

## Research Article

# Mathematical and Statistical Models with Applications of Spread of Private Tutoring in Saudi Arabia

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Over the past century, private tutoring (PT) in many countries has increased dramatically. Moreover, the main disadvantage of PT is that has a byproduct and a characteristic on the educational system in developing countries in terms of contributing to conditions such as large class sizes, low public expenditures, and an inadequate number of universities. In Saudi Arabia, the spread of PT at school and university levels has yet to be addressed by researchers. One goal of this examination was to research the spread of PT in relation to mathematics being taught at school and university levels. This investigation used quantitative data of the questionnaire to determine the reasons for the spread. A total of 1000 students responded from University of Ha'il. The edge plans given results that are associated and like the assessment that is performed with the whole data. The current study found that a good family financial situation and lack of parental supervision of the children were significant factors underlying the spread of private tutoring at school and university levels.

## 1. Introduction

Over the past century, private tutoring (PT) in many countries has increased dramatically. Private coaching is a far-reaching marvel in numerous nations. Moreover, the main disadvantage of PT is that has a byproduct and a characteristic on the educational system in developing countries in terms of contributing to conditions such as large class sizes, low public expenditures, and an inadequate number of universities. In Saudi Arabia, the spread of PT at school and university levels has yet to be addressed by researchers. There is evidence that PT plays important role in Saudi Arabia's educational systems and private mentoring influences numerous subjects in the Saudi instructive educational programs, albeit certain subjects take a lot of consideration. PT has become a threat to the skills and methods of students and teachers (Ikediashi et al. [1]). One goal of this examination was to research the spread of PT in relation to mathematics being taught at school and university levels. To achieve this goal, this investigation used

quantitative data of the questionnaire to determine the reasons for the spread. This paper begins, however, by reviewing the previous research on the spread of PT in Saudi Arabia.

Many published studies (e.g., Kwok [2] and Bray [3]) describe PT as "shadow education." According to Kwok, in many created nations (for example, Canada and USA) the interest for private mentoring has expanded. Surveys such as the one conducted by Tansel and Bircan [4] have shown that PT is an educational form that lies outside the formal tutoring framework. These surveys also connect PT to a motivation for financial gain. They note that understudies who take private mentoring trust that their odds of effectively traveling through the instructive framework will be expanded. The findings of Nyandara [5] were that students take on private educational costs because they need to get high marks on examinations. The students enrolling in private education paid Ksh 2000 per term. The private education helped enhance their scholarly performance. Manzoor [6] studied the reasons for and necessity of PT in

English for Bangla medium primary school students in Bangladesh. As part of this examination, thirty-five respondents were surveyed using written questionnaire. In addition, classroom monitoring was done to identify failures, if any, in English education. The discoveries from the overview demonstrate that a large portion of the essential dimension students get private coaching and they are happy with the English exercise given by their private mentor as opposed to their teacher. Ali studied private tutoring in Jordan. The study concluded that the causes of the spread of private tutoring are to get high grade in request to enroll at colleges and in specific specializations and influenced the commonness of private mentoring is the sort of scholarly branch. Ghounane [7] conducted a study titled "Private Tutoring and Public Schools in Algeria: Issues and Reflections. The study concluded, «parents send their children to private sessions for several reasons among which the poor teaching level in mainstream schooling in addition to the competitive nature that is based on the idea of prestige”.

