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The impact of higher education on female labor force participation in Saudi Arabia

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Abstract

The purpose of this paper is to explore the impact of higher education on female participation in the labor force in Saudi Arabia. Specifically, it aims to statistically examine the relationship between the number of female graduates and their rate of participation in the labor force, as well as to uncover the role of GDP in this relationship. To achieve these objectives, official data from the Saudi Authority for Statistics were used, covering a 17-year period (2006-2022), along with several recently published relevant documents. Statistically, the paper employs both a regression model and an independent samples t-test to analyze the relationship. The findings confirm a strong positive correlation between the number of female graduates and their participation in the labor force, with a correlation coefficient (R) of 0.993, and a coefficient of determination (R-square) of 0.986. Despite this encouraging result, gender disparity in employment remains. Although the number of female graduates has substantially surpassed that of males, their participation in employment is still significantly lower. Key recommendations include addressing socio-cultural barriers that limit females' full participation in the workforce. This paper contributes to the current debates on the relationship between higher education, GDP, and female labor force participation in Saudi Arabia.

Keywords: Gender parity, higher education, labor force participation, Saudi Arabia, SDGs.

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1. Introduction

Currently, female labor force participation has become an issue of concern among researchers, planners, and policymakers worldwide. This is due to the fact that women represent more than half of the world's population, but their contribution to labor force participation does not reflect this number [1, 2]. Moreover, their participation constitutes an

important end in itself and, at the same time, is essential for achieving sustainable development. Therefore, gender equality is highly needed in productive life, including shared responsibilities for the maintenance of the household [3, 4]. To ensure gender parity in all aspects of life, including the labor force, several goals and declarations have been implemented by the United Nations. Major among these are the Millennium Declaration and Sustainable Development Goals (SDGs). In 2000, 191 nations adopted the Millennium Declaration to be achieved by 2015. The Declaration outlines peace, security, and development concerns, including the environment, human rights, and governance [5]. Later in 2015, seventeen sustainable development goals (SDGs) were launched to be achieved by 2030. These goals address disparities in several issues like education, poverty, energy, and the environment. For education equality, Goal 4th focuses on quality education by "ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Target 3rd of the fourth goal (4.3) specifically guarantees equal access to affordable and quality technical, vocational, and tertiary education, including enrollment in universities. Furthermore, the 5th goal pertains to gender equality and the empowerment of all women and girls. This is explicitly mentioned in the first target (5.1), which states that all forms of discrimination against all women and girls everywhere should be ended. Also, Goal 8th aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. Goal 10th concerns the reduction of inequality within and between nations. Explicitly, the second target (10.2) states that by 2030, all people, regardless of age, gender, disability, race, ethnicity, origin, religion, economic status, or other factors, will be empowered and promoted for social, economic, and political inclusion [6]. Accordingly, the number of females enrolled in higher education has increased very rapidly in both developed and developing countries. Saudi Arabia has no excuse. More than 50 countries have achieved gender parity in educational attainment, including the Kingdom of Saudi Arabia.

As stated above, Saudi Arabia has committed itself to the international agreements, mainly the SDGs, to empower women and ensure gender parity. To speed up the process and achieve the international goals within the time determined, the country has embarked on formulating internal policies like "Saudi Vision 2030" and "National Transformation Program." The overall objective of these plans is to diversify the economy and ensure gender equality in all aspects of life, including the labor force. For example, Vision 2030 aims not only to enhance the education outcomes but also to improve the structure of the education sector as a whole. As argued by Alsubaie [7] through the Kingdom Vision 2030, Saudi Arabia is training capable women to take leadership roles in key economic. Accordingly, the total number of students in higher education has increased dramatically from 1.62 million in 2012 [8] to 1.97 million in 2022 [9]. This figure is supported by the World Bank [10] as it stated that in Saudi Arabia the gross enrollment ratio of female in tertiary education has increased from just 1% in 1975 to 24% in 2000 and jumped to 70% in 2017, compared to males, which were 5%, 14%, and 69% for the same years, respectively [11]. The country lies among the top-listed nations that have accomplished gender parity in education. Compared to 146 countries, Saudi Arabia lies at number 67 in educational attainment, as it ranked 1st and scored one [12]. The rate of enrollment in tertiary education in Saudi Arabia is higher compared to some Arab countries [13]. Within the six Gulf countries, Saudi Arabia ranked number four after Kuwait, the United Arab Emirates, and Qatar. The two countries that remain behind are Oman and Bahrain. This signifies that Saudi Arabia has achieved gender parity in higher education, and even today, females are outnumbering males in all levels of education. This positive remark enhances women's participation in various sectors, including employment.

