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Article

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Who Demands Technical and Vocational Education in Pakistan? A PSLM Analysis of Socio-Economic Determinants

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Abstract

Purpose: The present study investigates the influence of demographic factors on the demand for Technical and Vocational Education and Training (TVET) in Pakistan. The government of Pakistan has implemented various skill enhancement programs to harness the demographic dividend. However, only a small portion of the workforce receives any form of TVET, contributing to a shortage of skilled workers in the country. Many industries, particularly in manufacturing and mining, face deficits in the skilled labour. Consequently, this study aims to examine the role of demographic factors in shaping the demand for TVET within the Pakistani context.

Methods: For the TVET demand's estimation, this study employed the Pakistan Social and Living Standard Measurement (PSLM) dataset of 2018–19 by using binary logistic regression analysis (BLRA). The demographic variables include the household's income, household head's education, household size, male proportion of the target age group, household head's age, and region of the household.

Findings: The findings indicate that households in the higher income category do not demand TVET. Moreover, if the head of the household is highly educated, then the household is less likely to participate in TEVT. So, the higher the socio-economic status, the lower the

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probability of demand for TVET from the better-off students. Further, this study also indicates that boys are more likely to participate in TVET-related degrees, while females are less likely to participate in TVET due to the non-availability of institutes and hostel facilities, poor transportation, the limited number of trades available for females, and security issues.

Conclusion: The findings provide insightful evidence to support the idea that the higher the socio-economic status of households, the lower the probability of demand for a TVET degree or diploma. Similarly, children of parents with university education are less likely to pursue TVET-related degrees. The reason is likely attributed to the perception that TVET-associated degrees and diplomas are considered inferior due to their lower standing and prestige as compared to general or professional degrees. This study suggests that the attractiveness of TVET can be enhanced by improving the quality of TVET, improving labour market outcomes, and creating a pathway to general education. Overall, this study not only contributes to empirical analyses of socio-economic determinants in TVET demand but also suggests that its findings can be applied not only to South Asian countries but also to other comparable nations with similar cultural ties and affinities.

Keywords: Vocational Education and Training, VET, Competency Based Training, Socio-Economic Factors, Logit Estimation, PSLM Data

1 Introduction

Pakistan is the 6th largest country in the world in terms of population. Out of the 230 million people in the population, 64 percent are below the age of 30. The expected youth bulge will continue to grow until 2035. The young and energetic population can be an asset for the growth of the country. This opportunity will not come again for many generations (Najam & Bari, 2017). The Pakistan National Human Development Report (NHDR) also predicts that, after 2035, the youth bulge will start to age twice as fast as some western countries (Broga, 2016). However, Pakistan has not yet capitalised on this demographic dividend. The unemployment rate in the country is very high, especially among the youth, who are mostly educated. Only 39 out of 100 (32 males and 7 females) youth are employed in Pakistan. The university graduates are experiencing high unemployment, and only 35 percent of the vocationally trained or skilled pupils are employed (Najam & Bari, 2017).

In order to realise the full potential of the youth bulge and for inclusive economic development, government policies and programmes should provide employable skills to the young population as well as employed people. If the right strategies and policies, in terms of the provision of quality education and job opportunities, are not put forward to meaningfully engage the youth, then the largest group of the Pakistani population will result in being marginalised, intolerant, vulnerable to joining negative activities, and a burden on the economy

rather than contributing to economic growth (Farooq et al., 2014; Najam & Bari, 2017). Therefore, this demographic dividend provides an opportunity as well as a challenge for the government to add this bulge to the labour market.

A special focus is needed in the age bracket of 15–24 years, who are neither continuing their education nor entering the labour market due to their skill mismatch (Bolli et al., 2021). TVET in this regard can be a viable option to enhance the human capital of youth who do not participate in tertiary education due to resource constraints or a lack of motivation (Bolli et al., 2021; Landberg & Noack, 2022; Organization for Economic Cooperation and Development [OECD], 2015). The countries with strong TVET programmes have successfully maintained employment levels in times of economic crisis (OECD, 2015; Varaprasad, 2016). So, it encourages emerging and lower-income countries to invest in the TVET sector in order to stimulate economic growth, ignite startups, and bridge the skills gap (Mubarik et al., 2016; Symonds et al., 2011). Only a carefully designed TVET policy can provide the highly skilled and knowledgeable workforce demanded by the industry and advanced economies (Maclean & Lai, 2011).

There is substantial evidence about the importance of TVET in promoting human capital, economic growth, and employment opportunities (Bellakhal & Mahjoub, 2015; World Bank, 2012). Many theoretical and empirical studies have recognised the role of education and TVET in enhancing human capital and life standards (Acemoglu & Pischke, 1998; Becker, 2009; Heckman et al., 2003). Many studies have also shown that acquiring skills and training increases the productivity and lifetime earnings of laborers. Moreover, the employment rate of polytechnic and vocational college graduates has increased in the Finnish market (Böckerman et al., 2009; Cooke, 2004; Hill, 2002). TVET-type trainings add to the earnings of the labour force and create opportunities to penetrate the labour market (Galdo & Chong, 2012). Bellakhal and Mahjoub (2015) have also found the positive effect of participation in TVET on skills, employment, and wage level in Tunisia by applying various econometric techniques. Agarwal and Agarwal (2017) and Duraisamy (2002) also found that the technical diploma holders of a particular cohort (age 15–29) earn more as compared to university graduates in India, which is very similar to Pakistan in terms of culture and socioeconomic status. The TVET sectors have the ability to engage school dropouts, which is significantly high both in India and Pakistan, and enable them to compete in the labour market by importing employable skills (Agarwal & Agarwal, 2017; Chamadia & Mubarik, 2021).

There is ample empirical study that discusses the prospect and status of TVET in Pakistan (for example, Ahmed, 2019; Chamadia & Shahid, 2018; Chamadia & Mubarik, 2021; Raza & Khalid, 2017). These studies conclude that the TVET sector in Pakistan plays a key role in increasing earnings, employment rates, and labour market outcomes for both genders. Chamadia and Mubarik (2021) found that the TVET-related intervention increases the monthly income by Rupees (Rs.) 14,223 on average, and it also increases the employment

and productivity of the participants. Ahmed et al. (2020) found that the TVET skills-related trades have a positive effect on the socioeconomic and demographic empowerment of women in Baluchistan, Pakistan. Similarly, Ahmed (2019) also showed that TVET training has a positive effect on the earnings, employment status, and working aptitude of Afghan refugees in different districts of Baluchistan, Pakistan.

As per the National Vocational and Technical Training Commission (NAVTTTC), despite governmental initiatives and international assistance at both federal and provincial levels to enhance vocational and technical education, only 6 percent of the youth in Pakistan have gained technical skills, with merely 2.5 percent having received on-the-job training. Similarly, only 60 percent of the workforce in the country has a primary or lower level of education (NAVTTTC, 2017; Shah & Khan, 2017). The TVET sector in Pakistan enrolls less than half a million (0.424 million) students, and roughly 18.6 thousand teachers, mostly male, are engaged in the TVET sector (Pakistan Ministry of Finance, 2022). The annual supply of skilled workers is around 314,176, including the Diploma of Associate Engineering (DAE) accounting for 81,836 and various trade certificates accounting for 232,340. According to the National Skill Strategy (NSS) 2009–2013, the country has a demand for nearly 950,000 skilled workers. The said enrollment and institutions are not sufficient to bridge the demand and supply gap for a technical and skilled workforce in the country. Moreover, the budget allocated for technical education is insufficient, and the course/curriculum and teacher training materials are not tailored to the growing demand of the national and international job market (NAVTTTC, 2017; Raza & Khalid, 2017).

Despite international evidence and even high returns on TVET in the country, the low enrollment in the TVET sector needs to be studied thoroughly. There is a dearth of empirical studies evaluating the socioeconomic factors of the households participating in the TVET sector in South Asia, including Pakistan. This study takes place in Pakistan due to two reasons. First, Pakistan's cultural ties and other affinities are quite similar to those of neighbouring South Asian countries like India, Bangladesh, Sri Lanka, and Afghanistan (Mubarik & Naghavi, 2019). Hence, the results of this study can be generalised not only to South Asian countries but also to comparable other countries. Secondly, Pakistan is on the list of countries that receive international funding and aid to reform the TVET sector. Despite foreign funding and consultation, participation in the TVET sector is still very low as compared to conventional education. Therefore, it is also important for both the donors and recipients of international cooperation to know the socio-economic status of households participating in the TVET sector. The findings of this study will facilitate the federal and provincial governments, training institutes, and other stakeholders in the TVET sector in designing and implementing evidence-based programmes in order to bridge the skills gap in the country. This study contributes to the body of literature on TVET by examining the role of socio-economic factors that play an important role at the household level in their participation in TVET by utilising the latest available PSLM data from Pakistan.

