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Value of technical and vocational higher education in the labor market: Comparative perspectives from Middle Eastern countries

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ABSTRACT

The Middle East is a geopolitically diverse region that includes large economies, such as Saudi Arabia and Türkiye; densely populated countries, such as Iran and Egypt; and smaller nations with a high gross domestic product (GDP) per capita, such as the United Arab Emirates and Qatar. Despite the differences in sociocultural, economic, and environmental contexts between these countries, individuals across the region must participate in the labor force and contribute to production to benefit from national wealth. Specialized technical skills offer a significant advantage in securing employment, and technical and vocational education and training (TVET) in higher education has become a viable pathway for various technical roles. On this point, through its varying national (*e.g.*, population, GDP, GDP per capita, human development level, TVET starting age, TVET enrollment in higher education, gross enrollment in higher education) and TVET-related factors (quality of TVET, labor participation by TVET graduates, salary for TVET graduates, unemployment rate for TVET graduates), the Middle East presents an interesting case for examining the value of TVET in higher education to the labor market. Accordingly, this study aimed to compare the advantages (or disadvantages) of TVET graduation for people to access the labor market in Middle Eastern countries. The research was designed as a comparative quantitative study, following a descriptive survey model. The comparative analysis included data from Egypt, Iran, Qatar, Saudi Arabia, Türkiye, and the United Arab Emirates to compare TVET in higher education and employment relations. National data for the selected countries were collected from various sources. The focus was on statistical comparisons using cross-tables and classification and regression tree analysis. The analysis showed that TVET is a good way to secure work in the case countries (with relatively lower unemployment for TVET graduates). Nonetheless, according to a comparison of national data, GDP emerged as the most significant factor, highlighting the demand for more professionals in larger-scale production within the related countries. The results also reveal that the TVET starting age and gross enrollment in higher education are among the influential factors for students choosing TVET programs in higher education (ISCED level 5), while TVET-related factors do not generate a distinction in terms of the number of students who prefer TVET programs at the higher education level. Potential policy developments and practices are also discussed concerning educational priorities in Middle Eastern countries to increase the attractiveness of the TVET system as well as its value to the labor market.

Key words: higher education, technical and vocational education and training, labor force, unemployment, Middle East countries

INTRODUCTION

Our world offers a vibrant and diverse panorama when we consider the varying life conditions of its inhabitants across different continents and regions. With their historical roots, religious diversity, ethnic richness, and

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natural wonders, Middle Eastern countries occupy a highly divergent geopolitical region.[1] Despite ongoing armed conflicts and humanitarian crises,[2] the region includes major economies, such as Saudi Arabia and Tü rkiye; highly populated nations, such as Iran and Egypt; and smaller states with high gross domestic product (GDP) per capita, such as the United Arab Emirates (UAE) and Qatar.[3] Despite the differences in terms of sociocultural, economic, and environmental aspects, each Middle Eastern country naturally strives to enhance its national prosperity and welfare. As in other countries, achieving this goal requires people in Middle Eastern countries to participate in the labor force and contribute to production. Obviously, being a well-trained worker is crucial to accessing the labor market; thus, having specialized technical skills creates a significant advantage for obtaining jobs. At this point, higher education degrees are widely recognized by employers as indicators of advanced occupational skills. In particular, technical and vocational education and training (TVET) programs in higher education can be specific choices for certain kinds of technical jobs, such as anesthesiologists or radiologists in the health sector, electricians or machine operators in industrial production, or flight personnel or tour organizers in the tourism-hospitality sector.

Accordingly, Middle Eastern countries provide good examples to compare the value of TVET-related higher education in employment through different national factors, such as GDP, GDP per capita, population, length of educational attainment, and participation in higher education. In parallel, this study aims to compare the advantages (or disadvantages) of TVET graduation for people to access the labor market in Middle Eastern countries. On the other hand, considering potential language and web access barriers for data collection, the researcher had to select countries from the Middle East region based on their populations, economies, and income levels. Then, the researcher defined Egypt and Iran (by higher population), Saudi Arabia and Türkiye (by higher GDP), and Qatar and the UAE (by higher GDP per capita) to compare TVET in higher education and employment relations. These selected countries are relatively young; only Türkiye has celebrated its centenary (in 2023), while the Arab Republic of Egypt and Islamic Republic of Iran (having been founded in 1953 and 1979, respectively, despite their long histories), Qatar and UAE (both founded in 1971), and Saudi Arabia (founded in 1932) are all under 100 years old.[4] In this regard, by focusing on these relatively young nations, Middle East cases can offer valuable insights into the do's and don'ts of establishing an effective TVET system, particularly at the higher education level.

COUNTRY PERSPECTIVES AND TVET SYSTEMS IN THE MIDDLE EAST

Comparative research requires a thorough understanding of recent conditions in related countries to effectively examine the relevant topics. In this context, to analyze TVET systems and how they are reflected in the employment market, it is essential to know the characteristics of TVET systems in the selected countries. Here, it will be beneficial to start by summarizing the general profile of the Middle Eastern countries included in this research before discussing their TVET structures and outcomes (Table 1).

Egypt: recent conditions of TVET

As the only country in the Middle East with a population of over 100 million, Egypt is the largest among the case countries. It has various advantages due to its geographic location, abundant natural resources, growing workforce, and expanding trade partnerships.[5] Situated at the crossroads of Europe, Africa, and Asia, Egypt controls the Suez Canal, a vital global trade route that generates substantial revenue. While oil and natural gas remain major exports, Egypt also has growing sectors, such as tourism (due to its historical background, including the pyramids), textiles, and, considering its population, construction.[6] Naturally, all such sectors need well-trained professional workforces, and Egypt is seeking to leverage its young population through TVET. By equipping the workforce with practical skills aligned with industry needs, TVET can enhance productivity, innovation, and the ability to attract foreign investment.