Nusseibeh in Al-Fattal [8] examined the reasons for the spread of private lessons from the point of view of managers, teachers, students, and parents and ways to reduce this spread in Syria. The study concluded the reasons of the spread of this wonder return to the superintendent initially, and to the understudy, thirdly to the family, at that point to the educator. Hamid et al [9] argued that understudies may depend on PT not because of its demonstrated viability but since of their declining confidence in school English instructing. Rima and Saji in Ahmed [10] discussed the prevalence of private tutoring in Deir Al Balah and the reasons for its emergence. The study concluded that non-self-reliance and lack of interest to explain the teacher are the reasons of the spread private tutoring. The study of Tansel and Bircan Bodur [11] was the first of many investigators to demonstrate PT, particularly to get ready for the focused college selection test, is a significant, across the board marvel in Turkey. The examination of Yung (2015) researched the learning knowledge and impressions of 14 Chinese students who had gotten English private coaching (PT) during their auxiliary instruction in Hong Kong. Every member finished a foundation survey and partook in a one-to-one semi organized meeting. The examination uncovered members' conflicted and dumbfounding dispositions toward PT. Despite the fact that they considered PT key for auxiliary instruction, they did not see it as a compelling method to build their English capability in light of its exorbitant spotlight on assessment aptitudes rather than the utilization of English as a language of worldwide correspondence. A longitudinal study of PT by Bray [12] reports that PT has for quite some time been a noteworthy wonder in parts of East Asia, including Japan, Hong Kong, South Korea and Taiwan. Lately it has developed significantly in different pieces of Asia and in Africa, Europe and North America. The elements basic the development of private mentoring fluctuate, yet in all settings, it has real ramifications for learning and business. Families with the important assets can verify more noteworthy amounts as well as better characteristics of private coaching. Kids getting such coaching are then ready to perform better in school, and over the long haul to

improve their lifetime income. Conversely, offspring of low-income families who do not get such advantages will most likely be unable to stay aware of their friends and may drop out of school at a prior age.

Three main types of PT occur in our application in Saudi Arabia: the first is individual tutoring in which student goes to the teacher's home, this kind of PT is very expensive and costs much than other types of PT. The second kind is group tutoring in which the students go to the teacher's home, this kind of PT does not cost as much as individual tutoring. The third kind of PT is provided by school administrations, usually after school hours.

## 2. Procedures

Approach is an assortment of practices, techniques, and rules utilized by the individuals who work in an order or on the other hand take part in a request or research. Technique is a progression of decisions:

- (1) Decisions about what data and information to accumulate
- (2) Decisions about how to examine the data and information that you assemble
- (3) Other methodological decisions

*2.1. Research Design.* Two main types of study design of data collection were used to identify the spread of PT at school and university levels in Saudi Arabia. The first method involved conducting surveys regarding the spread of PT and then analyzing the survey results. The questionnaire questions contain 16 questions to find out the reasons that led to the spread of the problem of private lessons, where the study takes into account the different factors that relate to the student, teacher or university professor and educational administration, family, school or university. The questions asked the participants to assess how strongly they agreed with each statement in the questionnaires (see Table 1).

*2.2. Participants.* Two primary techniques to gather genuine information were utilized: (1) the math scores for the last tests were gathered from the everyday schedule and (2) understudy polls were directed by scattering 16-question surveys to understudies. These are results rather than methods. Also, consider providing detail on the scores collected and on the students surveyed and on how the surveys were distributed and collected, as well as including a sample questionnaire with this paper. The target population comprised 1,000 students from University of Ha'il. We could then calculate the achievement levels for the targeted student using the suitable sample. These levels are displayed in Table 1, which presents the data collected. A questionnaire was given to the students to find out the reasons that led to the spread of the problem of private lesson. The questionnaire questions contain 16 questions to find out the reasons that led to the spread of the problem of private lessons. The questions asked the participants to assess how strongly they

TABLE 1: Notes to be considered about the data tables.

X	Factor	Signal	Description
$X_1$	Lake of achievement	+	Yes
		-	No
$X_2$	Frequent absence from school or university	+	Yes
		-	No
$X_3$	Obtain a high mark	+	Yes
		-	No
$X_4$	Explain the behavior of the student during the lesson	+	Yes
		-	No
$X_5$	The culture of the tradition of classmates	+	Yes
		-	No
$X_6$	Lack of self-reliance	+	YES
		-	NO
$X_7$	Inadequate knowledge of the educational material	+	YES
		-	NO
$X_8$	A poor economic situation	+	YES
		-	NO
$X_9$	Unsuitable work environments	+	YES
		-	NO
$X_{10}$	Financial situation	+	YES
		-	NO
$X_{11}$	Lack of parental supervision of the children	+	YES
		-	NO
$X_{12}$	Lack of incentives for teachers	+	YES
		-	NO
$X_{13}$	Lack of supervision and follow-up of teachers or university professors	+	YES
		-	NO
$X_{14}$	The lack of counseling for teachers regarding enrolling in training courses on modern teaching methods	+	YES
		-	NO
$X_{15}$	Large number of students in classroom	+	YES
		-	NO
$X_{16}$	Students are not aware of the good use and communication of tutoring	+	YES
		-	NO
	Y (response)	Grades	First term exams math in 2018 in

agreed with each statement in the questionnaires. The respondents were asked to the mathematics scores for the final tests. The open finished inquiries gave the respondents extension to communicate their assessments about private tutoring in Mathematics.