1.1 Pakistan and TVET: A Profile

Before embarking on the TVET profile of Pakistan, we deem it necessary to briefly elaborate on the school education system in Pakistan. The school education system in Pakistan is split into three layers: Elementary education, secondary education, and tertiary education (Saeed, 2007). Elementary education is further split into three categories: Pre-primary (kindergarten), primary (grades 1–5), and middle school (grades 6–8). Secondary education is further subdivided into lower secondary/matriculation (grades 9–10) and higher secondary/intermediate (grades 11–12). TVET usually consists of a diploma that is extended for a period of six months to four years (Qadeer et al., 2022). After completing their matriculation, students have the option to enrol in TVET or start their intermediate. However, matriculation is not required at all for certain trades, such as tailoring, plumbing, carpentry, welding, etc.

Recognising the realised gains of the TVET sector globally, the government of Pakistan has introduced a TVET reform support system supported by international donor agencies like the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the European Union (EU), and the government of the Netherlands. In Pakistan, the existing setup of the National Vocational and Training Commission (NAVTTTC) at the federal level and the Technical and Vocational Training Authorities (TEVTAs) at the provincial level is responsible for the provision of skilled workers in the country. The government has established engineering colleges and polytechnic institutes across the country, and each province has also established an authority for technical and vocational education (Chamadia & Shahid, 2018). The Government College of Technologies (GCTs) and Government Polytechnic Institutes (GPIs) provide diplomas of associate engineering (three years) and bachelor of technology (four years) in various trades across Pakistan. Moreover, under the National Skill Strategy (NSS), Competency-Based Training (CBT) has been introduced, gradually replacing conventional or curriculum-based technical education since 2014 in Government Technical and Vocational Centres (GTVCs). NAVTTTC and TEVTAs, with the collaboration of provincial boards of technical education and private sector institutes, have introduced the Competency Based Training and Assessment (CBT&A). It is based on industry standards and competencies that can be demonstrated in the workplace. It envisions a shift from supply-driven training to demand-driven skill development with proper linkage with industries in both the design and delivery of TVET. Different qualification levels (1 to 4) have been mapped for each trade for vertical growth opportunities. This approach not only focuses on better employability and market linkages, but the trainees are also assessed after completion of their programmes and awarded vocational certificates (NAVTTTC, 2022). Despite formal vocational training, an informal system of *Ustaad-Shagird* (Trainer-Trainee) also prevails across Pakistan in various trades like carpentry, tailoring, mechanics, etc. where the *Shagird* (trainee) learns by doing and shadowing a professional for almost eight to nine hours daily without paying any tuition fee. The *Ustaad*, usually an experienced craftsman with no formal training or education, trains

the trainee, and the latter assists the former in his small tasks for almost two years without any remuneration (Chamadia & Mubarik, 2021).

Table 1 shows the number of technical institutes in Pakistan. There are 2,745 technical institutes in Pakistan, of which 1,497 (55 percent) are for males, 924 (33 percent) for females, and 324 (12 percent) are combined. Similarly, the total number of vocational institutes in the country is around 1,137, with 477 (42 percent) for males, 201 (18 percent) for females, and 459 (40 percent) combined. The technical institutes are not equitably available for both genders. The majority of the institutes are for males and are located in urban areas. While women have fewer institutions, rural residents in general—and women in particular—find themselves suddenly at a disadvantage. The total number of teachers in technical and vocational institutes is around 18.6 thousand, and the enrollment stood at around 0.46 million in 2019–20. It is expected to increase by 7.7 percent (from 0.46 to 0.50 million) in 2021–22 (Pakistan Ministry of Finance, 2022).

Table 1: Total TVET Institute in Pakistan (NAVTTTC, 2022)

<i>Institute</i>	<i>Male</i>	<i>Female</i>	<i>Co-Ed</i>	<i>Total</i>
<i>Technical¹</i>	1497	924	324	2745
<i>Vocational²</i>	477	201	459	1137
<i>Total</i>	1,974	1,125	783	3882

The TVET sector in Pakistan enrolls less than half a million (0.424 million) students: 0.283 million males and 0.140 million females, as shown in Table 2. Province-wise, Baluchistan has only 17,976 students: 11,307 males and 6,669 females. District-wise, only the enrollment of females (37,059) in Islamabad Capital Territory (ICT) is greater than that of males (1,110). This might be due to the high mobility of women and the greater number of TVET institutes in ICT. It means that the availability of facilities for females can increase their enrollment in the TVET sector. Empirical studies also indicate that enrollment rates fall by 6 percentage points for every kilometer increase in distance from the training centres (Cheema et al., 2019). It shows that low enrollment is recorded in TVET despite high demand for skilled workers of both genders (Cheema et al., 2012).

1 Technical colleges offer technical courses and programs focusing on books and manuals and resulting in an associate degree, pre-bachelor degree, or certificate.

2 Vocational centers focus on teaching specific trades and employable skills with a hands-on approach and often result in a certificate of completion.

Table 2: Total Enrollment in TVET Institutes of Pakistan (in thousands) (NAVTTTC, 2022)

Region	Public			Private			Total Male	Total Female	Grand Total
	Male (A)	Female (B)	Total (C)	Male (D)	Female (E)	Total (F)	A+D	B+E	C+F
Punjab	112	76	188	34	6	39	145	82	227
Sindh	48	10	58	26	9	35	73	20	94
KP	23	2	25	19	15	34	41	17	59
Balochistan	5	1	6	6	5	11	11	6	18
AJK	3	1	3	2	2	4	5	3	8
GB	2	1	2	2	8	9	4	8	12
ICT	1	35	37	1	2	3	2	37	40
Total	193	93	286	90	48	137	283	140	424

2 Literature Review

TVET is extremely important for stimulating economic growth, increasing the employment level, and improving the quality of employment (Ahmed, 2019; Cong & Wang, 2012). The high growth after World War II in the west and the latter rapid development in East Asian countries are attributed to high investment in formal education, especially upgrading the skills set of the existing work force through technical and vocational training (Clawson, 1995; Kuruvilla, 1996; Powell & Lindsay, 2010). Many studies have also shown that acquiring skills and training increases the productivity and lifetime earnings of laborers. TVET-related trainings add to the earnings of labourers and create opportunities to penetrate the labour market (Böckerman et al., 2009; Cooke, 2004; Galdo & Chong, 2012). TVET can ignite startups and have the potential to bridge the skills gap (Symond et al., 2011).

On the demand side, the majority of empirical research in both developed and developing countries indicates that poor households enrol their children in TVET-related programmes, while rich households mostly enrol their children in general or academic education. Empirical studies also indicate that the students with the highest academic achievements opt for academic education, while the students with lower academic achievements enrol in technical schools. This negative selection creates the perception that TVET is inferior to general education (Woronov, 2015). Therefore, households with higher incomes demand general education rather than TVET (Ainsworth & Roscigno, 2005; Altinok, 2012; Tilak, 2003). Blue collar and manual jobs are associated with negative perception and are assigned low status and dignity (Jambo & Pilz, 2017; Hansen & Woronov, 2013; Ratnata, 2013). However, such trends are not found in Japan, Taiwan, or Thailand, where mostly households with higher socioeconomic backgrounds send their children to TVET. This is likely attributed to the higher returns to technical education (Altinok, 2012; Moenjak & Worswick, 2003).

Moreover, the existing research has not been uniform in its findings regarding the returns of general education and TVET-related programs. Several studies have found that the return of tertiary education is higher than that of technical education, and the former stream of education is superior to the latter (Lauer & Steiner, 2001; Psacharopoulos, 1994). The return on technical education is lower than that of general education, causing less social mobility and creating inequalities across generations (Shavet & Müller, 2000). However, there are few studies that indicate that TVET graduates have higher returns than general education graduates (Weber, 2003). These inconclusive results may be attributed to context-dependent factors that should be investigated (Mubarik et al., 2018).

Similarly, the demand for TVET also depends on the education level of the parents. Parents who attended university education are less likely to enrol their children in technical education, whereas the children of less educated parents pursue TVET (Suaphan, 2015; Wang & Goa, 2019). Moreover, higher-status occupations are based on the quality of higher academic qualifications. These high-prestige jobs are mostly filled by students who are either exceptionally brilliant or who graduated from elite colleges or obtained their education abroad. Occupation also depends on economic background, education, and civil rights. Therefore, children from lower-income households or castes are prevented from pursuing certain occupations (Thorat & Madheswaran, 2018).