The TVET system in Egypt, which annually serves over two million young people, brings huge economic and social development potential.[7] Hence, Egypt places importance on further developing its TVET system by cooperating with international stakeholders and getting inspiration from well-established TVET models from other countries' globally recognized systems. For example, while people can start vocational education at 15 years old during secondary education, following Germany's dual system, Egypt plans to decrease the age to 12, in the middle school period.[8] However, serious challenges about TVET programs in Egypt persist, including a mismatch between the skills taught and industry requirements and higher levels of unemployment that are parallel to higher-level graduates.[9] To address these issues, Egypt has initiated reforms to create a demand-driven TVET system by focusing on curriculum updates and improved teaching programs at technical schools and universities.[7] In addition, international collaborations, such as the Water-Energy-Building-Training and Transfer (WEB-TT) project, have been contributing to developing appropriate training modules for the Egyptian construction industry, thereby emphasizing the importance of adapting foreign concepts to the local context.[10] Ultimately, these efforts aim to enhance the

Table 1: General profile of the selected Middle Eastern countries (with 2022-2023 values)

Specification	Egypt	Iran	Qatar	Saudi Arabia	Türkiye	UAE
Area (≈ '000 km^2)	997	1631	12	2150	770	71
Population (million)	112.7	89.2	2.7	36.9	85.8	9.5
GDP (US$ million)	348	464	245	1106	1114	528
GDP per capita (US$)	3225	5310	81,400	33,040	12,765	53,916
HDI	0.731	0.774	0.855	0.875	0.838	0.911
Education begins	Age 4	Age 5	Age 6	Age 6	Age 6	Age 6
TVET begins	Age 15	Age 15	Age 16	Age 17	Age 14	Age 15

Sources: IMF, GKI, Scholaro, and Brittanica (see details in the Methodology section). GDP, gross domestic product; HDI, human development index score; TVET, technical and vocational education and training.

relevance and effectiveness of TVET in Egypt by preparing students for the rapidly changing job market.

Iran: reformist TVET organizations

Despite facing sanctions on goods imports from and exports to global markets, due to various disagreements concerning international rules on military and nuclear technology, Iran still has economic advantages stemming largely from its natural resources.[11] In particular, its oil and gas reserves provide substantial revenue and potential for industrial growth. Also, Iran's strategic location at the crossroads of Asia and the Middle East enhances its role in regional trade, with access to both the Persian Gulf and the Caspian Sea.[12] Additionally, its large, youthful population offers a potential workforce for economic expansion, and vocational education plays a critical role in equipping this workforce with technical and practical skills. By aligning TVET programs with market needs, Iran can increase national productivity, reduce unemployment, and diversify its economy beyond oil and gas dependence.

On the other hand, Iran faces serious challenges that hinder the expansion of its TVET system. Despite a longstanding goal to increase TVET enrollment to up to half of the student population (starting at 15 years old) in secondary education, TVET programs suffer from lower social status compared to academic education.[13] In addition, Zeynivandnezhad and colleagues highlighted an issue concerning mathematics education in TVET, which requires improvement to enhance students' ability to apply mathematical knowledge in their work.[14] They also identified key skills for Iran's TVET system, including general skills, job skills, and problem-solving skills. To address these issues and ensure more practical development in TVET programs, Iran has formed different policymaking organizations, such as the Union of Universities of Technology, to link industry and educational institutions.[15] Similarly, to ensure professional curricular standards parallel to the health sector needs, the National Center for TVET in Medical Sciences has been established in Iran.[16]

Qatar: TVET for economic diversification

Having the smallest population but the highest GDP per capita rate among the selected Middle Eastern countries, Qatar's economy is primarily driven by its abundant natural gas reserves, making Qatar one of the world's leading exporters of liquefied natural gas.[17] This resource wealth has brought about a high standard of living, infrastructure development, and huge investments by Qatar in various sectors, such as real estate, finance, and tourism. On the other hand, Qatar seeks to diversify its economy away from oil and gas and sees vocational education as a critical way to foster sustainable economic growth through a well-trained workforce with practical and job-ready skills.[18] Certainly, if TVET programs are aligned with Qatar's national goals, they can assist in developing expert human capital in prominent areas, such as technology, engineering, and skilled trades. This will help reduce dependence on foreign labor and enable Qatari nationals to fill roles that are essential to the expansion of the economy.[19]

While people can start vocational education programs at 16 years old during secondary education, the TVET system in Qatar has been dealing with various challenges, including low enrollment, poor perception among young people, and misalignment with labor market needs.[20] Said and Alhares, for example, revealed that there is a mismatch between TVET program leaders' and employers' opinions about required professional skills, particularly in social and technological areas.[21] Due to such contradictions, Qatar has recently focused on Science, Technology, Engineering, Mathematics (STEM) integration into TVET programs to better meet 21st-century skill demands.[20,21] Furthermore, Gamar suggested that credit transfer mechanisms can be good policy tools to enhance the vertical mobility of professional skills from TVET to higher education programs in Qatar.[22]