### 2.3. Instruments

**2.3.1. Edge Designs Analysis.** Elster and Neumaier [13] presented the edge plan. The edge relies upon a model independent test that can be utilized for dynamic factors. To know the dynamic factors, the estimations are master-minded into a gathering of E sets. In this methodology, the estimations vary in just a single part. It is exceptionally normal in screening tests and infers that practically all distinctions

$$z_{i,j} = y_i - y_j, \quad (i, j) \in E, \quad (1)$$

comprise commotion as it were. In case it is expected that the commotion in the information is added substance, ordinarily conveyed with zero mean and fluctuation  $\sigma^2$ , the  $n - p$  of the  $z_{i,j}$  are regularly appropriated with zero mean and change  $2\sigma^2$ . In view of the obscure number of exceptions, the

change should be assessed heartily. For instance, the accompanying middle gauge can be utilized:

$$\sigma = \left| \frac{\text{med}\{z_{i,j} : (i, j) \in E\}}{0.675\sqrt{2}} \right|. \quad (2)$$

A preplan comprising of six elements and twelve preliminaries is chosen that shown down (Table 2).

More details about the edge design can be referred to Abdulrahman, Alanazi and Alamri, and Alanazi Talal Abdulrahman.

**2.3.2. Regression Analysis.** Consider modeling between dependent and independent variables. The dependent is First term Exams Math in 2018, and independent variables are the reasons for the spread. An analysis of the data using linear regression with the software package SPSS with equation model, mean and standard deviation.

The plan picked in the past advance is dissected utilizing the edges and regression strategies. On the off chance that the elements that we get from the edge plan strategy are equivalent to the regression technique, these components are the genuine reasons that prompted the spread of PT.

TABLE 2: Edge design of six factors and twelve runs.

Run	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$
1	1	1	-1	1	1	1
2	-1	1	1	1	1	1
3	1	-1	1	1	1	1
4	-1	-1	-1	1	-1	1
5	-1	-1	-1	1	1	-1
6	-1	-1	-1	-1	1	1
7	-1	1	-1	1	1	1
8	-1	-1	1	1	1	1
9	1	-1	-1	1	1	1
10	-1	-1	-1	-1	-1	1
11	-1	-1	-1	1	-1	-1
12	-1	-1	-1	-1	1	-1

### 3. Result

The gathered information were inspected utilizing the edge plan procedure and regression examination, which was performed utilizing SPSS programming to decide the central driver of spread of private exercises at school and college levels in Saudi Arabia.

Utilizing a few models, we show the utilization and examination of these two strategies for one repeat for the information gathered from schools and college.

*Example 1.* Let  $n = 6$  and obtain a high mark  $X_3$ , the behavior of the student during the lesson explain  $X_4$ , the culture of the tradition of classmates  $X_5$ , no reliance on self  $X_6$ , inadequate knowledge of the educational material  $X_7$ , a poor economic situation  $X_8$ . Analyzing the data in Table 3 using edge design is the following. To begin with, we observe to be all of the six contrasts of the response  $y$  over the edges and the absolute regard, as given in Table 4. Second, we figure the center to anticipate the number  $p$  as powerful parts. Third, we find  $(\sigma)$  and learn  $w(p)$  and  $k \times 20.5 \sigma$ . Finally, if the  $w(p)$  is more critical than  $p$  for some hypothesis  $p$ , we stop the method and track down the unique factor. Table 5 exhibits the results; we have  $w(5) = \text{zero}$ , which suggests there are no unique parts.

An examination of the information in Table 3 (utilizing direct relapse) with the product bundle.

