are outside of their parent's supervision. Once this happens, they tend to overspend the money given to them by their parents, as there is no one to monitor their spending. As the living cost has surged day by day, it has exaggerated the money movement among tertiary education scholars (Falahati & Paim , 2011). Most university students tend to have insufficient money to continue their living expenses after paying their tuition fee throughout their semester. It shows that they not only depend on their education loan but also need to ask for extra support from their family. Students need to spend their money wisely to survive throughout their semesters. Nevertheless, financial management and spending patterns are very important for making sure money is spent wisely so that we do not run into problems with a scarcity of money.

This is a problem that students frequently encounter, whether they attend public or private higher education institutions (IPTA) (IPTS). A few of these scholars get monetary resources through Perbadanan Tabung Pendidikan Tinggi Nasional (PTPTN) and other subsidies. (Seman & Ahmad, 2017). Several researchers that evaluated the spending patterns of university students concluded that their top two expenses were meals and tuition. However, there is a gap where there are no measurements done on the expenditure behavior between the public and private universities in Malaysia. This is a thorough look at the expenditure behavior of the students and how they manage their budget effectively. Scholars will also examine whether financial knowledge has a substantial influence on money organization between Malaysian public and private universities (Lyn & Sahid, 2021). As a result, the problem that must be examined in this study has to do with how students spend their money. Their needs as students are to provide for their necessities like food, housing, transportation, notes, and educational materials. These needs must be satisfied to ensure that their academic process runs smoothly and without financial restrictions, whether they are aware of excellent money management, which is knowledgeable and distinct in identifying their demands as students.

Spending Pattern: Spending patterns are how an individual spends money (Md. Sapir & Wan Ahmad, 2020) Individual expense planning is necessary to understand society to achieve the goal of improving one's quality of life. A wise spending pattern is when an individual prioritizes basic needs before fulfilling wants. As a student, according to (Nizad, Yakob, Hafizuddin-Syah, & Baharin, 2018), necessities are necessary items for life such as shelter, food, clothing, and necessities for learning such as notes and transport. While the will is the stuff, the individual may lack or not have it, and it has no impact, which is great for his daily life like dining in a fancy restaurant, paying phone bills, and buying designer clothes. Student expenses in educational institutions can be divided into two categories: the cost of education and the cost of living. The cost of living includes the cost of food, shelter, clothing, and other necessities, while the cost of education is comprised of tuition fees, textbooks, and usage facilities at the place of study. Malaysia's Ministry of Higher Education oversees higher education in the country (MOHE). It has been separated into two categories: public and private institutions (Seman & Ahmad, 2017). Universities, polytechnics, community colleges, and teacher education programs are all examples of public educational institutions.

For their operations, research, and development, Malaysian public educational institutions are reliant on government or state financing. Private universities, private university colleges, foreign university branch campuses, and private colleges are all examples of private institutions. Being independent, undergraduates tend to face an inability to manage their finances. This is where their spending patterns tend to deviate due to their thoughts and feelings (Hartono, 2022). A recent study shows that, if examined, married individuals had different spending patterns compared to unmarried individuals. Married individuals concentrate more on needs, while unmarried individuals focus more on luxuries such as car ownership, credit cards, etc. When people tend to spend, it is important to understand their needs and choices. People on a large scale choose to spend more on entertainment, food and drinks, education, as well as leisure activities. Recent studies by (Ismail, Amran, & Yusof, 2022) show that during the Covid-19 pandemic, food and transportation had the most influence on spending patterns, while entertainment had no influence. According to (Hartono, 2022), a student has no source of income and may not get their parents' allowance on time, run out of pocket money, or encounter other unanticipated expenses. While they are unable to budget themselves, students should be able to manage their funds instead of making unnecessary purchases.

Income and Spending Behavior: Under his Psychological Law of Consumptions concept, Keynes theorized that individuals typically spend more as their wealth rises. Nonetheless, there was also some spending and saving as a result of the rise in income. This study used Keynes' Psychological Law of Consumption theory to examine the connection between income and spending patterns (Jalil, Yusof, Rambeli, Samsudin, & Zakariya, 2015). The life-cycle theory, the prospect theory, and the consumer socialization theory are the three dominant theories featured in the study by Xiao, Ford, and Kim (Consumer Financial Behavior: An Interdisciplinary Overview of Selected Theories and Research, 2011) has concentrated. The most popular theory in economics, which addresses issues like consumption and saving behavior, is the life-cycle theory. The hypothesis evolved. Socialization is where a person learns values and norms that give a pattern to the society to which he belongs. According to the social learning theory, children learn their economic concepts from their parents' socialization throughout their life cycle. They learn their parent's behavior, which helps them understand consumer socialization.

Their parent's financial practice then develops the child's consumer attitude, knowledge, and behavior (Falahati & Paim, 2011). Taking self-control ability as one of the factors influencing a student's financial behavior, this includes being able to identify and control emotions as well as the desire to spend. Some students get funding from their parents or third parties, and this allows them to make their own spending decisions (Ida, Haizal, Noor, & Aizi, 2020). This leads to an increase in purchasing power among students. It is possible that expenses could exceed total earnings without parental control. Budget is a very important topic in all walks of life at the national level. The budget presented each year is intended to provide information to the public on total revenue and expenditure as well as financial planning for the following year (Kassim, Tamsir, Azim, Mohamed, & Nordin, 2018). For the university student, the budget should also be provided as a mechanism for measuring the implementation of financial planning and smooth cash flow. The budget serves as a yardstick for lifestyle based on ability.

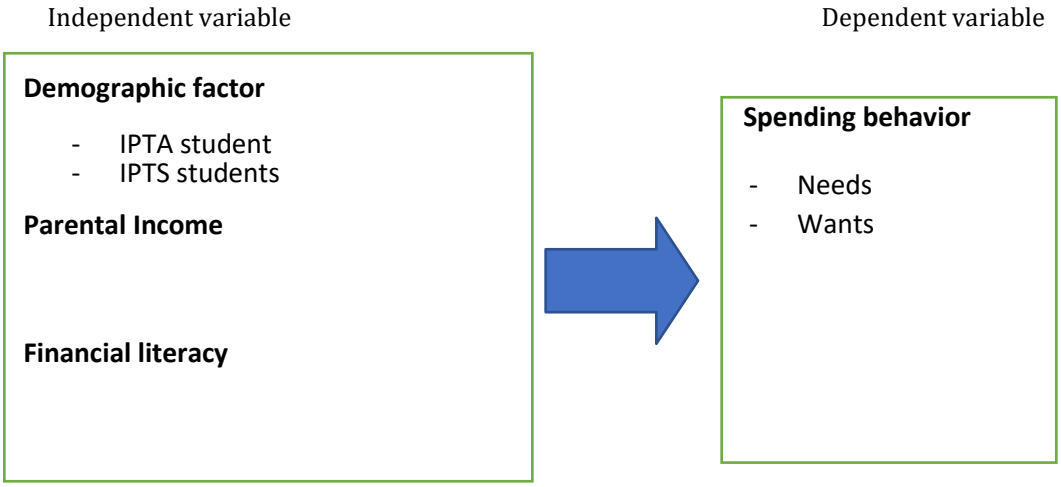
2. Financial Literacy

Basic knowledge of financial principles is known as financial literacy. It has been discovered that financial literacy is positively connected with people's propensity to save money. Knowledge of both fundamental and complex financial concepts, such as how to calculate interest rates, inflation rates, percentages, stock prices, and unit trusts, is referred to as financial literacy (Kenayathulla, Nair, Rahman, & Radzi, 2020). It is now globally recognized as an essential life skill as consumers must be able to differentiate between various products, services, and providers of financial products to manage their finances successfully. Everyone wants to make regular monetary choices about expenditures and investments (Ida, Haizal, Noor, & Aizi, 2020). Understanding how students can manage money well is a very important life skill and is needed in all aspects of daily life. According to Zahari & Wahid (2020), being literate in economics is very important for all humans as it involves their financial management. When they have a better understanding, they can manage and make decisions about their finances. The study Zahari & Wahid (2020) introduces those students who are literate in finance management and tend to have a good life despite the rise in living costs.

This is specifically focused on tertiary education student who needs to improve their financial management with financial support from education loans and parents. Financial literacy can have a significant impact on a person's financial behavior, according to a prior study. Debt problems are more likely to affect people with poor levels of financial literacy (Zahari & Wahid, 2020). Financially knowledgeable persons are more likely to recognize the ideal level of debt, have less debt, and make better credit decisions. This indicates that a lack of financial literacy causes a person to spend excessively to the point of running out of money at the end of the semester. If students fail to manage the given funding sources, they must do part-time work to earn money. According to (Hartono, 2022), financial literacy is the main concept to enable saving behavior. However, several factors influence saving behavior, which are parent socialization, peer influence, and self-control. Hartono also added that his study had given provided new underlying data on the financial literacy that affects the saving behavior of students.

Conceptual Framework: The conceptual framework in Figure 1 shows the direction of the relationship. In this study, the dependent variables are the spending behavior between needs and want. While the independent variables are demographic factors, parental income and financial literacy.

Figure 1: Conceptual Framework



Research Objective: The objective of this study is to attain; -

(i) To determine whether is there any difference in the spending pattern between public and private university students

(ii) Identify the relationship between parental income and spending behavior among the public and private university students

(iii) To examine the relationship between financial literacy and spending behavior between public and private university students

Research Question

(i) Is there any difference in the spending pattern between public and private university students?

(ii) How is the relationship between parental income and spending behavior among public and private university students?

(iii) Is there a significant relationship between financial literacy and spending behavior among students at public and private universities?

Research Hypothesis

i) H0: There is no difference in spending patterns between public and private university students.

H1: There is a difference in spending habits between public and private university students.

ii) H0: There is no relationship between parental income and spending behavior among the public and private university students

H1: There is a relationship between income and spending behavior among the public and private university students

iii) H0: There is no significant relationship between financial literacy and spending behavior between public and private university students

H1: There is a significant relationship between financial literacy and spending behavior between public and private university students.