Saudi Arabia: aiming for quality TVET

With the largest land area among the selected cases, Saudi Arabia's economic advantages are based primarily on its vast amount of oil reserves, as well as its strategic location along the Red Sea. These advantages provide opportunities for Saudi Arabia to substantially invest in infrastructure and innovation, such as The Line project, a US$500 billion futuristic city spanning 170 kilometers along the Red Sea and towering 500 meters above sea level.[23] Additionally, Saudi Arabia's location at the crossroads of Europe, Asia, and Africa makes it a critical global trade and logistics hub.[24] Nevertheless, to sustain and diversify its economy beyond oil, Saudi Arabia is increasingly investing in vocational education to build a skilled workforce that can support new industries in line with Vision 2030. By equipping citizens with practical and technical skills, TVET programs can be a suitable way to enhance workforce productivity, reduce reliance on foreign labor, and reinforce Saudi Arabia's economic resilience.[25]

Despite its importance in human resource development for any country, the TVET system in Saudi Arabia, like in other Middle Eastern cases, faces some challenges. While people can start TVET programs at 17 years old during secondary education, challenges include a mismatch between graduate skills and labor market needs, negative perceptions among young people about TVET (it is generally seen as unworthy), and a naturally low enrollment rate.[26] The stigma associated with TVET has traditionally favored white-collar jobs, and young people's career choices often lead to decisions that prioritize social acceptability over individual aspirations, with the aim of achieving high status in their community.[25,27]. In addition, private sector employers perceive a skills gap in TVET graduates, particularly in professional knowledge, generic skills, and ethical understanding.[28] After all, despite government efforts to enhance TVET quality and promote Saudization through Vision 2030, these challenges seem like barriers to Saudi Arabia's economic diversification goals.

Türkiye: expanding the TVET system

As the 18th largest economy globally and the biggest among the case countries, Türkiye has gained economic advantages from its strategic location, connecting Europe, Asia, and the Middle East, which has bolstered trade and transportation routes. In addition, Türkiye has a young, growing population, various natural resources, and diverse industries, including manufacturing (with large automotive factories and global home electronics brands), agriculture, textiles, and tourism.[29] To capitalize on these assets, Türkiye has increasingly focused on vocational education, even using the motto "Meslek Lisesi, Memleket Meselesi" (vocational high schools are a national issue) in 2006, directly addressing workforce demands by equipping students with practical skills tailored to key economic sectors.[30] The general expectations are that this approach will not only reduce unemployment but also drive innovation, increase productivity, attract foreign investment, and, of course, reinforce Türkiye's competitiveness in the global economy.

Since the 2006 Meslek Lisesi, Memleket Meselesi project, investments and efforts to strengthen TVET in Türkiye have shown a significant increase in terms of TVET students. With TVET programs starting for students aged 14 years during secondary education, the number of TVET students in secondary education increased from 1.2 million in 2006 to 2.3 million in 2023.[31] Despite this huge number of TVET students—nearly half of the secondary education population—Türkiye is still dealing with a chronic problem: not being able to attract academically high-performing students to TVET programs.[32] To increase the attractiveness of TVET components, in 2018, Education Vision 2023 (the centenary year of the Republic in Türkiye) emphasized several key areas of the TVET system, including strengthening stakeholder cooperation and teacher development and increasing positive perceptions by highlighting the TVET graduation and employment linkage.[33] Türkiye then lifted the coefficient regulation in the university entrance exam, which had previously restricted TVET graduates from accessing the higher education programs they wanted to attend. In the same vein, as one of the latest (and perhaps most important) changes in Türkiye, vocational education centers were established in each city in 2016, and TVET programs at these centers were officially added to the formal education cycle. At these centers, students must start when they are at least 14 years old and take one day of theoretical education at the center plus four days of practical education in firms/companies to develop their professional skills.[34] Expectedly, such efforts have generated positive perceptions about the value of TVET programs in the labor market, as well as TVET graduates' socioeconomic conditions, with ready jobs after graduation.

United Arab Emirates: national and international TVET institutions

Displaying the highest human development index (HDI) score among the case countries, the UAE is another oil-rich country in the Middle East. Yet, the UAE has other economic advantages, including its strategic location as a global trade hub, a diverse economy that incorporates sectors such as tourism, finance, and real estate, and a favorable business environment characterized by low taxes and minimal regulation.[35] Additionally, the UAE's significant investment in infrastructure and technology has enhanced its competitiveness. On this point,

vocational education is gaining importance in fostering these economic advantages by equipping the workforce with specialized skills parallel to the needs of developing industries, in addition to promoting innovation and increasing productivity in the UAE.[36] By aligning TVET programs with market demands, the UAE can ensure a skilled labor force capable of sustainably driving the country's economic growth.

Further, since students can start at 15 years old during secondary education, the TVET system is seen as a crucial part of the UAE's human resource development strategy, particularly in supporting the government's Emiratization policy.[37] TVET programs have shown positive outcomes by ensuring quality teacher training, integrating technology, and adapting the perceptions of stakeholders.[38] However, while female Emirati students have generally reported positive educational experiences and believe that TVET enhances their future career prospects, the underrepresentation of female students in TVET programs is still a persistent problem in the UAE.[39] In addition, Wilkins reported that all educational institutions have been influenced by various social, cultural, and even religious factors, while private TVET providers have been dealing with political and economic constraints.[37] Considering the time period of Wilkins's research on the Dubai Polytechnic case in 2002, since then, the UAE has expanded its TVET higher education institutions by politically supporting the establishment of both national and international, and largely private, colleges.[40]