As in education, Saudi Arabia has adopted both internal and external policies to achieve gender parity in labor force participation. These internal policies include, but are not limited to, Saudi Vision 2023, support and empowerment programs, and employment support programs for young people provided by the Ministry of Human Resources and Social Development [14]. One of the major objectives stated in the Saudi Vision 2030 is to increase women's participation in the labor market by 30%. It was highlighted clearly in the vision that "Saudi women are yet another great asset. With over 50 percent of our university graduates being female, we will continue to develop their talents, invest in their productive capabilities, and enable them to strengthen their future and contribute to the development of our society and economy" [15]. These policies generate wide opportunities for females to join the labor force. Since then, the rate of female in the labor force participation has increased, and it's faster than in some neighboring and Arab countries. Currently, the labor force participation of Saudis has reached 51.3% in 2023 (66.6% for males, and 35.5% for females) [16]. According to the World Economic Forum [12], female labor-force participation in Saudi Arabia has nearly doubled over time, from 22.5% in 2006 to 43.2% in 2024, as well as in Bahrain and the UAE, which have also seen significant increases since 2006. Compared to the Middle East and Northern Africa regions, among the fifteen countries, Saudi Arabia has ranked number six, preceded by the United Arab Emirates before Tunisia, Bahrain, and Jordan. Despite this positive progress, the rate of females in the labor force is still much lower compared to males. The situation becomes worse if it is known that women graduates are surpassing males. This implies that not all graduated females have managed to access jobs. Therefore, this paper aims to statistically explore the relationship between graduated female and their participation in the labor force in Saudi Arabia. Moreover, it is going to test the role of GDP in this relationship.

2. Literature Review

This section highlights the output of the ongoing debate between the three angles: education, employment, and GDP. Available literature indicates different streams of thinking in regard to this connection. The mainstream approach, propagated by the World Bank within the framework of the post-Washington Consensus, relates education to human capital [17]. Based on the work of Amartya Sen, education has been defined as a matter of capabilities connected to self-development as a basic human right, to which everybody is entitled [18]. Moreover, it has been considered an essential element in empowering women and addressing gender parity. As indicated by Bills [19], education is an instrument for women's equality and development as measured by a country's female labor force participation rate. Moreover, Ince [20] and Forsyth [17] have

found that female education has a great impact on the well-being of families and societies by raising output in economic activities, accelerating economic growth, and raising human and social capital. This led the United Nations [4] to argue that education is a prerequisite factor for other development targets and is an integral part of the sustainable development agenda. Due to this fact, education has received much concern from national and international organizations. This explains why in recent decades the number of students enrolling in higher education has expanded very rapidly.

The extraordinary expansion in higher education around the world is indisputable. Worldwide, the enrollments have increased manifold in the last three decades, and a large part of this is due to women entering degree programs in multitudes [21]. Female enrollment in tertiary education has tripled globally, with women now being overrepresented in higher education. Several regions have achieved gender parity in the last decade. According to the World Economic Forum [12], two regions have reached gender parity: Northern America (100%) and Latin America and the Caribbean. These are followed by the region of Central Asia (99.6%) and Europe (95.5%). The region of the Middle East and Northern Africa, including Saudi Arabia, has made marked advances in educational attainment, culminating in an educational parity score of 97.2%. In 2024, all economies in the region have reached parity in tertiary education enrollment. Based on Trow's theory, the Kingdom of Saudi Arabia has reached the final stage in tertiary enrollment [11]. According to Trow [22], there are three stages regarding a student's enrollment in higher education: elite, mass, and universal. Within these stages, the transition depends on the percentage of the gross enrollment ratio (GER). The elite system enrolls less than 15% of students within the age cohort; a mass system ranges between 15 and 50%; and a universal system has more than 50%. Based on Trow's theory, Saudi Arabia is passing the first two stages and is now enjoying the universal level with a gross enrollment ratio of 70.63 [23]. This implies that higher education is more accessible to the wider population that lies within the cohort age (17-24). Considering females, the gross enrollment ratio was 73.56 in 2020, compared with 67.93 for males [23].