3. Methodology

A quantitative method is used to analyze data using statistical analysis. A larger sample population will be summarized using quantitative research. In the quantitative study, two independent factors that are anticipated to affect students' spending behavior are their demographics, parental income, and financial literacy. For the student population, the researcher employed convenience sampling and random sampling. Various courses and levels of study were given different survey questions. Convenience sampling was used to choose the samples. An ideal probability sampling method would broaden the applicability of the findings. An analysis was performed to ascertain the validity and dependability of the questionnaires that were examined. The questionnaire comprised three sections: Section A asks questions about demographic data. Section B asks

questions about independent variables, and Section C asks questions about our dependent variable. The demographic information of the respondents was requested in the final part, Section A. Questions on the respondents' gender, age, ethnicity, current academic year, department of study, parents' total income, and other information are included in this section. The two elements that influence college students' spending patterns are measured in Section B.

These two elements include parental income and financial management knowledge. This section uses a five-point Likert scale to allow respondents to select their preferred response. The questions in Section C are intended to elicit responses, ideas, and perspectives on consumer behavior among university students. This segment utilizes the Likert scale. Before the questionnaire is published, a pilot test is conducted to test its reliability and understandability. Users of econometric analysis commonly use the implicit assumption that the classical assumptions, i.e., mean and variance values stay constant and independent throughout time to estimate these long-run relationships. However, empirical studies have shown that consistent mean and variance values do not typically occur for time series data. Due to this, conventional tests like the t-test and F-test presumptively reject constant mean and variance values.

4. Study Findings

Previous Study: Shahryar & Tan (2014) studied the expenditure pattern of Malaysian undergraduates from a Malaysian university. This is where the skill, especially in money management, came in when they explored the influence of money management in their lives. The methods used were qualitative and quantitative, whereas in qualitative the author wrote based on his or her experience and observation working with different types of colleagues. In the qualitative method, two independent variables were established, which were the student's attitudes and demography. This is because these variables had a high influence on the student's spending behavior. The finding showed that expense planning was determined as a dependent variable and expenses on phones, transportation, items related to study, entertainment, rental, and fashion were classified as independent variables. The level of significance was set at p=0.05 using multiple regression analysis and the r-square is 24.6%. This showed that 24.6% of the dependent variable could be explained using the independent variable, whereas the rest (75.4%) could be explained by another dependent variable which was not analyzed in this survey. On the t-test, each independent variable was not significant for the dependent variable as it was more than 5%. The finding also showed that most students spent more time on their phones, as the most significant F-test was 0.312%. A finding by Manju (2016) which indicated that most students preferred to spend more money on excursions, meals, and digital life than on books and savings has been used to justify this.

Most students relied on their parents as well, but only half of them made a budget. At least 90% of people set spending limits based on their income. The study also demonstrated that female students saved more frequently than male students did. The earlier study by Esmail Alekam, Madya Salniza, and Sany Sanuri (2018), which acknowledged that family, parents, and peers had the most effect on financial literacy, might be used to corroborate the findings of this study. The findings demonstrated that behavior and financial literacy had a favorable connection, with = 0.38; t = 8.81; $p < 0.001$; a relationship between family or parental and financial literacy with = 0.15; t = 3.48; $p < 0.001$; and a relationship between peer influence and financial literacy with =0.18; t = 4.69; $p <0.001$. As the results indicate, all hypotheses were accepted as the t-value was greater than 1.96. Therefore, when examined by (Kenayathulla, Nair, Rahman, & Radzi, 2020) it was demonstrated that the monetary illiterateness level among undergraduates was higher than their financial attitudes, which remained at a moderate level. This study has created a new perspective on looking at financial literacy through the branches of knowledge, behavior, and attitude. The key term in behavioral finance in the philosophy of self-control is known as present bias, according to Xiao and Porto (2019). The findings show that it is associated with saving practices, unwanted expenditures, and lending. It can be seen from the results of F value = 140.816, $p < 0.001$, and a value of $R^2 = 0.410$. As 41.0% of the economy is literate, this affects the student's financial behavior.

Table 1: Summary of Articles Included in Study Findings

Title / Author / Year	Theory / Model	Methodology	Year	Variables	Results
Spending Behaviour of a Case of Asian University Students. (Shahryar & Tan , 2014)	Spending behavior	Ordinary Least Square Regression (OLS)	2013	Financial Literacy, Background, Financial Awareness, Attitude, Family	Data study reveals that the majority of students do not have the right money management skills in practice.
Trends in Spending and Money Management Practices among Students of Kerala. (Manju, 2016)	Spending Pattern	Simple Percentage Analysis	2016	Budget To Limit Spending, Savings And Investments, Management Of Personal Finance	The report shows that students spend more money on fast food, pleasure excursions, and internet activities than on books, savings, etc. Most children rely on their parents to see them through each day. Only half of them budget, yet more than 90% of them keep their spending within their means. Compared to male students, female students are more adept at saving money.
The effect of family, peer, behavior, saving and spending behavior on financial literacy among young generations. International Journal of Organizational Leadership. (Esmail Alekam, Madya Salniza, & Sany Sanuri, 2018)	Financial Socialization On Conceptual Model, Social Capital Theory	Partial Least Squares Structural Equation Modelling (PLS-SEM)	2018	Financial Literacy, Behavior, Family/Parental Factors, Peer Influence	The results demonstrated a substantial relationship between Family/Parental and Peer Influence on Financial Literacy. This study, therefore, suggests that increasing the degree of financial literacy through the implementation of various financial education programs is relevant to the general public, academic and university administrations, government, and financial advisors. In the end, this research is regarded as one of those that have advanced concerns about financial literacy in the literature.
Financial literacy of undergraduate students in selected Malaysian higher education institutions: a way forward to a policy recommendation. (Kenayathulla,	Iceberg Model for Competency	Descriptive And Inferential Statistics	2020	Financial Knowledge, Attitudes, Behavior	These undergraduate students show a high degree of financial understanding and behavior, according to the data. They still have a reasonable financial mindset, though. Additionally, the findings show that students' financial literacy is not influenced by their gender or socioeconomic background.

Nair, Rahman, & Radzi, 2020)					This study offers policymakers and related organizations new information on the necessary steps to secure the financial security of future generations.
Present bias and financial behavior. (Xiao & Porto, 2019)	Theory of Self-Control	Ordinary Least Square Regression (OLS)	2019	Spending, Borrowing, Saving, Money Management	Results using data from a nationwide urban sample in China reveal that some behavioral patterns support the theory's predictions that customers who are biased in favor of the present are more likely to spend money now and less likely to save it for the future. The findings help academics better comprehend this crucial idea and have ramifications for future studies on the present bias. The findings will help financial planners provide their clients with better service.

5. Conclusion

This study overall has demonstrated that financial literacy is a significant factor in determining how much a person saves. However, it is just a preliminary finding from this exploratory research that implies that the government should strengthen efforts to promote financial literacy through fundamental teaching programs about financial concerns if it wants to raise saving among families. As stated by Perbadanan Insurans Deposit Malaysia (PIDM) in 2022, there are some notable programs on enhancing financial literacy, such as BNM's Train-the-Trainers (TTT) and AKPK's Customized Financial Solution Programme (Employee Wellness Programme) (Perbadanan Insurans Deposit Malaysia (PIDM), 2022). There are also UNCDF programs combined with other programs to support counseling and advisory services about financial literacy. This should raise awareness among parents, relatives, and students about the need to establish sound financial practices at home, particularly at the proper age when kids are prepared to learn about financial matters.

Second, social organizations like mosques and churches may promote financial literacy. Parents, educators, and university professors should all push students to develop sound financial habits and learn how to handle their money. An efficient strategy to teach pupils to become responsible and wise consumers would seem to be to provide them with a rudimentary understanding of personal finance through the educational system. Third, the study's most eye-opening findings and those that are most consistent with earlier research are that perceived financial well-being may be raised through finance knowledge. In other words, financial education should be made accessible to all school-age children, college students, and parents to assure financial well-being.

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The Relationship between Bank Deposits and Macroeconomic Variables in Ghana: A Co-Integration Approach

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Abstract: This study examined the linkages between macroeconomic variables and how those relationships affect the total deposits of Ghanaian banks. The macroeconomic variables included in this study were Inflation (I), Monetary Policy Rate (MPR), Gross International Reserve (GIR), Public Debt (PD), Gross Domestic Product (GDP), GSE All share Index (GASI), Rate of change in Total Money Supply (M2+), deposits in the banking sector (TD). The study employed monthly data over the period (2015–2020); obtained from the Bank of Ghana monthly time series database. The data were analyzed using Gretl. The cointegration technique was employed in this study to gauge the long-term and short-term responsiveness of the connections. The ADF results indicated that the study variables were non-stationary. The econometric analysis suggested that the study variables, inflation (I), Gross Domestic Product (GDP), Public Debt level (PD), and Total Deposits (TD) in banks operating in Ghana, exhibited a significant positive long-run cointegration relationship. This suggested that the identified variables play a crucial role in explaining the fluctuations in total deposit levels within the Ghanaian banking industry. Bank deposit is strongly exogenous and moves to restore equilibrium through several short-run partial adjustments in the short-run. Also, in the short-run, only the GSE All-share index (GASI) significantly influenced bank deposits, but not in the long-run. In the long run, the relationship was still positive but insignificant.

Keywords: *Bank Deposits, Money Supply, Public Debt, International Reserves, Cointegration.*

1. Introduction

Banks in Africa have undergone several reforms over the period, with Ghana being no exception. Recent reforms and restructuring of the Ghanaian banking sector had economic and financial implications for the country and the banking industry. Ghana's banking sector had seen several reforms since the 1980s when only 12 banks were operating. These reforms led to the liberalization of the sector leading to the influx of several foreign banks into the Ghanaian banking sector and increasing the level of competition in the banking sector. The banking sector continues to experience reforms. In 2017, the Central Bank of Ghana undertook a clean-up exercise in the banking industry in Ghana. Some seven banks lost their banking licenses. Two of such banks were assumed by an existing bank, while the remaining five were consolidated to form a new one. The Central Bank raised the minimum capital requirement of the surviving banks to 400 million Cedis to make them more liquid. The recent banking sector reforms included the cleaning up of the second-tier banks (savings and loans companies) as well as microfinance companies. Governmental activities, be it deliberate intervention in the banking sector like those experienced in 2017 or through fiscal and monetary policies, affected the performance of banking sector players. Macroeconomic factors originate from fiscal policies of the government, such as Inflation (I), Gross Domestic Product (GDP), and the level of public debts (PD).