Lastly, the low status of TVET education can be traced back to the colonial era. The colonial involvement placed more emphasis on general education, having a proper curriculum, text books, and examination system, ignoring the traditional apprenticeship linked to vocational learning (Andrea & Rajasekhar, 2023; Singh, 2001; Subramanian, 2019). The colonial masters (British) were mostly involved in white-collar jobs, and the manual work was left for the low-caste people of British India. People who belong to higher caste and social status considered technical and industrial jobs as manual work derogatory, and they avoided getting vocational and technical education established by the then government (Rao, 2006; Subramanian, 2019). For the last quarter century, Pakistan's education system has been pursuing the Macaulay educational system, which has been producing clerks, subordinates, and generalists with working knowledge of language to carry on the administration of the country. There are certain flaws in the British education system. This system did not introduce the knowledge of medicine, science and technology, economics, and politics but instead introduced English literature, philosophy, and metaphysics in an imitative fashion. The English language was a source of linguistic and cultural imperialism. The objective was to create a class of people who were Indian in colour and blood but English in morals, opinions, and intellect. It was designed as an instrument of social and political control for the natives and as a means of providing the government with paid functionaries (Kazi, 1987; Rahman, 1996). Pakistanis still prefer conventional Bachelor of Arts (BA), Master of Arts (MA), Bachelor of Medicine (MBBS), and engineering programmes over technical and vocational training.

3 Theoretical Exposition

This study is based on the theoretical foundation of human capital theory by Schultz (1961) and Becker (2009). Human capital refers to the knowledge, skill, experience, abilities, and attributes that a person acquires through education, vocational training, and learning by doing (Becker, 2009; Psacharopoulos, 1994). The core idea of human capital theory is that education increases the marginal productivity of labour, and marginal productivity increases the lifetime earnings of labour. Higher education automatically triggers private enrichment, intellectual development, career success, and national economic growth. Investment in human capital plays an important role for firms and national economic growth. Highly skilled human capital increases the productivity and competitive advantages of firms, and the high performance of firms hinges on their intangible resources and capabilities (Ray et al., 2004; Wernerfelt, 1984).

According to human capital theory, the human capital developed through education, vocational training, and on-the-job training has significant positive effects on the earnings of both genders. Technical education, an alternative to academic or general education, is acquired through vocational institutes, apprenticeships, or on-the-job training (Mincer, 1993). TVET is defined as a system of education that combines both theoretical understanding and practical skills to train individuals with the adequate skill set required for a specific trade, occupation, or job (Arthur-Mensah & Alagaraja, 2013). However, human capital theory is necessary for an explanation of the relationship between education and earnings, but it is not sufficient. There are a host of other factors, such as prior family endowment, financial, social, and cultural capital, that have a significant effect on the lifetime earnings of labour and income inequality (Marginson, 2019; Piketty, 2014).

3.1 Research Methodology and Data Description

As discussed earlier, technical education is important for stimulating economic growth and increasing the employment level and lifetime earnings of labour (Bockerman et al., 2009; Cong & Wang, 2012; Cooke, 2004; Maitra & Mani, 2017). Despite various attributes of TVET in terms of economic growth, job creation, and high government investment with donor support, only 13 percent of the young population of Pakistan enrolled in TVET. This low enrollment in TVET persists despite the high demand for skilled workers in both genders (Cheema et al., 2012; Khan & Mahmood, 1997; NAVTTC, 2017). Therefore, this study is intended to explore the role of demographic factors that influence the demand for TVET in the context of Pakistan. Based on the prior studies and literature review, the two assumptions are listed below.

Hypothesis 1 (H1): Households belonging to the higher income category do not demand or obtain a TVET diploma or certificate. The empirical findings also indicate that rich people do not go for skill-based professions (Altinok, 2012; Jambo & Pilz, 2017; Tilak, 2003).

Hypothesis 2 (H2): Children of parents with university education are less likely to pursue TVET-related degrees as they are considered inferior due to their lower standing as compared to general or professional degrees. The empirical findings also support this notion (Aarkrog, 2020; Wang & Guo, 2018).

In order to validate or reject the above hypotheses, this study utilises the Pakistan Social and Living Standard Measurement (PSLM) data set for 2018–19. It is a nationally representative cross-sectional survey conducted since 2005 by the Pakistan Bureau of Statistics (PBS). It provides individual-level household information on income, employment, education, health, assets, and other household characteristics with urban-rural, provincial, and district-level bifurcation.

3.1.1 Sample Selection

Households having at least one member of the age group 14–26 years (target age group) were selected from the full sample of PSLM. This age group has been identified as the 'target age group' after analysing the PSLM dataset, which revealed that 99.1% of students enrolled in TVET belonged to this age group. Therefore, our relevant population for TVET is households with at least one member belonging to this target age group. So, in this criterion, our sub-sample consists of 16,982 households, with 9,444 households from rural regions and 7,538 households from urban regions in four provinces of Pakistan: Baluchistan, Khyber Pakhtunkhwa (KP), Punjab, and Sindh. An analysis of the full population of the PSLM dataset revealed that there are 2,075 households that have attained TVET or are enrolled in TVET. However, there were only 1,342 households in our subset population with members of the target age group having attained TVET or currently enrolled in TVET.

3.1.2 Variable Construction

The PSLM collects information from each member of the household about their age, marital status, relation to the head, education, and income. From the full dataset of PSLM, we selected households with at least one member belonging to our target age group. These households are considered to be our relevant population. Further, households in which at least one member of the target age group is enrolled in TVET or has attained TVET were considered to have demand for TVET. All other households were considered to have no demand for TVET.

We aim to analyse the impact of socio-economic factors in households on the decision to demand TVET. Therefore, our dependent variable will be demand for TVET. If the household

is found to have demand for TVET, we assign the value of '1' to such a household. On the other hand, if a household is not found to have demand for TVET, we assign the value of '0' to such a household. Thus, our dependent variable takes the form of a dichotomous variable.

The explanatory variables include the household's income category, household head's education level, household size, male proportion of the target age group (MPTAG), gender of the head, household head's age, and region of the household. These variables are expected to affect the household's decision to pursue a TVET degree or diploma. For instance, the education level of a household's head and income level can significantly impact their decision about their child's education. If the household head is highly educated and belongs to an upper income level, then they may not be interested in a TVET degree for their children. The empirical findings also indicate that rich people do not go for skills-based professions (Altinok, 2012; Oakes, 2005; Jambo & Pilz, 2017; Tilak, 2003).

Income categories are computed from the total yearly income of households. PSLM provides information to each individual, having an age of 10 years and older, about their earnings from different sources. These sources include cash money earned during a year, money earned from a second occupation, money earned from other activities during a year, income received in kind during a year, and the amount of pension received during the year. Income from all of these sources was aggregated at the household level. Then each household was categorised as 1, 2, 3, 4, 5, and 6, with income levels defined by Nayab (2011) in Table 3.

Table 3: Income Categories of Households

Income Category	Income Category Name	Yearly income (Rs.)
1	Lower Low	<78,984
2	Lower Income	78,984-126,360
3	Lower Middle	126,360-252,720
4	Upper Middle	252,720-631,800
5	High Income	631,800-1,263,600
6	Upper High Income	1,263,600>

PSLM also provides information on each individual's status in the household (head, spouse, children, etc.), his or her highest education obtained, and in which class he or she is currently enrolled (if enrolled). The questionnaire gives categories of 1–10 for grades 1–10, 11 for technical education, 12 for intermediate education, 14 for bachelor of two years (14 years of education), 16 for bachelor of 4 years (16 years of education), 17 for bachelor of medicine or surgery, 18 for masters (18 years of education), and 21 for a PhD. The variable 'Education of Head' is computed by identifying a head in a household and taking his or her education in years as provided in the dataset.

For the construction of 'Education of Head Matric or Below', we categorised the households with heads having education equal to or below matriculation as '1' and all other households were categorised as '0'. Similarly, for the construction of the Education of Head Intermediate, households with heads having education equal to intermediate or TVET diploma were categorised as '1' and all other households were categorised as '0'. In a similar pattern, for the construction of the education of Head Inter Above, households with heads having education above intermediate were categorised as '1' and all other households were categorised as '0'.

Similarly, the size of the household can also have a significant effect on the decision to demand a TVET degree. We aggregated our sub-sample with respect to household and calculated the number of members in each household. Due to the quick payoff, larger households are more likely to enrol one or more children in a TVET-related degree.

Moreover, the region of the household can also have some effect on the household's decision to pursue a TVET degree. For instance, urban households are relatively more inclined towards formal education as compared to rural households due to the high skill-based job opportunities in urban areas. PSLM provides information about the region of the household. Households from rural regions are categorised as '1', whereas households from urban regions are categorised as '2' in PSLM. For the construction of the urban region variable, we recoded category '1' into '0' and category '2' into '1'.