ANALYTICAL APPROACH: POTENTIAL FACTORS REGARDING TVET PREFERENCES

When considering the case countries outlined above, a well-rounded framework emerged for comparatively analyzing the interconnections between TVET in higher education and labor market dynamics (Figure 1). While this framework focuses on the Middle East region, the defined analytical factors regarding national and TVET system perspectives could also be relevant to other countries from different parts of the world. For example, Gyimah, from reviewing international data from African, Asian, and European countries, clearly revealed that TVET performance contributes to a country's GDP level by moderating the effectiveness of research, development, and innovation investment.[41] In particular, Gyimah explained how TVET plays a crucial role in economic progress by targeting the necessary skills for highly professional graduates.[41] Expectedly, having a huge population generates a higher demand for higher education, as seen in the annual growth of gross enrollment in higher education in Nigeria, which has a population over 200 million.[42] Also focusing on Nigeria, Igberaharha argued for the importance of attracting more students to TVET programs in higher education to benefit from a large youth cohort for sustainable economic growth.[43] Nevertheless, gender parity, particularly the participation of female students in TVET-related higher education, is still a critical issue in the selected Middle Eastern countries. While these countries have all achieved at least a 1: 1 ratio of female to male students in higher education in recent years (https://ourworldindata.org/), female attendance has remained relatively low in TVET programs (*e.g.*, 1.3% in the UAE, 22.4% in Türkiye, and 18.8% in Egypt; https://genderdata.worldbank.org/).

Additionally, comparatively lower unemployment rates for vocational education graduates (*e.g.*, 9.5% for intermediate graduates against 12.9% for advanced education graduates in Iran, 5.3% against 6.7% in Saudi Arabia, and 0.2% against 0.3% in Qatar; https://genderdata.worldbank.org/) could be an important factor attracting more students to TVET programs in higher education. According to Lamb, the quick participation of TVET graduates in the labor market in Australia has generated a positive image for TVET programs.[44] In particular, relatively higher salaries (often higher than the national average) earned by technical professionals have become highly attractive examples for students from lower socioeconomic (in other words, poor) families.[44] By means of a well-educated technical workforce, it seems quite possible to increase people's share of national gross production. This means a combination of a higher GDP per capita and the guiding effect of increasing welfare for more students' preferences toward TVET programs in higher education. Further, in their analysis of 10 ASEAN countries, Elistia and Syahzuni identified a strong relationship between GDP per capita and HDI scores, which they explained as follows: "Economic growth makes it possible to reach a high level of human development, on the one hand, increasing levels of human development leading to increase opportunities for economic growth".[45]

On the other hand, it is not easy to assess the influence of global trends on TVET systems, even in a single country. As seen in the case of Egypt, global collaboration and experience transfer from well-known TVET systems can provide important contributions to the further development of TVET structures. Hence, the increasing quality of TVET programs can attract more students in any country. In this way, UNESCO's International Center for Technical and Vocational Education and Training in Germany reported that each country should employ policies to enhance TVET quality in terms of the techno-physical capacity of TVET schools/institutes, curriculum updates, and TVET