The Ghana Stock Exchange composite index (GSECI) and those originating from monetary policies such as the Monetary Policy Rate (MPR) and Gross International Reserve (GIR) all have some implications on the liquidity of banks. Although the relationship between these macroeconomic factors on banks' liquidity positions has been wildly researched in advanced countries, more study has yet to be undertaken in the Ghanaian context. Kumar et al. (2020) indicated that monetary policies, in addition to the capital adequacy ratio and the ratio of non-performance loans, influence the performance of banks in New Zealand. Yusuf and Abdulkadir (2020) also found that the policy rate influenced the position of the return on capital employed. In a study conducted in South Africa, Moyo and Tursoy (2020) investigated the potential inflationary effect and the impact of the exchange rates on the performance of banks. The authors found a material negative correlation between bank profitability, Return on Equity (ROE), and inflation. However, they noted a weak association between currency exchange rates and ROE. In a similar study, Jackson et al. (2021) reported a positive correlation between inflation and bank performance. Furthermore, Abate and Mesfin (2019)

identified a significant negative effect of GDP, inflation, and monetary policy rate on Ethiopia's performance of banks in Ethiopia.

Literature on the nexus between macroeconomic factors and the performance of banks has mostly concentrated on measuring the financial performance of banking institutions. These measures of the performance of banks are all determined as a relationship between the profit of the business and some measures of the funds invested in the bank. However, the performance of banks is not limited to the profit realized. Other financial performances of banks include the level of deposits mobilized, loan targets achieved, and asset size and value growth. Although the government bailout of non-performing banks is extensively researched, there is limited empirical evidence regarding the effect of national debt on the banks' performance. For instance, Gerhardt and Vander Vennet (2017) found no improvement in the financial position of banks after the bailout, which resulted in an increment in the national debt. Onyele and Nwadike (2021) found evidence of a long-run adverse effect of national debt on economic growth. In the short run, national debt negatively affects economic stability. The present study investigated the effects of variations in several macroeconomic variables, including inflation, GSE all share index, GDP, monetary policy rate, gross international reserve, growth in money supply, and public debt, on the level of deposit mobilized by all deposit-taking institutions in Ghana. Furthermore, the study examines the individual impacts of monetary policy and fiscal policy on the deposit mobilization of banking firms.

2. Literature Review

The Relationship between Banks' Performance and the Interconnection of Monetary Policy and Inflation: In their research, Kassim et al. (2009) investigated the effects of monetary policy on the balance sheet of conventional and Islamic banks in Malaysia. The authors' findings indicated that the policy rate exerted a more significant influence on the balance sheet of Islamic banks compared to conventional banks. Additionally, the loan portfolio of conventional banks was less responsive to changes in the policy rate. Adesina et al. (2018) studied the monetary policy impacts on banks' performance in Nigeria. The instruments of monetary policy examined included the policy rate, the open market operations, and cash reverse ratios. The study utilized data from the published financials of the banks between 2007 to 2016 and adopted the Ex-post factor and causal research design. The results suggested a significant negative effect of the monetary policy rate on the lending performance of the banks. Zaman et al. (2014) conducted a comprehensive investigation of the Pakistani banking sector to determine the effect of monetary policy on banks' performance. A representative sample of twenty deposit-taking institutions in the country was selected to achieve this.

The study employed robust statistical tools such as regression and correlation analysis. The results of the analysis revealed a significant negative correlation between the monetary policy rate and the performance of banks. This finding underscores the need for a nuanced understanding of the interplay between monetary policy and bank performance in Pakistan. Kumar et al. (2020) studied the impact that monetary policy has on banks' profitability in New Zealand. Their findings suggested that monetary policy significantly affected the financial performance of banks in New Zealand. The capital adequacy ratio, monetary measures, and the non-performing loan ratio impacted the success of banks. Yusuf and Abdulkadir (2020) also investigated the correlation between the performance of banks in Nigeria and monetary policy. They indicated that the policy rate influenced the position of the return on capital employed. The study results suggested that the volatility in the monetary policy decisions results in volatility in the profitability of Nigerian banks. To minimize the volatility in return, this study suggested that the central bank of Nigeria should set effective, realistic, and thoughtful rates to enhance the profitability of Nigerian banks.

Inflation, GDP, and Exchange Rate on Bank Performance: Moyo and Tursoy (2020) conducted an empirical investigation to examine the impact of exchange rates and inflation on the operational efficiency of the South African banking industry. Their results revealed a significant negative relationship between Inflation and the banks' Return on Equity (ROE). However, they found no significant association between the exchange rate and the banks' ROE. In their study, Jackson et al. (2021) investigated the impact of inflation and exchange rates on the financial performance of banks operating within Sierra Leone. To assess financial performance, the authors utilized Return on Equity (ROE) and Return on Assets (ROA) as proxies. The

findings indicated the existence of a positive correlation between inflation and the performance of banks. The study by Abate and Mesfin (2019) investigated the determinants of bank performance in Ethiopia. The study revealed that GDP, inflation, and monetary rate had a statistically significant negative impact on the financial performance of banks operating in Ethiopia. Joanna (2020) examined the correlation between GDP and the quality of banks' loans to determine the direction of such a relationship.

This study involved an analysis of various empirical studies on the relationship. Their findings suggested a proven relationship existed between improvement in GDP and banks' loan quality. Gikombo and Mbugua (2018) examined the relationship between some macroeconomic factors that influence bank performance in Kenya. The macroeconomic factors considered included the exchange rate, Inflation, GDP, and the monetary Rate. ROA and ROE were used as measures of bank performance. The results suggested at all the macroeconomic factors examined significantly influenced the performance of banks. Atukalp (2021) examined the correlation between the stock market's performance and bank performance in Turkey. The analysis suggested that the stock market's performance did not have any material effect on the performance of banks in Turkey. Tan and Floros (2012) conducted research on the correlation between the financial performance of banks in China and factors such as stock market volatility, ownership makeup of the firm, and competitive environment. It was found that when there is high volatility in the stock index, the ROE of the bank increases, and excess return on equity increases. There were limited studies on the impact of national debt on bank performance. However, there were studies about the impact on the national debt from the performance of banks as government bailouts of non-performing banks.

Gerhardt and Vander Vennet (2017) analyzed the effect of government bailouts on banks' profitability and efficiency in Europe by comparing their performance before and after the bailout. Their results suggested no improvement in the financial position of banks after the bailout, which resulted in an increment in the national debt. Nigeria's economic stability resulting from the effect of the national debt was the subject of research by Onyele and Nwadike (2021). Their results suggested a long-run negative effect on economic growth when the national debt increases. In the short-run, national debt negatively affects economic stability. Ünvan and Yakubu (2020) investigated the determinants of deposit mobilization in Ghana's banking industry, with a particular focus on bank-level factors such as size, profitability, and liquidity that affect deposit mobilization while controlling for the macroeconomic variable of inflation. The study's results indicate that bank-specific factors significantly impact bank deposit mobilization. Furthermore, the study found an inverse relationship between inflation and the level of deposit mobilization by the banks. Macroeconomic factors are one of the significant variables that impact banks' performance in all areas of their operations. The impact of several macroeconomic variables has been researched in the literature using various analysis techniques. Among the common macroeconomic factors employed in empirical studies.

Include GDP, Inflation, Interest Rate, Exchange Rate, MPR, and growth in Money supply, among others. These variables are a reflection of the health of the economy which has significant implications on economic agents within the economy. The correlation between these macroeconomic variables and the performance of financial institutions should be extensively researched. Another area of concern is the frequency of data used in most of the empirical studies about the relationship between macroeconomic variables and bank performance. The majority of such studies utilized annual data (Alhassan et al., 2014; Chaibi & Ftiti, 2015; Messai & Jouini, 2013; Opoku-Asante, K, 2013; Winful et al., 2022). Other studies also employed quarterly data (Ghosh, 2017; Louzis et al., 2012; Staehr & Uusküla, 2020). This study utilized monthly data throughout the study period to aid in the identification of both immediate and prolonged effects. It is relevant to understand the impact of macroeconomic factors on deposit mobilization. That is because finance literature (Becker & Knudsen, 2002; Nyasha & Odhiambo, 2018; Sanusi, 2013; Schumpeter, 1911) argues that growth in the financial sector positively impacts national growth through an efficient mobilization of savings and allocation of resources to diversify risk. It also leads to an increased flow of liquidity in the economy and reduced transaction costs of accessing finance. Effective allocation of savings by banks leads to improved productivity and economic growth.

Theoretical Framework: Monetarism is concerned with the macroeconomic impacts of money supply and the function of central banks in an economic system. The theory is quite simple. An increase in the money supply would lead to an increase in consumer spending, while a decrease in the money supply would result in

a corresponding reduction in budgeted expenditures by individuals. In theory, this would influence aggregate demand. The Monetarist Economic theory guided the study as it examines the relationship between macroeconomic variables. This theory is based on the following prepositions. **1.** Inflation results from the Rate of growth in the money supply being higher than the Rate of growth in real output. This relationship is, however, a necessary condition for Inflation, but more is needed for an inflationary condition. **2.** A higher expected inflation will result in a higher nominal interest rate leading to a depreciation in the value of inflated currencies. Persistent Inflation leads to currency depreciation, while persistent disinflation results in currency appreciation. **3.** The impact of monetary expansion is initially observed in output before its effect on price levels. Steinreich (2022) summarised these three prepositions and causal relationships as unproportional increases in money supply lead to Inflation and higher normal interest rates. Unexpected increases in money supply lead to short-term increases in real GDP, and the reverse is also true.