SPSS uncovered there is no dynamic variable and gave an expected straight model

$$Y = 82.5 + \varepsilon, \quad (3)$$

with

$$R - sg = 70.9\%, \quad (4)$$

of mean 84.75 and standard deviation  $\sigma = 16.42$ . Additionally, from the outcome, the leftover is typical in light of the fact that  $p$ -esteem (0.200) is more than 0.05.

From the above, I observe that the robust edge design method shows no active factors and the regression analysis method shows no active factor reward. Therefore, I conclude that there is no active factor with linear contributions.

*Example 2.* Let  $n = 6$  and the behavior of the student during the lesson explain  $X_4$ , the culture of the tradition of

TABLE 3: One replicate for Example 1.

Run	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$	$X_8$	Y	Response number
1	1	1	-1	1	1	1	62	46
2	-1	1	1	1	1	1	100	17
3	1	-1	1	1	1	1	98	25
4	-1	-1	-1	1	-1	1	96	61
5	-1	-1	-1	1	1	-1	90	87
6	-1	-1	-1	-1	1	1	70	310
7	-1	1	-1	1	1	1	80	98
8	-1	-1	1	1	1	1	96	65
9	1	-1	-1	1	1	1	81	30
10	-1	-1	-1	-1	-1	1	50	41
11	-1	-1	-1	1	-1	-1	97	15
12	-1	-1	-1	-1	1	-1	97	116

TABLE 4: Model-free checks with edge plan in Table 3.

$X_3$	$X_4$	$X_5$	$X_6$	$X_7$	$X_8$
-18	4	17	46	-7	-27
18	4	17	46	7	27

classmates  $X_5$ , no reliance on self  $X_6$ , inadequate knowledge of the educational material  $X_7$ , a poor economic situation  $X_8$  and unsuitable work environments  $X_9$ . Dissecting the information in Table 6 as described previously. The results are shown in Tables 7 and 8. Therefore, we have  $(5) = 4$  active factors: the behavior of the student during the lesson explain, the culture of the tradition of classmates, inadequate knowledge of the educational material, and unsuitable work environments. An analysis of the data in Table 6 (using linear regression) with the software package SPSS revealed there is no active variable and gave an estimated linear model

$$Y = 82.33 + \varepsilon, \quad (5)$$

with

$$R - sg = 62.2\%, \quad (6)$$

of mean 78.58 and standard deviation  $\sigma = 13.85$ . Also from the result, the residual is normal because  $p$ -value (0.095) is more than 0.05.

From the above, we observe that the robust edge design method shows four active factors—the behavior of the student during the lesson explain, the culture of the tradition of

TABLE 5: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p)$ e	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p?$
0	17.5	18.33	25.92	2	No
1	17	17.80	25.18	2	No
2	12	12.57	17.77	3	No
3	7	7.33	10.37	4	No
4	5.5	5.76	8.14	4	No
5	4	4.19	5.92	5	No

TABLE 6: One replicate for Example 2.

Run	$X_4$	$X_5$	$X_6$	$X_7$	$X_8$	$X_9$	Y	Response number
1	1	1	-1	1	1	1	75	21
2	-1	1	1	1	1	1	98	25
3	1	-1	1	1	1	1	62	46
4	-1	-1	-1	1	-1	1	98	10
5	-1	-1	-1	1	1	-1	70	3
6	-1	-1	-1	-1	1	1	70	6
7	-1	1	-1	1	1	1	88	583
8	-1	-1	1	1	1	1	80	29
9	1	-1	-1	1	1	1	58	108
10	-1	-1	-1	-1	-1	1	85	8
11	-1	-1	-1	1	-1	-1	66	37
12	-1	-1	-1	-1	1	-1	93	121

TABLE 7: Model-free checks with edge plan in Table 6.

$X_4$	$X_5$	$X_6$	$X_7$	$X_8$	$X_9$
-13	18	4	13	4	-23
13	18	4	13	4	23

TABLE 8: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p)$ e	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p?$
0	13	13.61	19.25	1	No
1	13	13.61	19.25	1	No
2	8.5	8.90	12.59	4	No
3	4	4.19	5.92	4	No
4	4	4.19	5.92	4	No
5	4	4.19	5.92	4	No

classmates, inadequate knowledge of the educational material, and unsuitable work environments—and the regression analysis method shows no active factor. We consequently infer that there is no dynamic factor with a direct commitment.