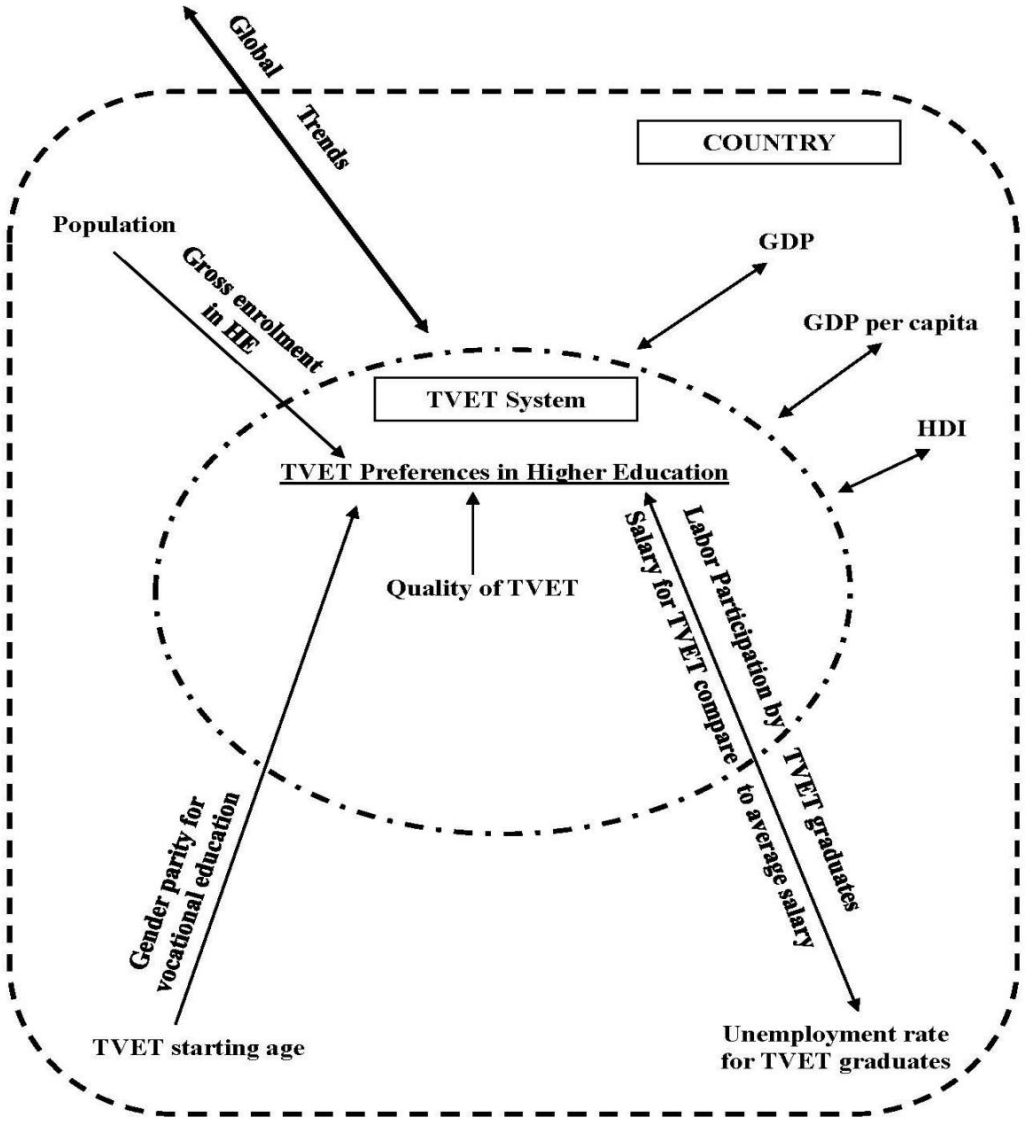

Figure 1. Analytical framework of comparative dynamics regarding TVET higher education. TVET, technical and vocational education and training; GDP, gross domestic product; HDI, human development index score.

teacher education in terms of both their pedagogical qualifications and professional/practical skills.[46] Caves and colleagues also underlined the advantages of starting TVET earlier and indicated that TVET students can find jobs at various stages of their education, even immediately after primary vocational training.[47] Nonetheless, many students would prefer to continue to further stages of TVET, particularly at higher education level, as Bakar identified from Malaysian youngsters, since they can achieve better living standards and higher salary levels by advancing their technical skills, gaining more practical experience, and/or expanding professional networks with internship opportunities.[48] Therefore, it is important to compare all the factors explained above to explore prominent variables for TVET preferences in the Middle Eastern cases.

METHODOLOGY: COMPARATIVE DESIGN

This research was designed as an international comparative study following a descriptive survey model. The researcher benefitted from interpretive and correlational analysis techniques to compare TVET systems in the selected Middle Eastern countries, and the data were collected from various sources in May 2024. Among the data sources, the researcher employed secondary data from the International Money Fund, the Global Knowledge Index (GKI), the Scholaro Database, USAID Records, the World Bank, and UNESCO websites.

Dataset and data analysis

The dataset for the research includes different variables

and data from multiple sources, as indicated below: (1) Information about the geographic areas of the case countries from Britannica (https://www.britannica.com/); (2) HDI scores from the GKI (https://www.knowledge4all.com/); (3) GDP and GDP per capita from the International Money Fund (https://www.imf.org/); (4) Educational and TVET start ages from Scholaro (https://www.scholaro.com/); (5) The income categories of the case countries from the World Bank Definitions (https://blogs.worldbank.org/); (6) Higher education spending per student and gross higher education enrollment from USAID (https://www.usaid.gov/); (7) TVET enrollment in higher education, government expenditure on TVET, quality score of vocational training, labor force participation rate by TVET in higher education graduates, high/mid-skilled TVET occupations salary ratio to average salary, and unemployment rate with vocational education from the GKI; (8) Enrollment in TVET programs from UNESCO Data (https://data.uis.unesco.org/).

Through these data, the researcher formed comparative tables on general conditions related to TVET systems in the selected countries. To better interpret the value of TVET graduation in the labor market, data were added from other countries, such as the USA (as the biggest economy globally), Luxembourg (with the highest GDP per capita), China (with the closest GDP per capita to the global mean), and Slovakia (which occupies the top position in TVET according to the GKI). Lastly, by recoding research variables into a nominal (categorical) format, the researcher employed classification and regression tree (CRT) analysis to explore influential national and TVET-related variables on students' preference to enroll in TVET programs (at the ISCED level 5; see https://www.oecd-ilibrary.org/) in the case countries of the Middle East.

COMPARATIVE RESULTS: TVET AND LABOR PARTICIPATION IN THE MIDDLE EASTERN CASE COUNTRIES

To better understand the general conditions of TVET in the higher education sector, comparative data can provide initial insights into the selected case countries in the Middle East. For this reason, general data can be used to help compare public investments in the TVET systems of the case countries. For this reason, general descriptive data on TVET and higher education conditions are presented below.

Looking at Table 2, Qatar shows a distinctively low gross enrollment rate in higher education (25.04%) compared to other Middle Eastern countries. A similar path can be seen in Luxembourg. Both countries are small but have the highest GDP per capita rates. This could be a sign that people in these small but rich countries do not need higher education degrees to achieve a good standard of living. When we take into account the need to attract foreign workers to Qatar (with high salaries) and recent attempts to do so,[49] it can be considered that Qatari people do not feel high pressure from unemployment. Occupying the 1st rank among 133 countries in the GKI in terms of employment of TVET graduates (Table 3), it seems TVET graduates can quickly find jobs in Qatar, even with higher salaries than the national average.