The assertion put forward by Steinreich (2022) maintains that the roots of monetarism can be traced back to Richard Cantillon (1680-1734), who laid the foundation for the concept that an increase in the money supply would inevitably lead to a rise in demand and consequent inflation. This perspective was later developed and expanded upon by notable economists such as Henry Thornton (1760-1815), David Ricardo (1772-1823), and John Mill (1806-1873), who shared a common belief in the inflationary consequences of monetary expansion. In addition to the aforementioned, Steinreich (2022) contended that the long-term impact of the relationship between money supply, demand, and inflation on macroeconomic stability was examined by Irvin Fisher (186-1947). Nevertheless, the work of Milton Friedman and Anna Schwartz in "The Monetary History of the United States (1867-1926)" advanced and refined the Monetarist theory to its current understanding. The research conducted by Friedman and Schwartz provided valuable empirical evidence to support the Monetarist position and solidified its place as a significant school of economic thought.

3. Methodology

In this section, we briefly describe the estimation technique adopted, the study's model, the data sources, and the variables employed in the study. The study adopted the co-integration method to answer the study questions. This method was adopted because it can be used to discover relationships between variables that have theoretical interpretations. Also, the method allows for estimating economic models and testing certain theoretical hypotheses (Lewis-Beck et al., 2004). A co-integration analysis is critical to this study as it allows for the interpretation of economic models as structural equations, and it is extremely consistent. It suggests that even with a small sample, the analysis can be very informative about the co-integration relations (Lewis-Beck et al., 2004). According to Sage's Encyclopaedia of social science, when a linear combination of nonstationary variables is stationary, these variables are cointegrated. Also, the vector that identifies the stationary linear combination becomes the co-integration vector. This method allowed the researchers to establish a long-term relationship between the study variables, with any short-term deviation being stationary.

The study variables are nonstationary macroeconomic variables and can meet the random walk description as such regression models on such nonstationary variables break down. Regressing one nonstationary series on another nonstationary series can result in spurious results (Cromwell et al., 1994). Differencing the variables before regressing also can potentially lose some relevant information, which is undesirable in this case. This study assessed the determinants of deposits in Ghana. Deposit refers to the total deposits in banks, savings and loan companies, rural banks, and microfinance institutions. The research used time series data on macroeconomic variables over six years, from 2015 to 2020. This period provided sufficient observations to estimate the parameters of the econometric model with reasonable accuracy. With a shorter study period, data would have been insufficient to identify the long-run relationships among the variables. In comparison, a longer period could have been affected by structural changes in the economy that could invalidate the assumptions of the cointegration approach. The study period assisted the researchers in capturing the data's cyclical and seasonal patterns.

Macroeconomic variables such as GDP, inflation, and interest rates often exhibit cyclical and seasonal patterns that may affect the long-run relationships among the variables. We were able to capture multiple cycles and seasons, improving the robustness of the econometric results. Gretl was employed for the analysis

of the data due to its superior analytical capacity in econometrics variables. The macroeconomic variables used in this study were Inflation (I), Monetary policy rate (MPR), Gross International Reserve (GIR), Public debt (PD), Gross Domestic Product (GDP), GSE All share Index (GASI), Rate of change in Total Money supply (M2+), and deposits in the banking sector (TD). We adopted the model employed by Larbi-Siaw and Lawer (2015).

$TD_t = \int(I, MPR, GDP, GIR, PD, GASI, M2)$ ---------- (1)

TD is the dependent variable, representing all banking deposits in all banks, savings and loans, rural banks, and microfinance institutions, be it savings, demand deposits, or fixed deposits. The independent variables were Inflation (I), monetary policy rate (MPR), Gross Domestic Product (GDP), Gross international reserve (GIR), Public debt (PD), GSE All share Index (GASI).

Change in Total money supply (M2+), From our review of the literature, we expected an inverse relationship between deposits in the banking sector (TD), Inflation (I), Public debts (PD), and GSE All Share index (GASI). Inflation was expected to negatively relate to deposits as higher prices lead to more money chasing the same goods. As such, more money is expected to move from the banking sector when Inflation increases. As the government borrows more from the public market, we expect an inverse effect on the level of deposits in banks. An increase in the All-share index attracts investors to withdraw savings and invest in stock markets leading to a decline in the level of banks deposit. We also expected a positive relationship between deposits in the banking sector (TD) and the monetary policy rate (MPR), Gross International Reserve (GIR), Gross Domestic Product (GDP), and Change in Total Money Supply (M2+). Table 1 shows the study variables with the expected direction of the relationship and the measurement unit for each of them.

Table 1: Study variable, Unit of Measure, and Expected Direction

Study Variable	Unit of Measure	Expected Direction
TD	Currency (GHC)	
I	Percentage	Negative
PD	Currency (GHC)	Negative
MPR	Percentage	Positive
GDP	Numeral	Positive
GIR	Numeral	Positive
GASI	Numeral	Negative
M2+	Percentage	Positive

The study variables under consideration are examined against time to determine a trend of I, MPR, GDP, GIR, PD, GASI, M2+, and TD. This research utilized monthly data for six years from 2015 to 2020 obtained from the Bank of Ghana monetary time-series database. Since monthly data includes short-term economic fluctuations that annual data might overlook, it paints a more accurate picture of the state of the economy. Monthly data can provide a more detailed analysis of economic trends and patterns, allowing for a more nuanced understanding of the economy. Also, monthly data leads to improve economic forecasting by providing more timely and accurate information about economic trends. That is particularly important for policymakers who need to make decisions considering all economic conditions. Using monthly data ensured a more accurate and detailed analysis of the macroeconomic relationship at play in Ghana.

4. Data Analysis and Findings

The study presented a graphical analysis of the data to determine the trend of movement among the study variables. It also examined the trend of the individual study variables. These graphical analyses are presented in Figures 1 and 2.

Figure 1: Relationship between Study Variables

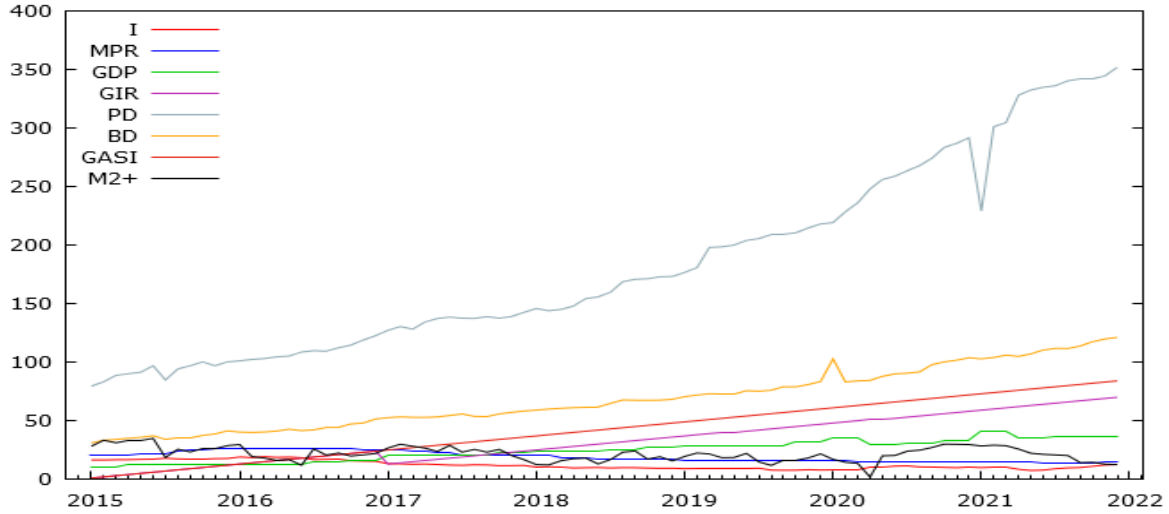
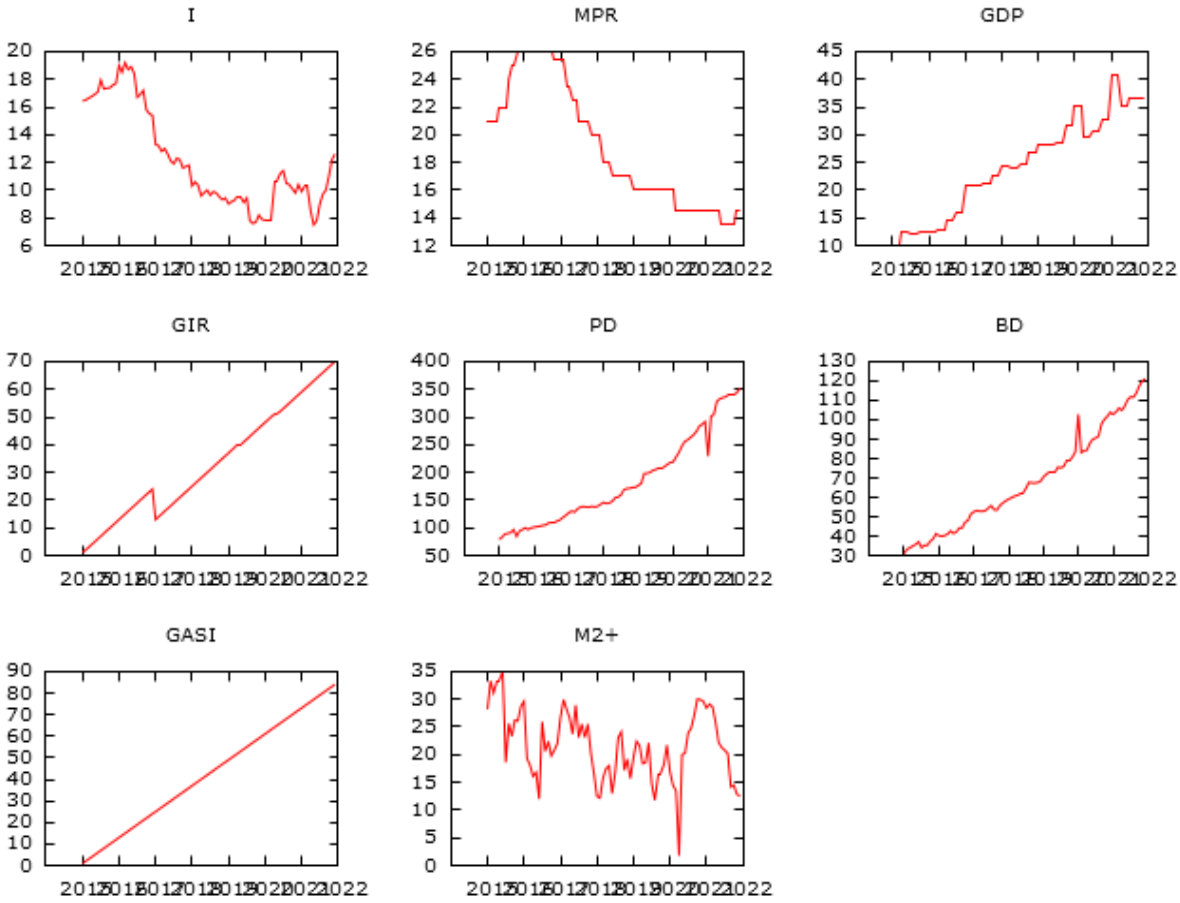


Figure 2: Trend of Study Variables Individually



Augmented Dicky Fuller Test (ADF): We used the ADF test to determine whether the study variables are stationary, analyzing stationery in the study data series and avoiding any autocorrelation in the study variables. ADF is a unit root test and a statistically significant test for determining stationarity in the variables. The results are summarized in Table 2.