*Example 3.* Let  $n=6$  and the culture of the tradition of classmates  $X_5$ , no reliance on self  $X_6$ , inadequate knowledge of the educational material  $X_7$ , a poor economic situation  $X_8$ , unsuitable work environments  $X_9$ , and good financial situation for family  $X_{10}$ .

Analyzing the data in Table 9 as described previously, the outcomes are displayed in Table 10 and 11. We along these lines have  $w(2)$ =one dynamic factor good financial situation for family. An investigation of the information in Table 9 (utilizing straight regression) with the product bundle SPSS uncovered there is no dynamic variable and gave an expected direct model

TABLE 9: One replicate for Example 3.

Run	$X_5$	$X_6$	$X_7$	$X_8$	$X_9$	$X_{10}$	Y	Response number
1	1	1	-1	1	1	1	97.5	62
2	-1	1	1	1	1	1	81	30
3	1	-1	1	1	1	1	75	21
4	-1	-1	-1	1	-1	1	93	121
5	-1	-1	-1	1	1	-1	50	41
6	-1	-1	-1	-1	1	1	50	36
7	-1	1	-1	1	1	1	81	20
8	-1	-1	1	1	1	1	58	108
9	1	-1	-1	1	1	1	95	139
10	-1	-1	-1	-1	-1	1	86	33
11	-1	-1	-1	1	-1	-1	70	144
12	-1	-1	-1	-1	1	-1	85	8

TABLE 10: Model-free checks with edge plan in Table 9.

$X_5$	$X_6$	$X_7$	$X_8$	$X_9$	$X_{10}$
16.5	23	-20	7	-20	-35
16.5	23	20	7	20	35

TABLE 11: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p)$ e	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p?$
0	20	20.95	29.62	1	No
1	20	20.95	29.62	1	No
2	18.5	19.11	27.03	1	Yes

$$Y = 93.66 + \varepsilon, \tag{7}$$

with

$$R - sg = 60.8\% \tag{8}$$

of mean 76.79 and standard deviation  $\sigma = 16.64$ . Also from the result, the residual is normal because  $p$ -value (0.200) is more than 0.05.

From the above, we observe that the robust edge design method shows one active factor—good financial situation for family—and the regression analysis method shows no active factor. We thus conclude that there was no active factor with a linear contribution.

*Example 4.* Let  $n=6$  and inadequate knowledge of the educational material  $X_7$ , a poor economic situation  $X_8$ , unsuitable work environments  $X_9$ , good financial situation for family  $X_{10}$ , lack of parental supervision of the children  $X_{11}$  and lack of incentives for teachers  $X_{12}$ .

Analyzing the data in Table 12 as described previously. The results are shown in Table 13 and 14. I thus have  $w(5) = 0$  active factors. An investigation of the information in Table 9 (regression analysis) with the product bundle SPSS uncovered there is a functioning variable. SPSS uncovered there is a functioning variable: inadequate knowledge of the educational material and gave an expected straight model

$$Y = 75 - 12.80 \cdot X_7 + \varepsilon, \tag{9}$$

with

TABLE 12: One replicate for Example 4.

Run	$X_7$	$X_8$	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	Y	Response number
1	1	1	-1	1	1	1	70	3
2	-1	1	1	1	1	1	81	20
3	1	-1	1	1	1	1	50	50
4	-1	-1	-1	1	-1	1	100	395
5	-1	-1	-1	1	1	-1	89	47
6	-1	-1	-1	-1	1	1	72	54
7	-1	1	-1	1	1	1	95	45
8	-1	-1	1	1	1	1	90	18
9	1	-1	-1	1	1	1	70	14
10	-1	-1	-1	-1	-1	1	99	88
11	-1	-1	-1	1	-1	-1	86	33
12	-1	-1	-1	-1	1	-1	97	15

TABLE 13: : Model-free checks with edge plan in Table 12.