PSLM data also provides information on the gender of each individual in a household. For the construction of 'Male Proportion of Target Age Group (MPTAG)', we calculated the total number of male individuals belonging to our MPTAG in a household. Then we divided it by household size, which yielded our desired variable. Moreover, it also asks each individual about his or her age in complete years and months. It also provides information on each individual's relationship to the head. For the construction of 'Head's Age', we extracted the age of the head from the dataset. For computing 'Head's age 40 plus', we selected households with heads having an age above 40 years and categorised that household as '1' whereas all other households were categorised as '0'. For computing 'Male Head', we identified households having a male as their head. All the households having a male as their head were categorised '1', and all other households were categorised '0'. These variables are summarised in Table 4.

Table 4: Definitions of Variables

Variable	Denomination	Description
Household's Demand for TVET Degrees or Diploma	Y_i	$Y_i=1$, if at least one member of our target age group in a household is enrolled or has attained TVET. $Y_i=0$, otherwise.
Income Category:	Income_Group	Explanation:
1) Lower Low Income	1→LLI	Income_Group = 1, if the yearly income of the household is below Rs. 78,984.
2) Lower Income	2→LI	Income_Group = 2, if the yearly income of the household is between Rs. 78,984 and Rs. 126,360.
3) Lower Middle	3→LM	Income_Group = 3, if the yearly income of the household is between Rs. 126,360 and Rs. 252,720.
4) Upper Middle	4→UM	Income_Group = 4, if the yearly income of the household is between Rs. 252,720 and Rs. 631,800.
5) High Income	5→HI	Income_Group = 5, if the yearly income of the household is between Rs. 631,800 and Rs. 1,263,600.
6) Upper High	6→UH	Income_Group = 6, if the yearly income of the household exceeds Rs. 1,263,600.
Male Proportion of Target Age Group (MPTAG)	MPTAG	Total number of male members of the target age group (14–26) divided by household size
Male Head	Male_Head	Male_Head = 1, if head of household is male Male_Head = 0, otherwise
Household size	HH_Size	HH_Size=Total members in a household
Household Head's age	Age_Head	Age_Head= Age of the household's head in years
Household Head's age 40 plus	Head>40	Head>40 = 1. If the age of the household's head is 40 or above Head>40 = 0, otherwise
Urban Region	Region	Region = 1, If a household lives in an urban region, Region = 0, Otherwise
Head's Education	Edu_Head	The highest level of education the household head has attained (in years of education)
Education of Head Matric or Below	Edu_Head≤10	Edu_Head≤10 = 1, If the highest level of education achieved by the household head is equal to or below matriculation Edu_Head≤10=0, otherwise
Education of Head Intermediate	Edu_Head_Inter	Edu_Head_Inter = 1, If the highest level of education achieved by the household head equals an intermediate or TVET diploma, Edu_Head_Inter = 0, otherwise
Education of Head Above Intermediate	Edu_Head>12	Edu_Head>12 = 1, If the highest level of education achieved by the household head is greater than intermediate Edu Head>12 = 0, otherwise

3.2 Model

To examine our two hypotheses, this study uses the PSLM 2018–19 data from Pakistan. A TVET demand function investigates the demand for TVET while accounting for the socioeconomic variables that human capital theory frequently predicts will influence the type and outcome of education.

$$Y=F(\text{Income, Household Characteristics}) \quad (1)$$

Here, Y indicates the household's demand for a TVET degree or diploma. It is a dichotomous or binary variable (0/1). Income is the income level of households, and the second term in equation (1) demonstrates the set of household characteristics involved in demand for TVET.

Our outcome variable is a dichotomous or binary variable (0/1). Therefore, it poses two major problems. First, the predicted values of the outcome variable through the ordinary least squares (OLS) method represent the probability of a household to demand a TVET degree or diploma, which may exceed the probability limit of 0-1, thus giving meaningless interpretations of the predicted values. Secondly, due to the dichotomous values of the outcome variable, the variance-covariance matrix of the error term may no longer remain an identity matrix, thus creating a problem of heteroscedasticity. In order to tackle these problems, this study uses the maximum likelihood estimation method to estimate equation (1). The maximum likelihood ensures that the bounded values of probability lie in the 0–1 range. Moreover, it also ensures the asymptotic efficiency and consistency of the parameters of the model (Green, 2003). Therefore, binary logistic regression analysis (BLRA) is employed for empirical analysis. The BLRA is a special condition of linear regression analysis (LRA) used to analyse the relationship between multiple explanatory variables and a response variable that is a binary variable with two categories, while the explanatory variables are quantitative or qualitative in nature (Hair et al., 2010; Sweet & Martin, 2011). So, following James et al. (2013) and Peng et al. (2002), the final BLRA model can be written as:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_i X_i \quad (2)$$

Here P_i can be represented as follows

$$P_i = E(Y = 1|X_i) = \frac{e^{\beta_0 + \beta_i X_i}}{1 + e^{\beta_0 + \beta_i X_i}} \quad (3)$$

Here P_i is the probability of the outcome or response of interest given that $X=X_i$, either continuous or discrete variables, while Y will always be a qualitative or categorical variable. β_0 represents the Y-intercept, and β_i is the slope parameter.

The term in parenthesis of equation (3) is simply the log of odds ratio in favor of the TVET degree or diploma, or the ratio of the probability of demanding a TVET degree or diploma to the probability that it will not be demanded for TVET. The variable X_i in equation (2) is the vector of all explanatory variables, whereas β_i is the vector of coefficients of all explanatory variables involved in equation (4). However, determining the marginal effect of each explanatory variable on the outcome variable is preferable for meaningful analysis. Therefore, by differentiating equation (4) with respect to X_i , the marginal effect can be determined.

$$\frac{\partial P}{\partial x_i} = \beta_i (1 - P)P \quad (5)$$

Here β_i is the vector for maximum likelihood estimates of explanatory variables through logit estimation.

For the evaluation of estimated models, we will start with the overall significance of the models. Hosmer and Lemeshow (2000) have suggested a likelihood ratio test for testing the significance of multiple logistic regression models. The test can be performed by applying Equation (6).

$$G = -2 \ln \left[\frac{\text{(likelihood without variable)}}{\text{(likelihood with variable)}} \right] \quad (6)$$

The statistic G follows a Chi-square distribution. The P-value for the test is given by $P[\chi^2(d.f.) > G] = P$. The null hypothesis in the likelihood ratio test assumes that all coefficients are equal to zero. The rejection of the null hypothesis will show that at least one coefficient of the model is non-zero.

Additionally, we use the Wald test from Equation (7) to determine the significance of individual coefficients in models. The statistics under the Wald test follow a normal distribution with a null hypothesis that the individual coefficient is equal to zero.

$$w_j = \hat{\beta}_j / SE(\hat{\beta}_j) \quad (7)$$

There are multiple criteria for model selection in the literature. However, Chakrabarti and Ghosh (2011) have proposed to use the Bayesian Information Criterion (BIC), which is given by Equation (8).

$$BIC = 2[l(\hat{\theta}_2) - l(\hat{\theta}_1)] - \log n(p_2 - p_1) \quad (8)$$

The BIC test employs likelihood ratio test $2[l(\hat{\theta}_2) - l(\hat{\theta}_1)]$ which is given by the first term in Equation (8) having χ^2 distribution with $p_2 - p_1$ degrees of freedom. The second term can be taken as a penalty for the increase in complexity in the second model due to overfitting. The model with the lowest value of BIC is considered a good fit for the data at hand. However, it is also an accepted fact that in practice, model choice mainly depends on the subject matter, information, and purpose of the analysis. Model selection solely based on statistical rules is rare (Chakrabarti & Ghosh, 2011). Therefore, we will be combining the model selection criteria of BIC with our domain knowledge and prior literature.

4 Results and Discussions

Prior hypotheses suggested that kids from wealthier and more educated families are more likely to demand TVET than general education. To support or disprove the said hypotheses, the next sections show descriptive statistics, the results of the logit model, and scatter plots and histograms that show how the variables are distributed across categories.

4.1 Graphical Representation of Data

The visualized presentation of the distributions of variables across categories is given in this section. We start by providing the distribution of households across income groups. Figures 1 and 2 present the distribution of households by income level and whether they have demand for TVET or not. It is seen that the distribution of income is positive for both households with and without a demand for TVET. The income of households that have no demand for TVET starts at Rs. 0 and reaches Rs. 50 million annually. The average income in this category is Rs. 691,318. On the other hand, the income of households with demand for TVET ranges between Rs. 0 and 8 million annually, with a mean of Rs. 588,708. There is a large difference in the incomes of both groups. This shows that higher-income households tend to have less demand for TVET.