Table 2: ADF Test for Unit Root

Variable	P- Value	Level of Integration
I	0.988	I(1)
PD	0.875	I(1)
MPR	0.217	I(1)
GDP	0.753	I(1)
GIR	0.734	I(1)
GASI	0.248	I(1)
M2+	0.127	I(1)
TD	0.922	I(1)

When conducting an Augmented Dickey-Fuller (ADF) test, the null hypothesis is formulated based on the assumption that a unit root is present in the time series data. As summarised in Table 2, the ADF results showed that the p-value for the dickey-fully unit root test is large for all the study variables. As such, we fail to reject the Null hypothesis for all the study variables. The study variables are nonstationary. The variables had to be differenced to make them stationary. That indicates that d=1 in all the study series. We performed the co-integration regression using the total deposit as the dependent variable, as all variables are integrated in the same order using the Engle-Granger Test.

Engle-Granger Test: The Engle-Granger test is used to test the co-integration relationship between the study variables in the long run. This method assumes variables to be stationary at the same level. The Engle-Granger test involved determining a static regression model with bank deposits as the dependent variable and running an auxiliary time series to test whether the residuals are stationary. The result of the Engle-Granger test is summarised in Table 3.

Table 3: Engle-Granger Test

	Coefficient	Std. Error	T-ratio	P-value
Const	−2.60363	5.57835	-0.4667	0.6420
I	0.617822	0.295406	2.091	0.0398
MPR	-0.005165	0.188052	-0.02747	0.9782
GDP	0.828203	0.196760	4.209	0.0000
GIR	0.145065	0.150818	0.9619	0.3392
PD	0.127329	0.2200203	5.782	0.0000
GASI	0.300418	0.169951	1.768	0.0811
M2+	0.106906	0.0602488	1.774	0.0800

Engle-Granger Test results indicated that the calculated test statistic value of -7.46091, with an associated p-value of 0.0002, is statistically significant at the 5% level. As a result, we rejected the null hypothesis, which assumes the presence of a unit root in the time series data. Therefore, we concluded that the series exhibit cointegration. The regression coefficients suggested that changes in total deposits in the banking sector in Ghana are significantly and positively influenced by the Rate of Inflation (I), Gross Domestic Product (GDP), and Public Debt level (PD). That indicated that these are the major determinants of total deposit levels in the Ghanaian banking sector. Monetary policy rate had an insignificant negative relationship with deposit levels in banks in Ghana, suggesting that it does not influence the level of deposits. Similarly, Monetary Policy Rate, Gross International Reserve, GES All Share Index, and percentage change in money supply were insignificant relative to total bank deposits but positively related. All had no major influence on the level of deposits in banks in Ghana. The descriptive statistics of the Engle-Granger test are presented in Table 4.

Table 4: Descriptive Statistics – Engle-Granger Test

Statistic	Coefficient	Statistic	Coefficient
Mean dependent var	68.23333	Log-likelihood	-200.4169
S.D. dependent var	25.53343	Akaike criterion	416.8339
Sum squared resid	581.0120	Schwarz criterion	436.2804
S.E. of regression	2.764940	Hannan-Quinn	424.6512
R-squared	0.989263	Rho	0.178845
Adjusted R-squared	0.988274	Durbin-Watson	1.619854

Estimating the Error Correction Model: We examined the short-run error correction model embedded in the relationship between I(0) variables of our co-integration relationship. The error correction models were used to estimate the speed at which deposits in the banking sector return to equilibrium from changes in the I, PD, MPR, GDP, GIR, GASI, and M2+. This model enabled us to analyze the short-run effect of the study variables. We utilized the residuals from the ordinary least square model as e_1. We also defined the first differentiation of the study variable as d_TD, d_I, d_PD, d_MPR, d_GDP, d_GIR, d_GASI, and d_M2+. We lagged each variable by 1 represented as d_TD_1, d_I_1, d_PD_1, d_MPR_1, d_GDP_1, d_GIR_1, d_GASI_1, d_M2+_1. Table 5 displays the outcome of the error correction model.

Table 5: Result of Error Correction Model

	Coefficient	Std. Error	T-ratio	P-value	
d_GASI_1	1.57641	0.472486	3.336	0.0013	***
d_I_1	−0.262474	0.509942	−0.5147	0.6083	
d_MPR_1	0.259568	0.587957	0.4415	0.6602	
d_GDP_1	−0.479569	0.282002	−1.701	0.0933	*
d_GIR_1	−0.140915	0.272488	−0.5171	0.6066	
d_PD_1	−0.0689878	0.0360108	−1.916	0.0593	*
d_M2+_1	0.0830009	0.0753923	1.101	0.2745	
e_1	−0.636669	0.185104	−3.440	0.0010	***
d_BD_1	−0.0294727	0.136911	−0.2153	0.8302	

The variable of interest in this error correction model is e_1, which is, in this case, statistically significant. The p-value for e_1 is 0.0010, which means that bank deposit is strongly exogenous and moves to restore equilibrium with the other identified determinants of bank deposit level in Ghana. The e_1 coefficient of -0.637 also explains the speed of adjustment in the short-run towards the long-run equilibrium through several short-run partial adjustments. Table 6 displays the descriptive statistics of the error correction model.

Table 6: Descriptive Statistic of Error Correction Model

Mean Dependent Var	1.070732	S.D. Dependent Var	3.366630
Sum squared resid	620.9121	S.E. of regression	2.916444
R-squared	0.323677	Adjusted R-squared	0.249559
F(8, 73)	4.367065	P-value(F)	0.000242
Log-likelihood	−199.3562	Akaike criterion	416.7125
Schwarz criterion	438.3730	Hannan-Quinn	425.4088
Rho	−0.035880	Durbin-Watson	2.054624

5. Conclusion

The ADF results suggested that the study variables of I, PD, MPR, GDP, GIR, GASI, M2+, and TD were nonstationary. They, however, became stationary after the differentiation. Only I, GDP, and PD levels were found to have significant positive effects on the level of deposits in the banking sector in Ghana. Growth in GPD significantly improves the level of deposits in banks in Ghana. The co-integration regression suggested a long-run negative relationship between the monetary policy rate and total deposits in the banking sector, although be it insignificant. This relationship is consistent with the findings of Drechsler et al. (2017), although they observed a significant relationship. The results also suggested an insignificant positive long-run relationship between Gross International Reserve, GES all share index, and change in money supply and total deposits in the Ghanaian banking sector. This relationship is contrary to Larbi-Siaw and Lawer (2015), who using annual figures, found a negative relationship between changes in money supply, GES all share index, and monetary policy rate and deposits in the banking sector in Ghana. In the immediate term, the significance of the error correction term facilitates a prompt convergence toward the long-run equilibrium.

That suggested that a long-run equilibrium influences the movement of the study variables. The GES all-share index in the short term significantly positively relates to total deposits in the banking sector in Ghana. However, in the distant future, the GES all-share index did not significantly influence the demand levels in banks, although the relationship is still positive. Further analysis of the study variables in the light of the monetary theory of economics can be used by policyholders as a measure to control the inflation rate. For a developing country like Ghana, the findings suggest a comprehensive economic reform policy of a mixture of monetary and fiscal policies as well as structural policies to reduce inflation and national debt to promote economic growth. An increase in the monetary policy rate could lead to a reduction in inflationary pressure and stabilize prices. As per the study findings, such a policy will lead to a decline in bank deposits but will increase confidence in the economy, which has the potential for increased investment and savings.

Fiscal policies such as reducing public spending and increasing tax revenues can help reduce budget deficits and borrowing needs, thereby reducing public debt. That could also promote greater macroeconomic stability and improve the efficiency of the financial system. Structural policies such as promoting greater financial inclusion and financial education, expanding infrastructure, and reducing bottlenecks to trade and investment can help nurture economic growth and long-term development. This could create a more favorable environment for savings and investments and further stimulate economic activity. Reduced inflation may come with some short-term adjustment costs, like a drop in total bank deposits and increased uncertainty among investors and consumers. However, over the long run, these measures might support increased fiscal stability, lower levels of public debt, and advance sustainable economic growth and development.