On the other hand, five other Middle Eastern countries recorded highly impressive rates in terms of gross enrollment in higher education rates and compared favorably with the USA, China, and Slovakia. Türkiye even showed a percentage exceeding 100; this means that, with a huge young population, many high school graduates could not find places to enroll in higher education institutions immediately after graduation. Most of these individuals can pass the university entrance exam later than the usual higher education age cohort (generally aged 18-22) and begin their higher education period later (https://yokatlas.yok.gov.tr/). Despite this impressive higher education enrollment percentage, Türkiye has the lowest TVET enrollment score (39.96), while the other countries in Table 2 have the top score (100). This clearly demonstrates the general tendency among young people to prefer attending advanced academic programs in universities (ISCED level 6) rather than TVET higher education programs (ISCED level 5) in Türkiye. Several reasons can be attributed to this, but the most important one is the widespread belief among the Turkish community that higher levels of education lead to higher salaries and higher-status jobs, particularly white-collar occupations. Although displaying higher TVET enrollment in higher education, other Middle Eastern countries also face similar societal issues. More students tend to pursue advanced academic programs (at ISCED level 6), especially in countries with larger populations, as in the cases of Egypt (5.29% TVET enrollment in higher education at ISCED level 5), Iran (13.71%), and Saudi Arabia (17.65%).

Table 3 presents interesting data on the value of TVET higher education graduation in the labor market. For example, higher-income Middle Eastern countries (Qatar, the UAE, and Saudi Arabia) display a similar level of quality of TVET programs compared to the USA and Luxembourg, even surpassing Slovakia. This indicates that a high GDP per capita rate enables governments to invest more in education and ensure better conditions for TVET programs in higher education. We can observe this reality in Table 2, in which higher education spending per student is shown

Table 2: Comparison of TVET and higher education in the case countries

Income level	Country	HE spending per student (US$)	Gross HE enrollment (%)	TVET enrollment (score)	Government expenditure on TVET (%)
Higher	Luxembourg	56,179	19.20	100	71.74
Higher	USA	16,588	57.57	100	2.07
Higher	Slovakia	7158	47.62	100	73.87
Higher	Qatar	NA	25.04	NA	NA
Higher	UAE	40,750	55.30	100	NA
Higher	Saudi Arabia	30,382	71.41	100	NA
Lower	China	11,707	63.60	NA	NA
Lower	Türkiye	4503	117.11	39.86	73.37
Lower	Iran	1283	58.22	NA	43.28
Lower	Egypt	NA	42.72	100	NA

Higher/Lower income levels are in comparison to the world mean of GDP per capita (US$13,840). TVET, technical and vocational education and training; NA, not applicable.

Table 3: Comparison of TVET outcomes in the case countries

Income level	Country	Quality of TVET (score)	Labor force participation by TVET graduates (score)	High-skilled TVET salary to average salary (score)	Medium-skilled TVET salary to average salary (score)	Unemployment tate for TVET graduation (score)
Higher	Luxembourg	64.84 (#24)	74.38 (#49)	17.56 (#73)	19.77 (#103)	90.43 (#19)
Higher	USA	67.64 (#18)	67.43 (#64)	12.10 (#95)	26.06 (#77)	88.45 (#33)
Higher	Slovakia	44.1 (#100)	87.52 (#19)	16.72 (#79)	34.27 (#46)	88.02 (#39)
Higher	Qatar	70.32 (#8)	NA	66.83 (#7)	28.69 (#62)	100 (#1)
Higher	UAE	71.74 (#7)	70.18 (#57)	NA	NA	86.66 (#44)
Higher	Saudi Arabia	66.15 (#22)	88.39 (#15)	23.47 (#45)	6.46 (#111)	NA
Lower	China*	NA	NA	NA	NA	NA
Lower	Türkiye	36.05 (#120)	67.79 (#63)	19.89 (#60)	28.56 (#65)	60.72 (#113)
Lower	Iran	46.51 (#93)	41.78 (#80)	NA	NA	73.28 (#96)
Lower	Egypt	42.63 (#105)	62.71 (#68)	13.36 (#92)	38.75 (#30)	74.62 (#91)

Numbers in brackets show the country's rank among the 133 countries of the GKI only in terms of the unemployment rate, with a higher rank meaning lower unemployment. *, China does not have a country profile in the GKI. TVET, technical and vocational education and training, GKI, Global Knowledge Index.

to be significantly higher in the UAE and Saudi Arabia than in Türkiye, Iran, and Egypt. Beyond the quality of TVET programs, labor force participation rates among TVET graduates are generally high in the Middle Eastern case countries, comparable to Luxembourg and the USA. However, higher labor force participation rates among TVET graduates, parallel to the quality scores, are again observed in the UAE and Saudi Arabia

In terms of salary level, it is obvious that highly skilled TVET graduates earn above-average salaries in all the countries listed in Table 3. However, some interesting examples emerge regarding medium-skilled TVET graduates, as they can earn as much as high-skilled TVET graduates in the USA, Slovakia, and Egypt. This might be due to a shortage of mid-skilled people, making them highly valuable, especially for jobs requiring practical skills and experience (*e.g.*, backhoe operators, CNC lathe workers, forklift drivers, *etc.*, compared to technicians with higher-level education). In any case, the unemployment rate for TVET graduates is relatively low in all the countries listed in Table 3. In particular, TVET graduates find jobs more easily in higher-income countries than in lower-income countries. Interestingly, in the lower-income countries in Table 3, the unemployment rate is even higher for advanced education graduates (*e.g.*, 11.28% in Türkiye, 12.94% in Iran, and 15.28% in Egypt). In contrast, this ratio is 0.28%-8.00% for high-income countries in Table 3 (https://data.worldbank.org/). While its employment rate is rising to become generally parallel to the education level in most of the countries in Table 3, Egypt presents a highly interesting situation, with lower unemployment rates for less-educated individuals than for advanced education graduates. This might indicate that less educated people are more likely to work in low-profile jobs, perhaps in the agriculture, textile, or tourism sectors, which require a larger but less skilled workforce,

compared to industrial sectors. Overall, for the selected Middle Eastern countries, Table 4 summarizes the national and/or TVET-related variables that influence individuals' choices to enroll in TVET programs in higher education (at ISCED level 5).