$X_7$	$X_8$	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$
-25	-9	-20	1	3	-25
25	9	20	1	3	25

$$R - sg = 75\%, \quad (10)$$

of mean 83.25 and standard deviation  $\sigma = 15.16$ .

Also from the result, the residual is normal because  $p$ -value (0.200) is more than 0.05. From the above, we observe that the robust edge design method shows no active factor, and the regression analysis method shows one active factor: inadequate knowledge of the educational material. We thus conclude that there was no active factor with a linear contribution.

*Example 5.* Let  $n = 6$  and a poor economic situation  $X_8$ , unsuitable work environments  $X_9$ , good financial situation for family  $X_{10}$ , lack of parental supervision of the children  $X_{11}$ , lack of incentives for teachers  $X_{12}$ , and lack of supervision and follow-up of teachers or university professors  $X_{13}$ .

Analyzing the data in Table 15 as described previously. The results are shown in Tables 16 and 17. We thus have  $w(5) = 3$  active factors: a poor economic situation, good financial situation for family, and lack of parental supervision of the children. An investigation of the information in Table 15 (regression analysis) with the product bundle SPSS uncovered four dynamic factors: unsuitable work environments, good financial situation for family, lack of supervision, and follow-up of teachers or university professors and lack of incentives for teachers, and gave an expected straight model

$$Y = 39.5 - 15.7 \cdot X_9 - 19.95 \cdot X_{10} + 14.3 \cdot X_{11} + 12.3 \cdot X_{12} + \varepsilon, \quad (11)$$

with

$$R - sg = 87.5\%, \quad (12)$$

of mean 78.75 and standard deviation  $\sigma = 17.41$ . Also from the result, the residual is normal because  $p$ -value (0.095) is more than 0.05.

TABLE 14: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p)$	$e$	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p?$
0	14.5	15.18		21.48	2	No
1	9	9.42		13.33	3	No
2	6	6.28		8.88	4	No
3	3	3.14		4.44	4	No
4	2	2.09		2.96	5	No
5	1	1.047		1.48	5	No

TABLE 15: One replicate for Example 5.

Run	$X_8$	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	$X_{13}$	Y	Response number
1	1	1	-1	1	1	1	58	19
2	-1	1	1	1	1	1	50	50
3	1	-1	1	1	1	1	70	3
4	-1	-1	-1	1	-1	1	95	7
5	-1	-1	-1	1	1	-1	98	5
6	-1	-1	-1	-1	1	1	93	24
7	-1	-1	-1	1	1	1	95	90
8	-1	-1	1	1	1	1	70	14
9	1	-1	-1	1	1	1	100	129
10	-1	-1	-1	-1	-1	1	60	31
11	-1	-1	-1	1	-1	-1	81	99
12	-1	-1	-1	-1	1	-1	75	285

TABLE 16: Model-free checks with edge plan in Table 15.

$X_8$	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	$X_{13}$
-37	-20	-30	35	17	18
37	20	30	35	17	18

From the above, we observe that the robust edge design method shows these active factors—a poor economic situation, good financial situation for family, and lack of parental supervision of the children—and the regression analysis method showed these active factors: unsuitable work environments, good financial situation for family, lack of supervision of children, and lack of incentives for teachers. We thus conclude that there are two active factors—good financial situation for family and lack of parental supervision of the children—with a linear contribution.

*Example 6.* Let  $n = 6$  and unsuitable work environments  $X_9$ , good financial situation for family  $X_{10}$ , lack of parental supervision of the children  $X_{11}$ , lack of incentives for teachers  $X_{12}$ , lack of supervision and follow-up of teachers or university professors  $X_{13}$ , and the lack of counseling for teachers regarding enrolling in training courses on modern teaching methods  $X_{14}$ .

Analyzing the data in Table 18 as described previously. The results are shown in Tables 19 and 20. We thus have  $w(5) = 4$  active factors: unsuitable work environments, good financial situation for family, lack of parental supervision of the children, and lack of incentives for teachers. An analysis of the data in Table 18 (using linear regression) with the software package SPSS revealed there was one active variable—good financial situation for family—and gave an estimated linear model

TABLE 17: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p) e$	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p$ ?
0	25	26.18	37.03	0	No
1	20	20.95	29.62	3	No
2	19	19.90	28.14	3	No
3	18	18.85	26.66	3	No
4	17.5	18.33	25.92	3	Yes

TABLE 18: One replicate for Example 6.