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Tax Morale and its Drivers: Empirical Evidence from Ghana

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Abstract: Using the binary logistic regression model, this study analyzes the statistical relationships between tax morale and its drivers as developed by the World Values Survey (WVS) on 1,552 respondents in Ghana between 2010 and 2014. The findings show that age has a significant positive relationship with tax morale, whereas participation in national-level elections also has a significant positive relationship with tax morale. Secondary education and above have a positive relationship with tax morale, but the relationship is negative below secondary education. One's employment status has a positive but insignificant relationship with tax morale, but income factors have a negative relationship. Confidence in government and parliament has a positive but insignificant relationship with tax morale. Finally, preference for the redistribution of wealth has a significant positive relationship with tax morale, while trust in others has an insignificant positive relationship with tax morale. The study provides country-specific drivers of tax morale (with expanded variables) and their relationships with tax morale in direct response to a suggestion by Daude, Gutiérrez, & Melguizo in their study in 2012 and as an improvement upon a similar study conducted in Ghana by Ibrahim, Musah, & Abdul-Hanan in 2015.

Keywords: *Tax Morale, Tax Morale Drivers, Tax compliance, World Values Survey, Binary Logistic Regression Model, Ghana.*

1. Introduction

Tax researchers, administrators, and policymakers view the imposition of a tax and the associated revenues as one of the most significant contributors to economic growth (Filippin, Fiorio & Viviano, 2013). Governments can only obtain the funds required to invest in development, provide public services, alleviate poverty, and build the social and physical infrastructure necessary for sustained economic growth through the collection of taxes. However, numerous developing nations require assistance to increase domestic tax mobilization efforts (Daude et al., 2012). According to the IMF (2018), the tax-to-GDP ratio of sub-Saharan African nations is significantly lower than that of most developed nations, at less than 20 percent. A small tax base, a substantial informal sector, insufficient governance and administrative competence, low levels of per capita income, domestic savings and investment, and likely tax evasion by elites are some of the challenges faced. Several nations, the majority of which are in Sub-Saharan Africa, collect less than 17% of their gross domestic product (GDP) from taxation. The significant disparity between (low) tax enforcement policies and (high) tax compliance behaviors has recently emerged as an extensive and expanding topic of discussion in tax studies.

Numerous developing nations require assistance to address the problem posed by taxpayers who do not comply with their tax obligations (Horodnic, 2018). Even though compliance varies widely from country to country, and is frequently low, the low compliance rate is accurate. It is hard to believe that government operations in enforcement can only account for high compliance rates (Alm & McClellan, 2012). Several decades after its initial publication, the neoclassical method proposed by Allingham and Sandmo (1972) served as the standard economic model of tax noncompliance. The theory assumes that taxpayers are rational agents who maximize the utility of their taxable income by comparing the benefits and costs of complying with tax laws against the gain of avoiding paying those taxes (Lisi, 2015). Noncompliant taxpayers, therefore, engage in noncompliance when both the anticipated penalty and the risk of getting caught are relatively low in comparison to the benefit they obtain from noncompliance. As a result, governments and tax revenue administrators have devised methods to deter noncompliance by introducing and increasing both the penalties for non-compliant taxpayers and the perceived likelihood of being detected (Blaufus, Braune, Hundsdoerfer & Jacob, 2015).

Problem Statement: To address the issue of tax noncompliance, tax researchers, policy makers and administrators have incorporated non-financial factors into their economics-of-crime model to provide a more holistic explanation of the drivers of tax compliance behavior. Nonetheless, the United Nations has determined that this is the minimum requirement for achieving the Millennium Development Goals (OECD, 2019). Nevertheless, compliance levels in most developing nations rarely reached the level predicted by conventional economic theory. The "intrinsic motivation" defined as inherent traits which drive individuals to pay their taxes without the application of force, also known as their "tax morale" (Lubian & Zarri, 2011), is a desirable strategy in the fight against tax noncompliance. Moreover, if cultural norms and beliefs influence the propensity of taxpayers to pay or not pay, and if these limits vary from country to country, this may influence taxpayer compliance (Alm & McClellan, 2012). Governments, tax revenue administrators, and other stakeholders around the world would benefit from a deeper understanding of the drivers of tax morale, their relationships with tax morale, and the reasons why individuals choose to participate in and comply with a country's tax system.

Both the Addis Ababa Action Agenda (AAAA) and the Sustainable Development Goals (SDGs) have emphasized and highlighted the significance of tax revenue for developing economies (OECD, 2019). This policy area has held an important place in the realm of vital policy throughout history and will continue to do so for the foreseeable future, given that taxation enables a state or government to function and fulfill its mandate. Even though there is ample empirical research on the drivers of tax morale (Bilgin, 2014; Chong & Arunachalam, 2018; Daude et al., 2012; Ibrahim, Musah & Abdul-Hanan, 2015; Luttmer & Singhal, 2014; Torgler, Demir, Macintyre & Schaffner, 2008; Trüdinger & Hildebrandt, 2013), the vast majority of the findings from these studies are frequently contradictory and inconclusive and largely apply to developed economies with highly effective tax administrations. In Ghana, tax evasion is one of many issues the Ghanaian tax administration must address (Ameyaw & Dzaka, 2016; Armah-Attoh & Awal, 2013; Ibrahim et al., 2015). Tax evasion is widespread because there are insufficient effective monitoring mechanisms for tracking tax income from tax officials and taxpayers. Multiple Ghanaian media outlets portray tax evasion as a significant economic burden for the nation (Ameyaw & Dzaka, 2016). By engaging in multiple dishonest practices, such as sending fraudulent tax payment receipts to taxpayers, taxpaying citizens view tax officers as tax evasion facilitators (Armah-Attoh & Awal, 2013).

Considering the obstacles to tax compliance, the purpose of this study is to provide a contrast between the existing studies on tax morale drivers, and emerging economies using Ghana as the case study. In addition, prior research has demonstrated that demographic, socioeconomic, and institutional factors play a role in determining the propensity of individuals to pay taxes. To provide a further understanding of country-specific drivers of tax morale, a recommendation was made for a more comprehensive study to determine developing country-specific tax morale drivers (Daude et al., 2012). To fulfill the WVS's recommendation on the need for further research into country-specific drivers of tax morale, this study employs the binary logistic regression model to analyze the data of reputable polls of public opinion conducted by the WVS between 2010 and 2014 with 155 respondents on tax morale variables (sociodemographic, educational attainment, employment, economic, trust, political involvement, democracy, and conditional cooperation) in Ghana to establish statistical relationships between these independent variables and tax morale specific to Ghana. By employing the binary logistic regression model to determine developing country-specific relationships between tax morale and its drivers, this study contributes to the existing body of knowledge on tax morale by filling this gap in the literature and provides additional impetus for the ongoing research and debate on the drivers of tax morale.

2. Review of Literature

Schmolders, (1960) and Strümpel (1969) of the Cologne School of tax psychology provided the foundation for the study into tax morale. They determined that "tax morale" was a defining factor in tax compliance behavior, but tax academics since then, have paid little attention to it for several decades (Alm & Torgler, 2004). According to these researchers, economic events require a broader lens than the traditional neoclassical one (Williams & Krasniqi, 2017). This is an important element of tax compliance behavior. In the 1990s, there was a rise in focus on tax morale, and it has become a central issue in empirical studies on tax compliance (Torgler, 2011). According to Luttmer and Singhal (2014), "tax morale" encompasses all non-

maximizing expected utility-based variables and motivations for tax compliance. They argue that individuals may pay taxes out of a sense of obligation or guilt. Individuals may comply with tax obligations if they are willing to pay taxes in exchange for benefits the state provides them or others, even if their financial gain would increase without honoring tax obligations. In addition, Luttmer and Singhal (2014) found that tax morale can be affected in two ways: first, by an individual's choices, and second, by designing government policies that cater to those interests.

According to them, tax morale is influenced by five distinct but interconnected mechanisms, each of which can operate independently but also interact and overlap with one another. There are five categories of mechanisms: "intrinsic motivation," which refers to how much a person is willing to pay in taxes; "reciprocity," which refers to how a person's relationship with the state affects the additional utility of tax payments; and "external motivation," which refers to how much a person is willing to pay in taxes. The third is peer effects and social influences, which determine the added value of a tax payment based on the opinions or actions of others. The fourth factor is long-term cultural influences on a person's desire to pay taxes. Misinformation and deviations from the objective of maximizing utility constitute the fifth mechanism. In a nationwide survey, Dorrenberg and Peichl (2018) examined the effects of progressive taxation on individual tax motivation and found that women and married individuals pay more federal and state taxes than men and single individuals. In addition, religiosity, patriotism, retirement, and employment had a positive impact on tax morale. According to Dell'Anno (2009), tax evasion is primarily caused by a lack of tax morale, as attitudes regarding honesty and social shame have a direct impact on tax morale. His model also takes into account the efficacy of policymakers in mitigating the effect of significant economic and institutional factors on tax evasion.

Madi et al. (2010) also investigated the level of tax return filing readiness required of individuals. This study focuses primarily on the Self-Assessment System (SAS) implementation in Malaysia. To determine taxable income, a series of questions based on the concept of tax literacy were administered to evaluate the individual's understanding of tax terms, deductions, and exemptions. Lago-Peas and Lago-Peas (2010) provide a summary of findings from earlier studies indicating that several factors influence tax morale. However, education and self-employment had adverse effects on tax morale. Age, religiosity, financial strain, and agreement with government decisions are all factors that improve tax morale. They contend that a rise in tax morale leads to increased tax compliance. Yew, Milanov, and McGee (2015) used an ordered probit regression model to examine the influence of sociodemographic and institutional factors on the tax motivation of Russian individuals. Their research revealed a negative correlation between the incentive to pay taxes, a person's industry of employment, and income level. Institutional factors boost tax morale, whereas sociodemographic factors have variable effects on tax morale. Ibrahim et al. (2015) investigated the factors that influence Ghanaian citizens' desire to pay taxes. They discovered a nonlinear relationship between age and tax morale in their investigation. Tax morale was unaffected by education level, marital status, patriotism, the industry of employment, satisfaction with democracy, and religious significance.