Education is crucial not only for people to become more efficient in the sphere of production but, more importantly, to enhance people's capabilities. Human capital theory regards participation in education as an investment in human capital because of the expected returns later in life. Therefore, the greater the amount of educational attainment, the more skilled, knowledgeable, and productive people in the society will be [20]. Neoliberal arguments have emphasized the economic returns on investments in women's participation in higher education, while others stress that higher education is a human right and is essential for the creation of a moral and progressive society, as it enables an ongoing participation in a "life of the mind." This led the paper to raise the fundamental question: Does the educational attainment of women affect their participation in the labor force? Several authors, like Becker [24], Khanie [25], and Shuangshuang et al. [26], argued that an increase in the gross enrollment in tertiary education, especially for females, will lead to an increase in the rate of participation in the labor force. Steinberg and Nakane [27] indicated that in Japan, the higher level of education strengthens the attachment of women to the labor market by increasing their potential earnings. Kazandjian et al. [28] under the title "Empowering Women Can Diversify the Economy," stated that "whereas primary and secondary education can enable a country to imitate frontier technology, tertiary education can increase its possibility of innovating. Moreover, Das et al. [29] deduce that in India, higher social spending, including investment in education, could lead to higher female labor force participation by boosting the number of women with the requisite skills, knowledge, and experience. In the same line, Jenkner [30] stated that in Hungary, during 2008–13, the overall increase of 2.8 percentage points in the female labor force participation rate was driven primarily by the growing share of women with higher education among the working-age population. Currently, the young entrants to the female labor force are better educated, on average, than cohorts that left to retire. In Pakistan, women with higher levels of education are more likely to participate in the labor force in urban areas but not in rural areas. In rural areas, married women are less likely to work outside the home, but if they are the head of a household, that likelihood increases. Having a higher level of education significantly increases women's participation in the labour force in both urban and rural areas, Salman [31]. Gonzales [32] demonstrated that the educational attainment for women is positively correlated with female economic participation. Calibrating a dynamic model of labor supply, Eckstein and Lifshitz [33] find that one-third of the increase in female employment during the last century in the United States can be attributed to education. In an empirical exercise, [34] shows that a one standard deviation increase in the education level in the Organization for Economic Co-operation and Development countries is associated with a three percentage point increase in female labor force participation. In Malaysia, the gains in tertiary attainment have led to greater depth of human capital through bringing more people, especially females, into the workforce and prolonging their stay there [35].

In contrast, several empirical studies have rejected the positive relation between the large numbers of female graduates and their participation in the academic labor market, Hakiem [36]. Jayaweera [37] under the title "Women, Education, and Empowerment in Asia," stated that there is no positive linear relationship between education and the economic, social, and political empowerment of women as a consequence of the interface of gender ideologies and social and economic structural constraints. In the developmental trajectory, some authors suggest the U-shape theory in conceptualizing and addressing female labor force participation disparities. This theory suggested that less developed countries have high levels of female labor force participation rates. Since agricultural activities play an important role, women in these countries are employed as unpaid family workers; therefore, female labor force participation is relatively high in less-developed countries. While in developing countries, women have the lowest labor force participation rates compared to developed countries [38]. In this context, Nagac and Nuhu [39] found that in Nigeria, the effect of education on female labor force participation falls under the inverse "U shape" pattern, increasing up to high school but then decreasing with a higher education degree. In the same vein, Joyner [40] argued that despite the rise of female educational attainment, it is clear that this is not reflected in female labor force participation. In Mauritius, unemployment is also higher among educated women rather than men. The largest share of unemployed women is between the ages of 16 and 30 years. One-fifth of unemployed women possess a tertiary education, and the percentage of those unemployed has increased significantly and faster for women than for men over the

past five years [41]. In addition, Bhalla and Meher [42] stated that even though women's educational level is constantly increasing, employment rates have not improved at a similar speed. Safdar [43] argued that despite the fact that women outperform men in higher education, this does not translate into better economic opportunities due to workplace discrimination and physical insecurity. The situation is alarming if it is known that out of 57% of women who received tertiary education worldwide, only 33% participate in the labor force [44]. Some authors, like Hossain et al. [45] distinguished between developed and developing countries. Their findings indicated that female education consistently correlated with female Labor force participation (FLFP) negatively for low- and middle-income countries, while for the high-income group, the correlation was positive. This is due to the fact that women in high-income countries do part-time jobs besides their education, so we see a positive relationship there. Regarding the Middle East and Northern Africa, gender parity in labor-force participation rate is the lowest of all regions (28%) on average and has been in decline since 2019, when it reached 30.8% [12]. These figures vary among countries, as 43% of women hold a bachelor's compared to 80% for men in Egypt, while in Iran, only 33 percent of women with a bachelor's relative to 66.5% of men with a bachelor's, participate in the labor force [44]. In Qatar, it seems quite different, as 62.7 percent of women with above secondary education to 45.4 percent of men with above secondary education participated in the labor force in 2020 [46]. In Morocco, only 43 percent of women with a higher education degree to 66 percent of the men with a higher education degree participate in labor force in 2020 [47]. Despite progress made in several countries, wide gender gaps remain, and women have fewer economic opportunities than men. As stated in the World Bank [48], women are still less likely to be active in the labor market than men in most of the world, whereas the labor force participation rate reached 69.4%, with a high rate of 82% male and only 56% female.