Run	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	$X_{13}$	$X_{14}$	Y	Response number
1	1	1	-1	1	1	1	100	16
2	-1	1	1	1	1	1	70	3
3	1	-1	1	1	1	1	58	19
4	-1	-1	-1	1	-1	1	75	549
5	-1	-1	-1	1	1	-1	70	34
6	-1	-1	-1	-1	1	1	60	31
7	-1	1	-1	1	1	1	89	130
8	-1	-1	1	1	1	1	60	28
9	1	-1	-1	1	1	1	85	8
10	-1	-1	-1	-1	-1	1	90	69
11	-1	-1	-1	1	-1	-1	75	285
12	-1	-1	-1	-1	1	-1	65	66

TABLE 19: Model-free checks with edge plan in Table 18.

$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	$X_{13}$	$X_{14}$
11	10	-27	-15	-5	-5
11	10	27	15	5	5

TABLE 20: step estimations for the investigation with the edge plan.

$p$	Median	$\sigma(p) e$	$k \times 2^{0.5} \sigma(p)$	$\omega(p)$	$\omega(p) < p$ ?
0	10.5	10.99	15.55	1	No
1	10	10.47	14.81	2	No
2	7.5	7.85	11.11	2	No
3	5	5.23	7.40	4	No
4	5	5.23	7.40	4	No
5	5	5.23	7.40	4	Yes

$$y = 97.50 + 9.25 \cdot X_{10} + \varepsilon, \quad (13)$$

with

$$R - sg = 83.4\%, \quad (14)$$

of mean 74.75 and standard deviation  $\sigma = 13.59$ . Also from the result, the residual is normal because  $p$ -value (0.200) is more than 0.05.

From the above, we observe that the robust edge design method shows four active factors—unsuitable work

environments, good financial situation for family, lack of parental supervision of the children, and lack of incentives for teachers—and the regression analysis method shows one active factor: good financial situation for family. We thus conclude that there was one active factor—good financial situation for family—with a linear contribution.

In summary, experimental results are shown in the following table that compares all examples with two methods (Table 21).

TABLE 21: Experimental results with two methods.

Example	Edge design analysis	Regression analysis	Experimental results of active factors
Example 1	No active factors	No active factors	No active factors
Example 2	The behavior of the student during the lesson explains the culture of the tradition of classmates, inadequate knowledge of the educational material, and unsuitable work environment.	No active factors	No active factors
Example 3	Good financial situation for family	No active factors	No active factors
Example 4	No active factors	Inadequate knowledge of the educational material	No active factors
Example 5	A poor economic situation, good financial situation for family, and lack of parental supervision of the children	Unsuitable work environments, good financial situation for family, lack of supervision, and follow-up of teachers or university professors and lack of incentives for teachers	Good financial situation for family, and lack of parental supervision of the children
Example 6	Unsuitable work environments, good financial situation for family, lack of parental supervision of the children, and lack of incentives for teachers	Good financial situation for family	Good financial situation for family

#### 4. Conclusion

The current study examined and described the spread of private tutoring? in general and university education in Saudi Arabia. One of the aims of this paper was to study significant factors underlying the spread of PT at school and university levels. In reviewing the literature, no data was found on the association between the edge designs analysis and regression analysis. Therefore, there were two main types of analysis study design used to identify the actual reasons for the spread of PT: the edge plans assessment and backslide examination. We can say that the examination with the edge plans given results that are associated and like the assessment that is performed with the whole data. The current study found that a good family financial situation and lack of parental supervision of the children were significant factors underlying the spread of private tutoring at school and university levels. In future examinations, it very well may be feasible for information to utilize supersaturated plans, where many variables are explored utilizing a couple of trial runs. [14–18].

#### Data Availability

The data that support the findings of this study are available on request from the corresponding author.

#### Conflicts of Interest

The authors declare that there are no conflicts of interest.

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