If people were content with their financial situation, trusted the government, and respected the legislature, their socioeconomic status had little effect on their willingness to pay taxes. Kemme, Parikh, and Steigner (2020) conducted a study to determine whether low tax morale is related to domestic tax evasion. Their research indicated that international stock transfers could lead to tax evasion in nations with a low tax culture. The findings demonstrated that individuals in nations with low tax morale engage in tax evasion by using tax havens as a return route. Furthermore, they discovered that foreign investors pay lower taxes than domestic investors to take advantage of tax breaks available to domestic investors (Kemme et al., 2020). Cyan, Koumpias, and Martinez-Vasquez (2016) examined the factors that influence the attitudes of Pakistani taxpayers toward tax compliance. They relied on information from a 2014 survey of Pakistani taxpayers conducted by the Federal Board of Revenue. The analysis of the data using a binary probit regression model revealed that Pakistani citizens with a lower likelihood of employment hold a more favorable view of tax compliance. In addition, those with a bachelor's degree had higher tax morale than those with a low or high level of education, relative to illiterate individuals. In addition, the study revealed that females have a significantly more positive attitude toward tax payments than males. Nonetheless, as time passed, their attitudes toward tax compliance deteriorated to the point where elderly males have a more positive view of taxes than elderly females.

Using data from the World Values Survey, Daude et al. (2012) investigated the factors that influence tax morale globally, with a focus on developing nations. According to this study, various social and economic factors, such as satisfaction with democracy, trust in government, and satisfaction with the value of public services, have a substantial effect on taxpayer attitudes toward taxes. Leonardo and Martinez-Vazquez (2016) created a conceptual model that examined the effects of morality and tax evasion on the equity of the tax system. This study indicates that tax evasion decreases as its social and moral costs increase. A person with a high income would have a harder time evading taxation and would pay more tax as a result. There is a positive correlation between tax morale and sociodemographic factors such as education, income, life satisfaction, and age, but it tends to be lower among the upper social class and higher among women and married people. Pensioners have higher tax morale than part-time workers, self-employed individuals, students, the unemployed, housewives and housekeepers, and those who engage in undeclared work.

Horodnik (2018) conducted a systematic review of the elements within informal institutions that influence tax morale and discovered that cultures, subcultures (within countries), communities, and social groups had relationships with tax morale, implying that the actions of others in a community can affect people's attitudes toward paying their fair share of taxes. According to the study, disobedience to the law is socially unacceptable, and those who disobey the law are viewed with contempt by society. Due to a lack of horizontal trust in society, the tax morale of honest taxpayers decreases when they believe that a substantial percentage of the population evades taxes. Age, education, income, and life satisfaction impact the motivation to pay taxes. Individuals in the upper socioeconomic classes have a lower tax attitude. In general, women and married people have a greater tax attitude. Self-employed individuals, part-time employees, students, housewives and housekeepers, the unemployed, and individuals performing undeclared labor pay lower tax rates than retirees. Alasfour, Samy, and Bampton (2016) investigated the factors influencing tax avoidance and compliance in Jordan and found that the level of corruption within a government influences tax morale and compliance.

This study demonstrates that tax evasion is frequently used as an excuse for wasteful government spending. In addition, public mistrust in tax systems and the government due to a lack of transparency and accountability regarding public funds increases tax evasion. In addition, the economic outputs of legislators are the primary factors upon which taxpayers base their opinions regarding the payment of taxes, according to the study. If taxpayers see and benefit from economic outputs such as improved health care, roads, low fuel prices, low prices for goods and services, etc., they are less likely to avoid paying taxes. Nyamapheni (2021) examined the factors that affect tax morale in Zimbabwe and South Africa and discovered that despite having lower living standards than South Africans; Zimbabweans have higher tax morale. According to the study, tax morale is affected by several country- and economy-specific variables. Corruption, a problem in both nations, has had a substantial effect on tax compliance. All logistic regression models demonstrate that demographic factors have a negligible impact on tax morale. The investigation into the factors that influence tax morale identified hunger as a major factor. In Zimbabwe, the study found a correlation between hunger and low tax morale, whereas, in South Africa, the hunger variable was insignificant.

3. Methodology

The WVS, which was conducted in several countries around the world, is the study's primary data source. The survey is a global research project that investigates people's values and beliefs, how they have changed over time, and how they affect society and politics. Since 1981, a group of social scientists from all over the world has done national surveys in at least 100 countries. Therefore, the World Values Survey is the only source of empirical data on attitudes that is representative of a sizeable portion of the global population (nearly 90 percent). The first wave of the WVS was conducted from 1981 to 1984, while the second wave was conducted from 1990 to 1993. The third, fourth, and fifth were conducted between 1995 and 1997, 1999 and 2001, and 2005 and 2008, respectively. The sixth study wave was finally conducted between 2010 and 2014. The subsequent survey, dubbed Wave 7, conducted between 2017 and 2022, did not include Ghana; hence, data was limited to Wave 6, conducted between 2010 and 2014. This research made use of the sixth wave of the WVS. The data from the World Values Survey can be utilized to construct a global picture of tax morale. Depending on the level of education of the interviewee, face-to-face interviews are conducted in the respondents' respective national or local languages at their homes.

The surveys are conducted by reputable scientific institutions with a solid international reputation. Under the ethical principles and norms section, the dependent variable tax morale was represented by the statement, "If I had the opportunity, I would cheat on my taxes." Responses ranged from 1 (never justifiable) to 10 (always justifiable) on a Likert scale of ten points, with 1 representing never and 10 representing always. The tax morale proxy variable was reconstructed as a dummy variable, with a value of 1 indicating respondents who selected one on the scale and a value of 0 indicating respondents who selected two to ten. Individuals who engage in tax evasion and continue to justify it are deemed to have low tax morale. Individuals with high tax morale are opposed to tax evasion and will never rationalize tax evasion. The eight categories of explanatory variables were sociodemographic factors, educational factors, employment factors, economic factors; trust in government factors, political involvement factors, democratic factors, and conditional cooperation. A micro econometric study allowed for the investigation of the relationships between these variables and the tax evasion justifications of individuals. The first explanatory variable consisted of sociodemographic variables such as gender, age, health status, marital status, and religiosity. Educational attainment factors, the second explanatory variable of the study, examined education from five perspectives: no formal education, below primary education, primary education, and tertiary education.

Employment factors including paid employment (i.e., whether they are working in a paid or income-generating profession) and chief wage earner employment were the third explanatory variable for the study (i.e., the current employment status of the chief wage earner of the household). The fourth explanatory variable was economic variables, which quantified the cash income of respondents. The fifth explanatory variable was trust in government factors, which pertain more specifically to government characteristics. Both confidence in the government and the legislature contribute to confidence in the government. The sixth factor examined respondents' participation in local and national elections. The seventh explanatory variable was democratic factors, such as the level of trust individuals have in the democratic system and whether taxing the wealthy and subsidizing the poor is an essential characteristic of democracies. It also describes the participation of respondents in local and national elections. Numerous studies (Bilgin, 2014; Chong & Arunachalam, 2018; Daude et al., 2012; Ibrahim et al., 2015; Luttmer & Singhal, 2014; Torgler et al., 2008; Trüdinger & Hildebrandt, 2013) on the factors that contribute to tax morale influenced the selection of these seven explanatory variables. This study utilized binary logistic regression analysis for its data analysis. Due to the dichotomous nature of the dependent variable, tax morale, binary logistic regression (a probability model) was utilized.

To identify the factors that contribute to tax morale, we hypothesized that the decision of whether to pay taxes is determined by a latent (unobservable) variable known as tax morale. The general model for logistic regression is denoted by:

$$Y_i^* = P(y_i^* = 1/X_i) = \alpha + \Sigma\beta_i X_i + \varepsilon_i \quad (1)$$

α is the constant, β_i is the regression parameters, and ε_i is the error term that follows the normal distribution $N(0,1)$, Y_i^* represents the dependent variable, and X_i represents the independent variables.

Tax Morale is expressed in the study as follows:

$$\text{TaxMorale} = F\begin{pmatrix} Gender,\ Age,\ Health,\ MaritalStatus,\ Religiousity,\ Education,\ PaidEmp,\ WageEmp, \\ CashIncome,\ FanSat,\ ConfGov,\ ConfParl,\ LocElect,\ NatElect,\ SuppDem, \\ PrefRed,\ TrustInOthers \end{pmatrix}$$

Tax morale is alternatively expressed as:

$$\text{TaxMorale} = P(\text{TaxMorale} = 1/X) = \alpha_i + \beta_2 Gender + \beta_3 Age + \beta_4 Health + \beta_5 MaritalStatus + \beta_6 Religiosity$$
$$+\beta_7 Education + \beta_8 PaidEmp + \beta_9 WageEmp + \beta_{10} CashIncome + \beta_{11} FanSat + \beta_{12} ConfGov + \beta_{13} ConfParl$$
$$+\beta_{14} LocElect + \beta_{15} NatElect + \beta_{16} SuppDem + \beta_{17} PrefRed + \beta_{18} TrustInOthers + \varepsilon_i$$

P (TaxMorale = 1/X) is the probability that an individual is willing to pay tax.
Gender is the gender of the respondents.
Age represents the age of the respondent.

Health represents the health status of the respondent.
Marital status is the marital status of respondents.
Religiosity represents how active respondents are in religious groups.
Education is the educational level of respondents.
PaidEmp represents paid employment which considers respondents that were categorized as part-time, full-time, and self-employed.
WageEmp represents if the chief wage earner of the household is currently employed.
Cash income is the cash income of respondents.
FanSat represents how satisfied respondents are with their current financial status.
ConfGov represents confidence in government.
ConfParl represents confidence in parliament.
LocElect represents the participation of respondents in local elections.
NatElect represents the participation of respondents in national elections.
SuppDem represents the perception of respondents regarding the support for a democratic political system.
PrefRed represents the preference for redistribution, thus whether the governments tax the rich and subsidize the poor.
TrustInOthers represents the trust that respondents have in other people.

Scope and Limitation of the Study: The study is restricted to the opinions obtained from the World Values Survey from a survey of 1,552 Ghanaian respondents interviewed between 2010 and 2014. The available survey data from 2017–2022 do not include data on opinions in Ghana, so they could not be used for this study. However, a review of the ongoing WVS with Ghana data began in 2019 and is expected to be completed in 2023, preventing its use in this study. Due to the availability of data, the scope of this study is restricted to the drivers of tax morale obtained from 2010 to 2014. Individuals' perspectives on tax obligations may have changed during and after the COVID-19 pandemic, which could render the findings out of sync with contemporary trends. It is believed that the cost-of-living crisis has affected people's attitudes toward their tax obligations, especially in developing nations where tax morale is generally low compared to developed nations. The established drivers of tax morale may have evolved to include new variables, while some of the existing variables may no longer serve as accurate predictors of an individual's tax morale.