In the CRT analysis, the mean was calculated for each variable, and then the selected Middle Eastern countries were placed into lower or higher categories based on their values relative to the mean of the respective variables. To predict TVET registration (categorized as low- or high-rate countries, the dependent variable), 10 independent variables were included in the CRT analysis:[1] GDP, population, GDP per capita, HDI score, TVET starting age, gross enrollment in higher education (as national variables), quality of TVET, labor participation by TVET graduates, salary for TVET compared to average salary, and unemployment rate for TVET graduates (as TVET-related variables). While the analysis correctly predicted five of the six countries in terms of low or high TVET registration clusters, only three independent variables exhibited an importance level exceeding 50%: TVET starting age, gross enrollment in higher education, and GDP. These results are not surprising. Whereas a significant portion of higher education enrollment stems from academic secondary education programs, individuals who start TVET education earlier tend to continue TVET programs in higher education to gain better and higher skills in their professions. Nonetheless, only the GDP level emerged as a significant factor in differentiating Middle Eastern countries with higher TVET registration in higher education (ISCED level 5, Figure 2).

Since GDP reflects countries' higher productivity, it can be argued that countries with larger industrial and service sectors naturally require more workers with advanced professional skills. In this research, Saudi Arabia and Türkiye, the two countries with the highest GDP among six Middle Eastern countries, have significantly larger production capacities across various sectors, from the car industry to plastic materials, white goods to oil production, and military technology to new constructions. Considering the high gross enrollment in higher education in both Saudi Arabia (71.41%) and Türkiye (117.11%) and the limited capacity of academic programs in universities (at least ISCED level 6), more students are likely to enroll in TVET programs at a higher education level. Conversely, Qatar, the country with the highest GDP per capita and the lowest GDP among the Middle Eastern case countries, has a low gross enrollment in higher education (25.04%) and a moderate level of TVET enrollment. This suggests that, overall, fewer students opt to continue their education in TVET programs. For the remaining three lower GDP countries, Iran, Egypt, and the UAE, it can be argued

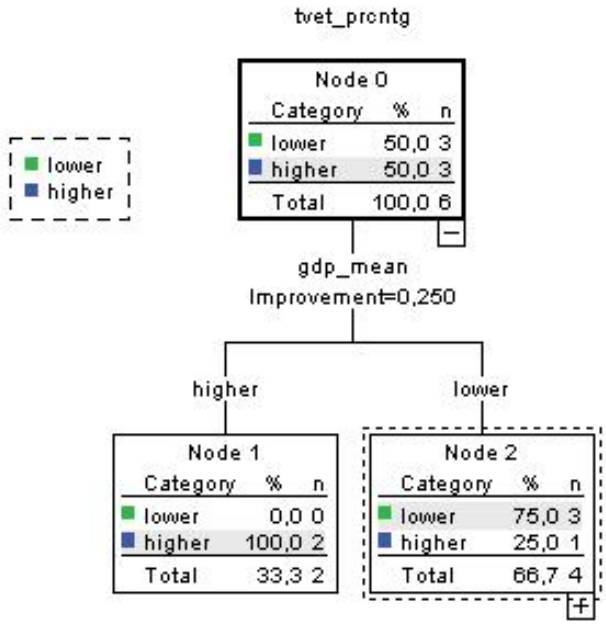

Figure 2. CRT node families for TVET registration percentages and related variables. CRT, classification and regression tree; TVET, technical and vocational education and training; GDP, gross domestic product.

that they have limited industrial production capacity compared to Saudi Arabia and Türkiye, resulting in a lower demand for TVET graduates. This indicates a need for these countries to invest more in TVET-oriented higher education to train a larger cohort of the technical workforce and expand their industrial production.

CONCLUSION

As a divergent geopolitical region, the Middle East encompasses several large economies, such as Saudi Arabia and Türkiye; highly populated countries, such as Iran and Egypt; and small states with high GDP per capita, such as the UAE and Qatar. Therefore, this research leverages the geopolitical richness of these Middle Eastern countries to compare national and educational variables influencing TVET enrollment and the advantages (or disadvantages) of TVET in accessing the labor market in the selected countries: Egypt, Iran, Qatar, Saudi Arabia, Türkiye, and the UAE. In general, the analysis reveals that TVET starting age, gross enrollment in higher education, and GDP are more influential factors in students' decision to choose TVET programs in higher education (at ISCED level 5), while TVET-related factors (*e.g.*, quality of TVET, salary rates for TVET graduates, and higher employment rates for TVET graduates) do not significantly differentiate

Table 4: Classification and regression tree for TVET enrollment in the case countries

Country	TVET enrollment (%)	Group*	Independent variable importance	
Türkiye	37.65	High	TVET starting age	0.25 (100% normalized)
Qatar	23.63	High	Gross enrollment in higher education	0.25 (100% normalized)
Saudi Arabia	17.65	High		
Mean	17.18	-	GDP	0.25 (100% normalized)
Iran	13.71	Low		
Egypt	5.29	Low	Prediction summary	
UAE	5.15	Low	Overall percentage = 83.3% (as 5 of 6 case countries)	

*, For the categorization of the selected country cases, high *vs.* low clusters were composed according to above and below the rate of their mean TVET enrollment percentages (at ISCED level 5). GDP, gross domestic product; TVET, technical and vocational education and training.

countries in terms of TVET program preference at the higher education level.