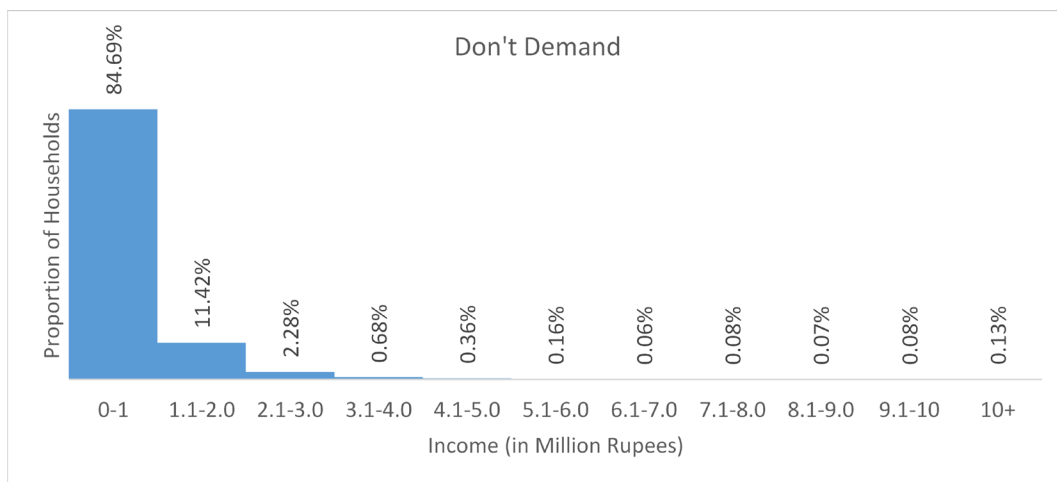


Figure 1: Proportion of Households Not Demanding TVET From Different Income Levels

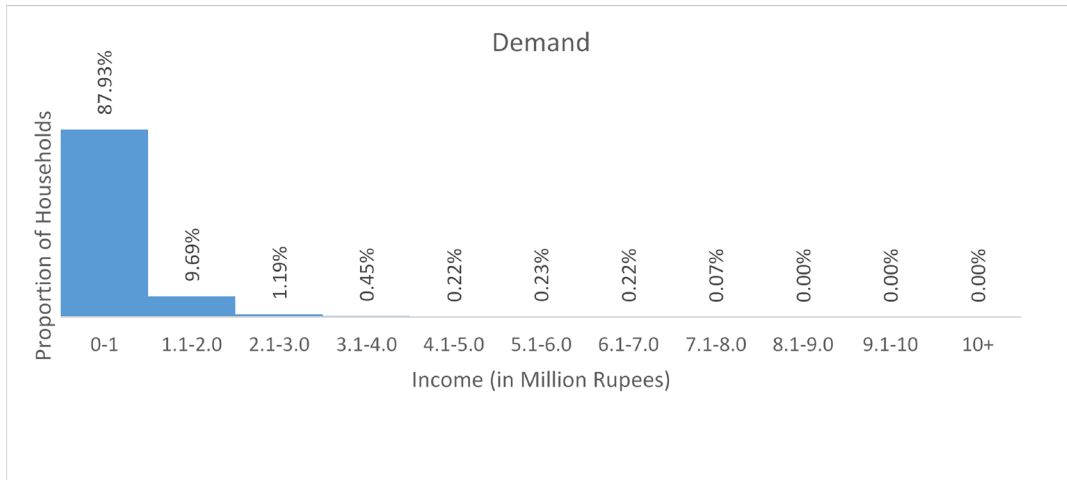


Figure 2: Proportion of Households Demanding TVET From Different Income Levels

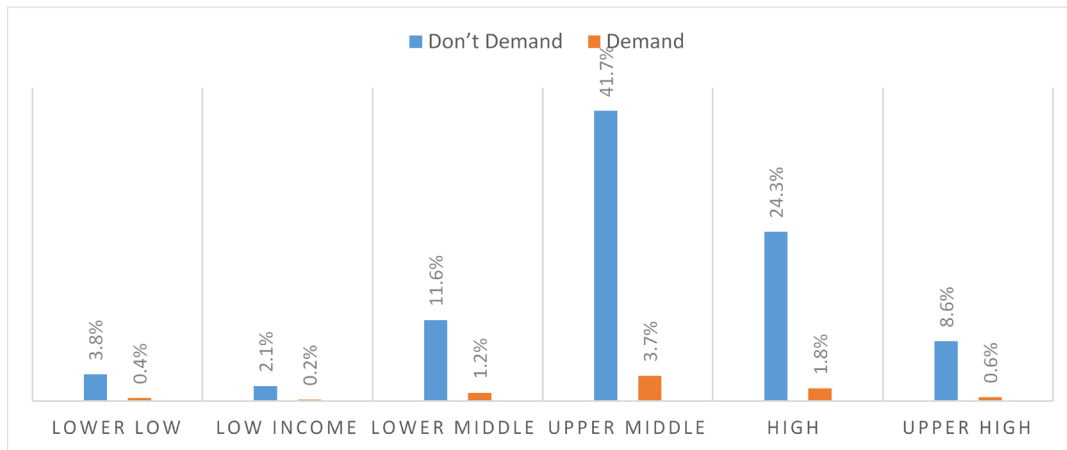


Figure 3: Distribution of Households Across Income Categories (%)

Figure 3 shows the distribution of households by income groups and whether they have demand for TVET or not. It can be observed that the highest proportion of households lie in the categories of lower middle, upper middle, and high income. It also shows that the higher-income groups have relatively less demand for TVET.

Figure 4 presents the number of households in each income group and whether they have demand for TVET or not. It can be observed that a very small number of households in each income group have a demand for TVET, while the majority of households do not demand TVET.

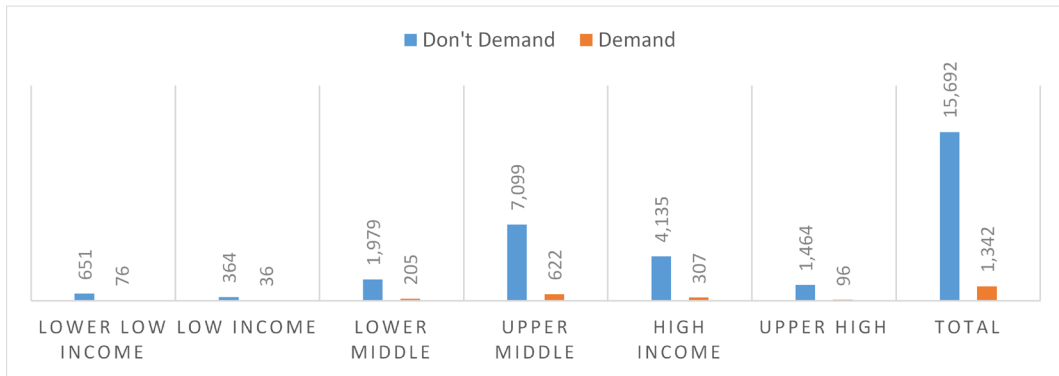


Figure 4: Number of Households Having Demand for TVET Across Income Groups

Figure 5 presents the proportion of households with a demand for TVET and matriculation heads. It may be noted that households with or without demand for TVET have higher education than matriculation. Although the proportion of heads having education matric or below is also high (41.7 percent among those with no demand and 3.5 percent among those with demand for TVET), Similarly, Figure 6 presents the proportion of households with heads having an education level of intermediate. It may be noted that a large proportion of heads have education below or above intermediate.

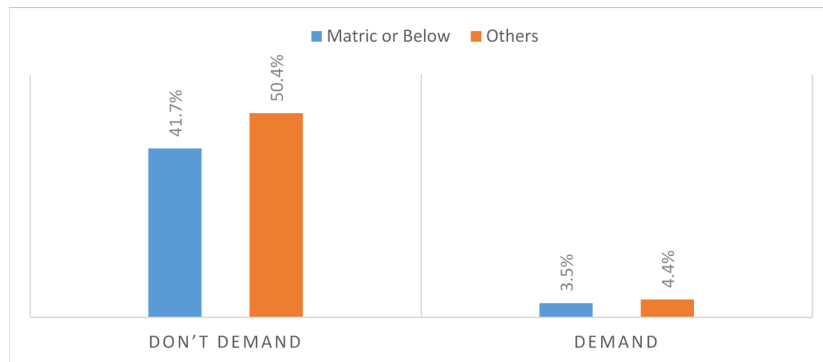


Figure 5: Proportion of Households With Matriculate Head (%)

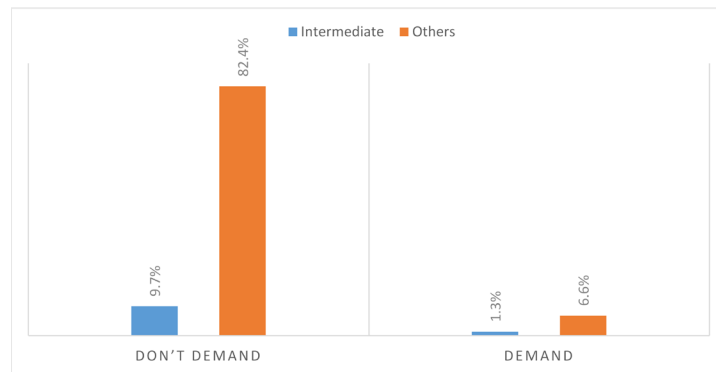


Figure 6: Proportion of Households With Head Having Intermediate (%)

Figure 7 presents the distribution of households with heads having education above or below intermediate. It may be observed that a large proportion of heads have education that is intermediate or below.