4. Results and Discussion

This section presents the results for the descriptive statistics based on WVS data. The results for the descriptive statistics for the variables used in the model are presented in Table 1.

Descriptive Statistics: The findings of the 1,552 respondents revealed that 68.7% had good tax morale, 31.3% would always avoid taxes, 50.3% were male, and 49.7% were female. The educational attainment variable revealed that 7% had no formal education, 12.8% had lower than primary, and 43.2% had their highest level of education be primary. 60.2% were employed, 39.8% were not employed, and 61.3% had never gone without cash income. 95.1% supported taxing the rich to support the poor, while 90.3% disagreed.

Table 1: Descriptive Statistics for Variables

Variable	Mean	SD	Minimum	Maximum
Dependent Variable				
Tax Morale	0.687	0.464	0	1
Independent Variables				
Sociodemographic				
Gender	0.503	0.500	0	1
Age	30.925	12.703	18	82
Health Status	0.887	0.316	0	1
Marital Status	0.421	0.494	0	1
Religiosity	0.695	0.461	0	1
Educational Attainment				
No formal education	0.070	0.255	0	1

Variable	Mean	SD	Minimum	Maximum
Lower than primary	0.128	0.334	0	1
Primary	0.432	0.496	0	1
Secondary	0.063	0.242	0	1
Tertiary Education	0.070	0.255	0	1
Employment Status				
Paid employment	0.602	0.490	0	1
wage earner employment	0.879	0.326	0	1
Economic				
Cash income	0.613	0.487	0	1
Financial satisfaction	0.041	0.199	0	1
Trust				
Confidence in government	0.587	0.493	0	1
Confidence in parliament	0.542	0.498	0	1
Political Involvement				
Local level elections	0.540	0.499	0	1
National level election	0.685	0.465	0	1
Democratic				
Support for democracy	0.951	0.216	0	1
Preference for redistribution	0.097	0.296	0	1
Conditional Cooperation				
Trust in others	0.117	0.322	0	1

Tax Morale and Socio-Demographic Factors: Gender does not have a significant effect on tax morale, but the age of respondents has a significant and positive effect. Health status also has a negative effect, suggesting that an increase in the health status of citizens will increase their tax obligations. Tie taxes to government expenditures, especially health expenditures, may make people more willing to pay more taxes. Religious practices may restrict criminal behavior, but there is insufficient data to support the claim that religiosity affects tax morale.

Tax Morale and Educational Attainment: Educational attainment does not influence tax morale, while secondary and tertiary education positively affects it. Torgler and Schaltegger (2006) argue that educated taxpayers have higher knowledge of tax laws and fiscal relations.

Tax Morale and Employment Status: The study found no significant relationship between employment and tax morale, with a positive relationship between paid and wage-earner employment. Occupational status is not significant, except in transitional countries where it is predominantly significant with a negative sign.

Tax Morale and Economic Factors: According to the results of the probit model, there is no significant relationship between economic factors and tax morale. The results corroborate the findings of Bilgin (2014), who examined the determinants of tax morale in Turkey and Spain using WVS data and discovered a non-significant relationship between income and tax morale in Turkey. In Spain, they discovered a significant correlation between income and tax morale. According to McGee (2012), individuals with higher incomes are less likely to have a negative attitude toward taxes. Therefore, to improve equity, some nations have altered their tax systems so that wealthy people shoulder a greater proportion of the total tax burden. These reforms are likely to increase the motivation of wealthy tax evaders to avoid paying their fair share of taxes. According to Trüdinger and Hildebrandt (2013), income disparity has a significant negative impact on taxpayer morale. This is a significant finding that highlights the reality that the degree to which a society is economically homogeneous affects individuals' incentives to pay taxes to the state.

Tax Morale and Trust: Trust in the government had a positive but non-significant effect on tax morale, while trust in the legislature had a positive impact. Martinez-Vazquez, Koumpias, and Leonardo (2021) found a correlation between higher tax morale and greater trust in government organizations. Cyan et al. (2016) argued that trust in output-side government agencies is a more accurate predictor of tax morale. Chong and Arunachalam (2018) found that trust has a significant impact on tax compliance. Social trust in government is

the belief that the government formulates policies and conducts operations for the benefit of its citizens, which encourages taxpayers to embrace enforced compliance.

Tax Morale and Political Involvement: This study found a positive correlation between local election participation and tax morale, but a negative effect on national elections. This is consistent with Torgler (2003), who found that direct democracy significantly increases tax morale. Wahl, Muehlbacher, and Kirchler (2010) conducted two experiments to determine if taxpayers' cooperation was influenced by their participation in government decisions. Experiment 2 showed that tax payments are at their lowest in a tax simulation when participants profit from tax payments and cannot vote.

Tax Morale and Democracy: The study found a positive but non-significant correlation between democratic support and tax morale, suggesting that tax morale is higher the greater the support for democracy. It also found a significant positive correlation between tax morale and redistribution preferences, suggesting that people believe the government should tax the wealthy and subsidize the poor. This suggests that public support for the government is essential for establishing fiscal legitimacy and could result in greater fiscal revenue returns than compliance alone. Yamamura (2014), Gaviria, Graham, and Braido (2007), and McGee (2016) all suggest that the poor, those with fewer upward mobility prospects, and those who believe market outcomes are unfair will want a high level of redistribution and a significant role in government. McGee (2016) used WVS data to determine the extent to which individuals believe that taxing the wealthy and subsidizing the poor is a necessary element of a democratic society. The mean total score was 5.04, indicating a strong opinion that redistribution of wealth was a legitimate government function. Age-related declines indicate an increase in opposition to wealth redistribution.

Tax Morale and Conditional Cooperation: The study found that trust in others has a weak positive correlation with tax-based morale, but the coefficient for trust in others was positive, indicating that the greater a person's trust in others, the greater their tax motivation. This is consistent with those of Kondelaji et al. (2016), who found a positive and statistically significant correlation between trust in others and tax morale. Traxler (2010) investigated the motivations for tax compliance using the concept of tax morale as a social norm for tax compliance, and his findings indicate that people's willingness to commit tax fraud is influenced by their perceptions of what their neighbors are doing. Tax evasion is easier to conceal when more people engage in it, and the perception of the behavior f other taxpayers has a significant impact on the behavior of individual taxpayers.

Table 2: Probit Model Results

Variable	Coeff.	Std. Err.	z-Stat.	P>|z|	Marg. Eff.
Constant	0.68266	0.41380	1.65	0.099	_
Sociodemographic					
Gender	-0.08998	0.11609	-0.78	0.438	-0.01888
Age	0.01735	0.00567	3.06	0.002	0.00364
Health Status	0.03216	0.18202	0.18	0.860	0.00675
Marital Status	0.09692	0.12915	0.75	0.453	0.02034
Religiosity	-0.08581	0.12392	-0.69	0.489	-0.01801
Educational Attainment					
No formal education	-0.05017	0.26488	-0.19	0.850	-0.01053
Lower than primary	-0.10512	0.21285	-0.49	0.621	-0.02206
Primary	-0.13834	0.15940	-0.87	0.385	-0.02903
Secondary	0.11697	0.20560	0.57	0.569	0.02455
Tertiary Education	0.40171	0.27699	1.45	0.147	0.08430
Employment Status					

Paid employment	0.18817	0.12724	1.48	0.139	0.03949
wage earner employment	-0.25065	0.18151	-1.38	0.167	-0.05260
Economic					
Cash income	-0.10752	0.11772	-0.91	0.361	-0.02256
Financial satisfaction	0.48072	0.31470	1.53	0.127	0.10088
Trust					
Confidence in government	0.08219	0.12536	0.66	0.512	0.01725
Confidence in parliament	0.00411	0.12416	0.03	0.974	0.00086
Political Involvement					
Local level elections	0.01500	0.14763	0.10	0.919	0.00315
National level elections	-0.47511	0.16529	-2.87	0.004	-0.09970
Democratic					
Support for democracy	0.05660	0.26271	0.22	0.829	0.01188
Preference for redistribution	0.40793	0.20411	2.00	0.046	0.08560
Conditional Cooperation					
Trust in others	0.08772	0.17237	0.51	0.611	0.01886
Number of Obs.	1,552				
LR chi2(21)	38.76				
Prob > chi2	0.0105				
Pseudo R2	0.0201				

5. Conclusions and Policy Implications

The study determined the relationships between tax morale and drivers in Ghana using data from the sixth wave of the WVS from 2010–2014. The findings show that age has a significant positive relationship with tax morale among the sociodemographic factors, while participation in national-level elections has a significant positive relationship with tax morale among the political involvement factors, as shown in Table 2 of the results of the probit model. The relationship between secondary education and tax morale is positive but insignificant above secondary education and negative but insignificant below secondary education. The employment status of an individual has a positive but insignificant correlation with tax morale and a negative correlation with income factors. Tax morale has a positive but insignificant relationship with confidence in the government and parliament. The relationship between preference for the redistribution of wealth and tax morale is significantly positive.

While the relationship between trust in others and tax morale is positive but statistically insignificant, the relationship between local election participation and tax morale is positive but insignificant. There is a statistically significant positive correlation between participation in national elections and tax morale. Moreover, the findings suggest that conditional cooperation, or "trust in others," has little impact on tax morale. Individuals with strong interpersonal relationships are less likely to avoid paying taxes, according to the findings. The study's results add new information to the study of tax morale and could help tax officials in Ghana and other countries better understand the links between tax morale and its causes and come up with policies and strategies to improve tax morale and get more people to pay their taxes. To eliminate the incentives for people to cheat on their taxes, it is recommended that trust must be established between the people and the government, and the youth with the greatest incentives to cheat must be educated and supported in their civic responsibilities.

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