The results also reveal that while TVET can be a good way to secure jobs in the case countries (with lower unemployment for TVET graduates), a comparison of national data shows a mismatch between education level and labor force participation rates in each of the selected countries. For example, Egypt and Qatar, with lower gross enrollment in higher education, favor graduates from pre-higher education levels due to the higher demand for low-skilled jobs in their national labor markets. In contrast, the remaining case countries favor graduates from short-cycle (often TVET) tertiary education programs over graduates from advanced university (at least bachelor's) degree programs. However, all the case countries exhibit relatively low rates of students choosing TVET at the higher education level, even in Türkiye, where TVET enrollment at the higher education level is highest, at 37.65%. Despite higher unemployment rates for advanced education graduates and even better salaries for TVET graduates in the Middle Eastern labor market, the main barrier to TVET enrollment seems to be societal perceptions that view TVET programs as lower-status education.[9,13,20,26,32,39] This low perception of TVET can cause delays in higher education, as seen in the case of Türkiye, where many individuals take the university entrance exam multiple times, resulting in gross enrollment in higher education exceeding 100%. Another common issue highlighted by the GKI is the low level of female participation in TVET programs in the selected Middle Eastern countries. As Hojeij and Al Marzouqi discussed, most Islamic countries (including all the selected cases) have historically struggled with low female literacy rates due to various socio-Islamic traditions.[39]

In addition to the common problems mentioned above, the selected countries also have different geo-economic conditions that promote (or, in some cases, such as Egypt and Qatar, hinder) longer periods of education. As a result, each selected country has pursued different a policy regarding TVET enrollment, prioritizing its own specific needs. For example, Iran, a relatively isolated country from global markets, prioritizes training intermediate staff with entry-level technical skills before higher education to boost industrial production. On the other hand, Egypt and Türkiye, despite having larger industrial and service sectors, struggle with overeducation problems, which means graduating more people from universities, particularly in white-collar occupations (*e.g.*, business management, law, teaching, and even some engineering fields, such as geology or mechanical, civil, or industrial engineering), than the labor market demands. This oversupply of white-collar workers has led to a shortage of blue-collar workers, making vocational education graduates more valuable than those with advanced higher education degrees in Egypt and Türkiye.[50,51] Intermediate technical staff with vocational education degrees can earn more than their senior peers with advanced engineering skills, a trend that diverges from the global norm.

Accordingly, Egypt and Türkiye have recently implemented national policies to increase the attractiveness of vocational education partly before the higher education level (largely at the secondary-high school education level). For instance, Türkiye has established two tracks for TVET programs: one within the formal education system and another within the public education system.[34] Egypt, in consultation with international collaborators, has expanded its TVET system to start at age 11, straight after basic education.[4] However, this early integration of TVET could have unintended consequences, as in the case of Egypt, where agreements with other nations, such as Germany, to accept Egyptian TVET graduates into the German labor market may have caused a brain/workforce drain (https://www.etf.europa.eu/). On the other hand, Qatar, Saudi Arabia, and the UAE have lower unemployment rates among higher education graduates. With large amounts of natural resources such as gas and petroleum, these countries have established strong commercial and investment

relations with other countries from all around the world. Their high-income levels (measured by GDP per capita) enable them to attract both unskilled labor and skilled vocational education graduates from other countries to meet their technical workforce need.[19,25,37] Nevertheless, all three countries (Qatar, Saudi Arabia, and the UAE) are establishing vocational training centers to reduce reliance on oil income and empower female citizens.

Consequently, the selected Middle Eastern countries, most of which are relatively young at under 100 years old, can provide many valuable insights into what the do's and don'ts should be. For instance, policymakers and educational authorities should do the following: (1) Design various campaigns to overcome negative perceptions among people about the low status of TVET graduates and encourage female students to enroll in TVET programs, emphasizing the higher chance of joining the labor market. (2) Plan short-, mid-, and long-term TVET investments (in terms of infrastructure, superstructure, teacher workforce and qualifications, curriculum preparations/updates, *etc.*) by overseeing various occupational needs in their national markets. (3) Consider adapting TVET programs to be parts of compulsory education, perhaps after primary education, to generate alternative pathways for students. (4) Embrace practice-oriented TVET systems by collaborating with industrial companies and business firms. (5) Enrich TVET curricula with new technological skills, with most listed as 21st-century skills. (6) Organize a higher quota for TVET programs (at ISCED level 5) to accept more students than advanced programs (at ISCED level 6) in their higher education systems.

Conversely, they should not do the following: (1) Aadapt their national educational systems by largely copying other countries (unlike Qatar and the UAE). (2) Rely too much on other countries' guidance to develop their own TVET systems (unlike Egypt). (3) Put TVET options at too late an age, considering the higher chance for students to continue TVET in higher education if they start TVET programs at an earlier age (unlike Iran). (4) Ignore female human resources for their highly skilled professional needs (unlike Saudi Arabia). (5) Place TVET higher education institutions under universities' umbrellas due to various managerial challenges; rather, they should establish independent TVET colleges (unlike Türkiye).

Despite the valuable insights gained here, this research was carried out with limited national data from only selected Middle Eastern countries. Thus, studies benefiting from larger dataset(s) and/or adding different variables could provide further insights into TVET systems in the Middle East region. On this point, gender parity deserves to be a separate topic to compare women's approaches to TVET-related higher education in different countries if relevant international data can be obtained. Nonetheless, both from country-specific and comparative perspectives, a rich combination of qualitative and quantitative data will provide better opportunities for further research to offer deeper analysis and recommendations for countries' TVET systems, not only in the Middle East region but also in other regions of the world.

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