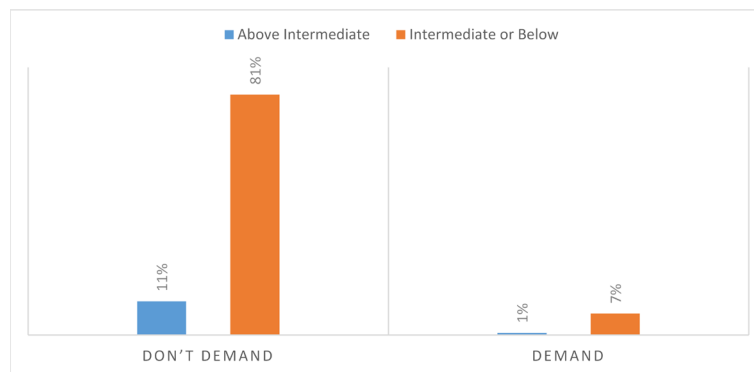


Figure 7: Proportion of Households With Head Having Above Intermediate Education (%)

Figure 8 presents the distribution of households by education of the head. It can be observed that a majority of household heads have the highest education from grade 8 to grade 10, with a share of 31.6 percent. A small proportion of heads have education above the undergraduate level.

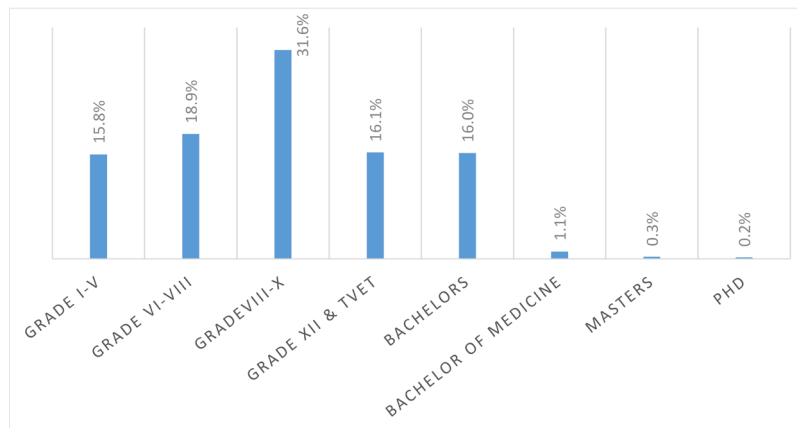


Figure 8: Distribution of Households by Education of Head

4.2 Descriptive Statistics and Correlation Matrix

Table 5 shows the descriptive statistics of the main variables involved in our study. The average income of the households in our sample is Rs. 187,847, with a standard deviation of 330,847 and a minimum and maximum yearly income of Rs. 0 to Rs. 5,000,000. It indicates that some households have a proportionally high income, while others have a relatively low income. Similarly, 13,968 heads of households have a below-intermediate level of education, and only 3,014 heads of households have an education that is either intermediate or above. It shows that the majority of households head education is below the intermediate level. In our sample size, 9,444 households belong to rural areas, while the remaining 7,538 households belong to urban areas. The average household head age is 50.44 years, and it ranges from 13 to 99 years.

The average of MPTAG is 0.29, with a minimum and maximum value of 0 and 1, respectively. Moreover, we have also disaggregated the income of households into six categories. A total of 727 households with an income level below Rs. 78,984 are included in the first income category. Furthermore, another 400 households with incomes in the range of Rs. 78,984–126,360 are included in the second category. The third category consists of 2184 households with incomes between Rs. 126,360 and 252,720. The fourth category has 7,721 households with incomes in the range of Rs. 252,720–631,800. The fifth category consists of 4,442 households with incomes in the range of Rs. 631,800–1,263,600. Finally, the sixth category consists of 1,560 households with incomes higher than Rs. 1,263,600.

Table 6 shows the correlation of independent variables. It may be observed that the majority of variables have a significant correlation with each other. However, there are

some variables with insignificant correlations. MPTAG has a high negative correlation with household size. This indicates the inverse relationship between the two variables, as the former is derived by dividing the size of male members by household size.

Table 5: Summary Statistics of Socio-Economic Status of Household

<i>Variables</i>	<i>Mean</i>	<i>SD</i>	<i>Min/Max/Number of Households</i>
<i>Total Households</i>			17,037
<i>Household's yearly income (Rs)</i>	683,234	1003302	0-50,000,000
<i>Y</i>			Yes=1,342 No=15,695
<i>Income category</i>			No of households (%)
<i>LLI</i>			727 (4.3%)
<i>LI</i>			400 (2.3%)
<i>LM</i>			2,184 (12.8%)
<i>UM</i>			7,721 (45.3%)
<i>HI</i>			4,442 (26.1%)
<i>UH</i>			1,560 (9.2%)
<i>MPTAG</i>	0.29	0.140	Min=0 Max=1
<i>Male_Head</i>			Yes= 15,255 (90.1%) No= 1,683 (9.9%)
<i>HH_Size</i>	6.53	2.794	Min=1 Max=36
<i>Age_Head</i>	50.45	10.428	Min=13 Max=99
<i>Head>40</i>			Yes= 15,346 (90.1%) No= 1691 (9.9%)
<i>Region</i>			Rural=9,466 (55.6%) Urban=7,571 (44.4%)
<i>Edu_Head</i>	9.8	3.26	Min=1 Max=21
<i>Edu_Head≤10</i>			Yes=7,702 (45%) No=9,335 (55%)
<i>Edu_Head_Inter</i>			Yes= 1,874 (11%) No=15,163 (89%)
<i>Edu_Head>12</i>			Yes= 2,040 (12%) No= 14,997 (88%)

Table 6: Correlation Matrix of Independent Variables

	1	2	3	4	5	6	7	8	9	10	11
<i>Income_Group</i>	1										
<i>MPTAG</i>	-0.042 (0.000)	1									
<i>Male_Head</i>	0.141 (0.000)	-0.087 (0.000)	1								
<i>HH_Size</i>	0.160 (0.000)	-0.357 (0.000)	0.147 (0.000)	1							
<i>Age_Head</i>	0.155 (0.000)	-0.114 (0.000)	0.106 (0.000)	0.137 (0.000)	1						
<i>Head>40</i>	0.120 (0.000)	-0.065 (0.000)	0.057 (0.000)	0.038 (0.000)	0.611 (0.000)	1					
<i>Region</i>	0.114 (0.000)	0.072 (0.000)	0.061 (0.000)	-0.151 (0.000)	-0.007 (0.378)	0.026 (0.001)	1				
<i>Edu_Head</i>	0.230 (0.000)	0.054 (0.000)	0.101 (0.000)	-0.113 (0.000)	-0.045 (0.000)	-0.013 (0.160)	0.194 (0.000)	1			
<i>Edu_Head≤10</i>	-0.058 (0.000)	-0.056 (0.000)	0.045 (0.000)	0.015 (0.045)	0.010 (0.212)	0.052 (0.000)	-0.040 (0.000)	-0.777 (0.000)	1		
<i>Edu_Head_Inter</i>	0.060 (0.000)	0.007 (.407)	0.064 (0.000)	-0.036 (0.000)	-0.039 (0.000)	0.005 (0.512)	0.090 (0.000)	0.285 (0.000)	-0.319 (0.000)	1	
<i>Edu_Head>12</i>	0.197 (0.000)	0.028 (0.001)	0.067 (0.000)	-0.074 (0.000)	-0.009 (0.255)	0.019 (0.013)	0.157 (0.000)	0.690 (0.000)	-0.335 (0.000)	-0.130 (0.000)	1

4.3 Results of Logit Model

This study analyzes the role of socio-economic factors in the demand for TVET degrees and diplomas in Pakistan using the latest available PSLM data for 2018–19. Table 7 presents the univariate analysis of the dependent variable with categorical variables. The results indicate that the demand for TVET is significantly influenced by income groups, education levels above intermediate, age groups above 40, and urban regions. Therefore, we can use these variables in our models. Education of head matriculation, education of head intermediate, and male head have insignificant impact on demand for TVET. However, we will analyze the impact of these variables in multiple regression analysis to see how they respond in multiple regression analysis.

Table 7: Univariate Analysis of Dependent Variables With Categorical Variables

<i>Categorical variable</i>	<i>Coefficient (P-Value)</i>	<i>Pearson Chi-Square Value</i>	<i>% Cells have expected count less than 5</i>
<i>Income_Group</i>	-0.1245 (0.000)	26.634 (0.000)	0.0
<i>Education of Head Matric or Below</i>	-0.0382 (0.504)	0.4458 (0.504)	0.0
<i>Education of Head Intermediate</i>	0.5156 (0.000)	44.4971 (0.000)	0.0
<i>Education of Head Above Intermediate</i>	-0.3898 (0.000)	15.327 (0.000)	0.0
<i>Age of Head 40 plus</i>	0.2058 (0.044)	4.066 (0.044)	0.0
<i>Urban Region</i>	-0.1299 (0.024)	5.077 (0.024)	0.0
<i>Male Head</i>	0.1405 (0.160)	1.975 (0.160)	0.0

For model selection, we opt for purposeful selection of variables, as proposed by Bursac et al. (2008), instead of the step-wise deterministic method of model building. The deterministic method of model selection is useful in cases where the outcomes being studied are relatively new and important covariates are not well understood. However, in the case of demand for conventional and technical education, there are multiple studies that have outlined important covariates involved at the household level. Although the variable of education of Head Matric or below is insignificant, following Hosmer and Lemeshow (2000), we will still include it in our model to check how it behaves in multiple regression. All variables with a probability value (P-value) <0.25 are candidates for the multivariable model (Mickey & Greenland, 1989).

The individual P-value of the Likelihood Ratio (LR) test for each model is provided in Table 8. The constant-only model yields a likelihood of -4698.0262. Evaluating Model 1 reveals that it is significant at a 5 percent confidence interval, as the P-value of the LR test is less than

0.05. Hence, we reject the null hypothesis of all coefficients being equal to zero and conclude that at least one coefficient is different from zero.

In order to evaluate individual coefficients, we apply the Wald test. The estimated P-values for Wald tests are provided in Table 8 in parenthesis under each estimated coefficient. We use a significance level of 5 percent and conclude that all income categories are insignificant at the 5 percent level of significance. However, income is our main variable, and therefore, we do not drop this variable from our entire analysis. Further investigation reveals that the age of the head, urban region, and education of the head are insignificant. The Bayesian information criterion (BIC) has a value of 5,737.

Model 2 replaced the Age of Head with the age of Head 40 plus to investigate the impact of maturity on the decision to enroll a child in TVET. Furthermore, Education of Head was replaced with Education of Head Matric or Below to investigate the impact of education level of head on the decision to demand TVET for its members. Urban Region was dropped from later models due to an insignificant result in Model 1. It may be observed that the overall model is significant at the 5 percent level, as the value of $\text{prob} > \text{Chi}(2)$ is below 0.05. The Lower Income and Lower Middle Income categories are still insignificant, whereas other successive categories have become significant at the 5 percent significance level. Among others, only the Education of Head Matric or Below is insignificant. The value of BIC has increased to 8,349. At this stage, although the value of BIC for Model 1 is lower than that for Model 2, it cannot be selected as it is overfit and contains multiple insignificant variables.

Model 3 replaced the Education of Head Matric or Below with the Education of Head Intermediate. The likelihood ratio test shows that the overall model is significant at the 5 percent significance level. Therefore, we reject the null hypothesis of all coefficients being equal to zero and accept the alternate hypothesis that at least one variable is non-zero. The Wald test reveals that the coefficients of Lower Income and Lower Middle Income are still insignificant. The coefficients of the remaining successive income groups are significant. Male head has become insignificant, whereas Education of Head Intermediate is significant at the 5 percent significance level. The model has a BIC value of 8318.986, which is lower than the BIC value of Model 2. Furthermore, Model 3 also has a higher Pseudo-R square value, which also indicates that Model 3 is better than Model 2.

However, we intend to check whether eliminating the Male Head increases the fit of the model. Model 4 presents the result of the estimation without a Male Head. The LR test reveals that the model is significant at the 5 percent significance level. The Wald test shows that the income categories of Lower Income and Lower Middle Income are insignificant. Other than these two income categories, all the income categories and variables are significant. However, the value of BIC has increased, and the Pseudo-R square has also slightly decreased. Both of these indicators show that Model 3 is a better fit as compared to Model 4.

Hypothesis 2 intends to analyze the role of higher education on demand for TVET. In order to analyze this hypothesis, we further replace Education of the Head Intermediate with Education of the Head above Intermediate. Model 5 presents the results of the estimation with a head having an education level above intermediate. The LR test shows that the overall model is significant at a significance level of 5 percent. The Wald test indicates that the income categories of Lower Income and Lower Middle Income are insignificant at a significance level of 5 percent. However, the remaining three income categories and all variables are significant. The coefficient of Education for Heads above Intermediate is significantly negative, which supports our hypothesis. This result shows that household heads with higher education do not prefer TVET.

However, the overall significance of Model 5 has decreased as the BIC value has increased to 8343.557 and the Pseudo R square has declined to 0.0079. Therefore, we conclude that Model 3 is a better fit as compared to the rest of the models. It explains our data better than the rest of the models. Therefore, we chose Model 3 for interpretation purposes.

Table 8 presents the results of marginal effects computed from logit estimation in multiple regression analysis. The key finding is that households in the higher income category do not demand TVET education, as the estimation results indicate. Here, we illustrate the results of Model 3, as it describes the behavior of our data better than other models.

Table 8: Marginal Effects From Logit Estimations

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Income_Group*					
LI	0.0022 (0.941)	-0.0132 (0.552)	-0.0097 (0.670)	-0.0023 (0.916)	-0.0135 (0.539)
LM	-0.0039 (0.838)	-0.0195 (0.208)	-0.0164 (0.294)	-0.0106 (0.478)	-0.0206 (0.180)
UM	-0.0134 (0.443)	-0.0336 (0.018)	-0.0336 (0.018)	-0.0273 (0.026)	-0.0336 (0.017)
HI	-0.0310 (0.081)	-0.0491 (0.001)	-0.0499 (0.001)	-0.0438 (0.001)	-0.0468 (0.001)
UH	-0.0334 (0.079)	-0.0598 (0.000)	-0.0599 (0.000)	-0.0537 (0.000)	-0.0557 (0.000)
MPTAG	0.1141 (0.000)	0.0772 (0.000)	0.0790 (0.000)	0.0765 (0.000)	0.0775 (0.000)
Male_Head	0.0298 (0.024)	0.0179 (0.032)	0.0147 (0.080)		0.0187 (0.026)
HH_Size	0.0034 (0.003)	0.0022 (0.011)	0.0025 (0.004)	0.0026 (0.002)	0.0019 (0.024)
Age_Head	0.0002 (0.524)				
Head>40		0.0243 (0.005)	0.02432 (0.005)	0.0242 (0.000)	0.0238 (0.006)

Region	-0.0046 (0.423)				
Edu_Head	0.0001 (0.927)				
Edu_Head≤10		-0.0039 (0.397)			
Edu_Head_Inter			0.0375 (0.000)	0.0383 (0.000)	
Edu_Head>12					-0.0200 (0.015)
Constant	-3.3722	-2.9742	-3.06	-2.94	-2.9625
Observations	9811	14509	14509	14596	14509
Log likelihood	-2813.5231	-4121.8203	-4106.789	-4130.546	-4119.0745
LR Chi(2)	46.29	60.17	90.23	86.62	65.66
Prob>Chi(2)	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R (2)	0.0082	0.0072	0.0109	0.0104	0.0079
BIC	5737.341	8349.048	8318.986	8356.977	8343.557

Note. * Base for Income_Group: LLI, P>|z| in parenthesis

It can be observed that the income categories of Lower Income and Lower Middle Income are insignificant. However, other successive income categories are significant and have a negative relationship with demand for TVET. The interesting point is that the value of the coefficient is decreasing for successive categories, indicating a disinclination of higher-income households towards TVET degrees. The results indicate that Upper Middle-Income Households, High-Income Households, and Upper-High-Income Households are 3.4 percent, 4.9 percent, and 5.9 percent, respectively, less likely to choose TVET as compared to households of Lower Income. This result validates Hypothesis 1 (H1) that households belonging to the higher income category do not demand or obtain a TVET diploma. Studies in India, China, and other countries also found a negative relationship between the economic status of households and participation in TVET (Altinok, 2012; Tilak, 2003; Wang & Guo, 2018). The underlying reason is that households with lower socioeconomic status cannot afford university education. Secondly, the opportunity cost of forgone income due to taking admission to a professional degree is high for poor households.

The Male Proportion of Target-age Members (MPTAG) in households has a significant positive impact on demand for TVET. With an increase of 100 percent in the male proportion, the chances of demand for TVET by households increase by around 7.9 percent. This indicates the tendency of Pakistani society to prefer the education of boys over the education

of girls. These results are consistent with similar studies in other countries (Andrea & Rajasekhar, 2023; Kumar et al., 2019; World Bank, 2012). Females are less likely to participate in TVET due to the non-availability of institutes and hostel facilities, poor transportation, the limited number of trades available for females, and security issues (Adams & Baddianaah, 2023; Mathur et al., 2014).

A strict application of a significance level of 5 percent results in an insignificant impact of a Male Head on demand for TVET. However, a relaxation from the 5 percent significance level to 10 percent shows that households with a male head are 1.5 percent more likely to demand TVET as compared to households with a female head. We relaxed our criteria of 5 percent significance, as recommended by Hosmer and Lemeshow (2000), because of the importance of a male head in the context of Pakistani male-dominated society.

Household size has a positive and significant effect on demand for TVET. Larger households tend to have demand for TVET. However, the coefficient of household size is negligible, which shows that it has very little impact on the decision to demand TVET.

The Age of the Head, when considered in terms of total years of age, has an insignificant impact on demand for TVET. However, it was transformed into the age of 40 or older to capture the impact of maturity among heads. It shows that households with a head age of forty years or older significantly increase the chances of demand for TVET. On average, a household with a head of age of forty years plus is 2.4 percent more likely to have demand for TVET as compared to a household with a head of age below forty years. With age, household heads may accumulate knowledge and become more aware of the advantages and economic opportunities that technical education can offer. They may seek to provide their children with opportunities they didn't have themselves, recognizing the transformative power of technical skills and better career opportunities.

Similarly, Education of the Head, when considered in terms of years of schooling, has an insignificant impact on demand for TVET. However, in order to capture the effect of each level of a head's education on demand for TVET, we transformed education into a head's education: Matriculation, or below, equal to intermediate, and above intermediate. The results indicate that a household with a head with intermediate education increases the chances of getting TVET by 3.75 percent.

On the other hand, according to Model 5, households with heads having education above intermediate are 2 percent less likely to demand TVET as compared to their counterparts. So, it means that if the head of the household is intermediate or above, then there is a high probability that the household will opt for a non-TEVT degree for their children. This result validates Hypothesis 2 (H2) that educated parents are less likely to pursue TVET-related degrees for their children. The reason is likely attributed to the perception that TVET-associated degrees are considered inferior due to their low standing as compared to general or professional degrees. Hence, children of parents with university education are less likely to pursue

TVET-related degrees. These findings are also supported by many empirical studies in China, India, and other developed and developing countries (Altinok, 2012; Aarkrog, 2020; Wang & Guo, 2018). A similar perception was also reflected in Pakistan in the 2014–16 national youth consultation: TVET is a form of 'second-class' education, and TVET graduates are somehow 'less respectable' as compared to formal graduates. Such misperceptions about TVET graduates and education lead to fewer people being motivated to join this pathway of education (Najam & Bari, 2017).

In a nutshell, this study indicates a negative relationship between the economic status of households and their participation in TVET degree programs or diplomas. The reasons are likely attributed to the low status, prestige, and social mobility of the TVET graduates. If the household head is highly educated and belongs to an upper income level, then he or she may not be interested in TVET or blue-collar jobs. Finally, this study also showed that the number of males in a household also affects the demand for TVET-related degrees or diplomas. An increase in the ratio of males in a household is associated with an increase in the demand for the TVET degree or diploma.

5 Conclusions and Limitations

TVET plays an important role in economic growth by increasing productivity, employment level, and lifetime earnings of labor. Pakistan's government introduced various skill enhancement programmes under the tutelage of NAVTTC and other foreign donor agencies to take advantage of the youth bulge. However, only a meagre amount of the workforce gains some form of technical and vocational training. The majority of industries, especially manufacturing and mining, have shortages of skilled labor. This suggests that skill development programmes and policies have not yet obtained desirable results. Therefore, this study is intended to explore the role of demographic factors in the demand determination of TVET in the context of Pakistan. This study utilises the latest available Pakistan Social and Living Standard Measurement (PSLM) data set for 2018–19.

The results of this study are also in line with the traditional views of the inferiority of TVET to general education. The findings indicate that households belonging to the higher income category do not demand a TVET degree or diploma. So, the higher the socio-economic status, the lower the probability of demand for TVET from the better-off students. This is further supported by the findings that if the head of the household is above intermediate, then there is a high probability that the household will opt for a non-TEVT degree or diploma for their children. The reason is likely attributed to the perception that a TVET-associated degree or diploma is considered inferior due to its low standing and prestige as compared to general or professional degrees, and children of parents with university education are less likely to pursue TVET-related degrees. A similar perception was also reflected in Pakistan

in the 2014–16 national youth consultation: TVET is a form of 'second-class' education, and TVET graduates are somehow 'less respectable' as compared to formal graduates. Such misperceptions about TVET graduates and education lead to few people being motivated to join this informal pathway of education. The disinclination towards TVET contributes to a shortage of technically qualified and skilled people to fulfil the demands of industry, particularly in the manufacturing sector. The supply of graduates from the formal education sector far exceeds the absorption capacity of the white-collar job market, resulting in large-scale unemployment (Najam & Bari, 2017).

Pakistani society is male-oriented, and people mostly prefer educating male members as compared to educating female members. An increase in the ratio of males in a household is expected to increase the demand for the TVET degree. This indicates that boys are more likely to participate in TVET-related degrees due to the availability of various trades and their higher mobility for job search. Females are less likely to participate in TVET due to the non-availability of institutes and hostel facilities, poor transportation, the limited number of trades available for females, and security issues.

Overall, this study contributes to the research on technical education by providing an empirical analysis of the role of socioeconomic determinants in the demand for TVET in Pakistan. Moreover, this study takes place in Pakistan for two reasons. First, Pakistan's cultural ties and other affinities are quite similar to those of neighbouring South Asian countries like India, Bangladesh, Sri Lanka, and Afghanistan. Hence, the results of this study can be generalised not only to South Asian countries but also to other comparable countries. Secondly, Pakistan is on the list of countries that receive international funding and aid to reform the TVET sector. Despite foreign funding, aid, and consultation, participation in the TVET sector is still very low as compared to general education. Therefore, it is also important for both the donors and recipients of international cooperation to know the socioeconomic status of households participating in the TVET sector. The findings of this study will facilitate the federal and provincial governments, training institutes, and other TVET sector stakeholders in designing and implementing evidence-based programmes in order to bridge the skills gap in the country.

This study has the following policy implications:

Higher socioeconomic status and more educated households are not willing to participate in TVET. Therefore, it is suggested that the attractiveness of TVET should be improved by providing opportunities in the labour market, improving the quality of TVET institutes, creating pathways to general education, and fostering good liaison between industries and TVET institutes. Moreover, females are less likely to participate in TVET-related programmes as compared to males. This may be due to the non-availability of institutes and hostel facilities, poor transportation, the limited number of trades available for females, and security issues. The government may increase the number of female TVET institutes with female instructors

in rural areas, and gender mainstreaming in training is expected to increase women's labour force participation.

It is acknowledged that this study does not fully capture the demand for TVET due to data limitations. The data provided information on the enrollment and attainment of TVET by a household member. However, there may be people who wanted to get TVET but could not get it for any reason. In such a scenario, a household has a demand for TVET but cannot enrol its members in TVET. This aspect of demand is left in our analysis and may be explored in future research. Similarly, there may be households with members who, at some point, enrolled in TVET but could not complete TVET due to any reason other than non-willingness to attain TVET. In this case, according to our dataset, that member will be considered to have matriculation as the highest level of his education. However, in reality, he wanted to attain a TVET degree but could not complete it. Such households will also be considered to have no demand for TVET in our analysis. Therefore, future research may also cover these limitations while analysing demand for TVET. Furthermore, this study takes into account the impact of only household socioeconomic factors on the demand for TVET; there are also a host of other factors, such as labour market outcomes, market returns to TVET graduates, and a lack of basic facilities, that can also affect the decision of households for TVET. Future studies can be carried out by employing the said factors to better understand household participation in the TVET sector.

Ethics Statement

Adhering to ethical principles outlined by the International Journal for Research in Vocational Education and Training (IJRVET), the research strictly implemented informed consent. The study, discussed in this article, utilized data from the Pakistan Social and Living Standard Measurement (PSLM) dataset for 2018–19, a nationally representative cross-sectional survey conducted by the Pakistan Bureau of Statistics (PBS) since 2005.

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