On the other hand, the relationship between economic growth and employment seems to be more debatable. There have been divergent opinions on the importance of the female labor force and its impact on a country's economic growth. Hickel [49] specified that the main factors that improve an economy are proper infrastructure and access to quality education; to him, these factors are overlooked while female labor development is wrongly accorded attention as a key driver of the economy. Thaddeus et al. [2] and Obodoechine [50] discussed the impact of gross domestic product (GDP) on female labor force participation. They have concluded that female labor force participation changes with a country's economic development. According to modernization theory, when GDP reduces, female workforce participation increases due to subsistence farming being the main source of income for less developed countries [2]. As a country develops, female labor participation decreases as males take on the manufacturing and service jobs and women stay home as mothers. In contrast, when GDP increases, female workforce participation increases, especially in the service sector. In this context, Thaddeus et al. [2] indicated a long-run causal relationship exists between the female labor force and economic growth in sub-Saharan Africa, and the direction of causality is unidirectional, running from economic growth to female labor force. They also stated that the female labor force participation rate is negatively and significantly contributing to the economic growth (GDP). For the Council of Economic Advisers [51], the relationship between female labor force participation rates and GDP can also be viewed from another lens: We can consider women's labor force participation rates relative to that among men, rather than considering the absolute rate at which women are working. This reflects the relationship between the gender gap and GDP, rather than just the share of women who are working overall. A second way to think about how increased female labor force participation rates can contribute to economic growth is to ask how much GDP would increase if women worked at the same rate as men and earned the same wages.

The Saudi government has invested heavily in higher education and made intensive efforts to close the gender gap in the entire country. The kingdom adopted rational policies to overcome constraints that hindered females from accessing education. Since 1970 up to the present, nine development plans have been implemented by Saudi authorities to ensure economic growth, improve social services, reduce gender inequality, and conserve natural resources; each plan is for five years. These plans have succeeded in promoting economic growth, increasing the gross national product, and strengthening the social sector [52]. For the Ministry of Education, all women, regardless of socio-economic status, have access to a high-quality education in order to produce citizens who will contribute to the country's future progress and prosperity [7]. Accordingly, the female gross enrollment ratio for tertiary education has increased from 61.44 in 2015 to 73.56 in 2020, compared to 60.69 in 2015 and 67.93 in 2020 for males [23]. It is true to say that gender parity in Saudi higher education is almost achieved and even indicates a reversal of the situation [11]. Furthermore, the education sector has become the largest employer of Saudi women [53]. Since the appointment of King Abdullah [54], the roles and status of females have become a prominent issue, and changes have been implemented. Under the 2030 vision that the government recently announced, many reforms have been introduced, which are expected to have a direct impact on the empowerment of women. As a result, there were more options for Saudi women to find jobs without restrictions, a boost to national income, and a reduction in the country's reliance on labor from other countries [7]. Many authors investigate the female labor force participation in Saudi Arabia under the intensive efforts provided by the Saudi government, especially in the education field. Alkhazim [55] indicated that higher education provision in Saudi Arabia does not meet the demands of workforce sectors in terms of both quantity and quality. So, it is important to direct the education system strategy to meet the needs of the country and to fulfill manpower requirements. Naseem and Dhruva [56] clarified that despite recent improvement, female labor force participation (FLFP) in Saudi Arabia remains extremely low. Moreover, an increase in participation has exacerbated female unemployment as the availability of jobs has failed to keep pace with the higher FLFP. According to the Saudi General Authority for Statistics [57], the female unemployment rate decreased from 32.5% in 2017 to 15.15% in 2023 and is projected to decrease by 50% in 2023. Although Saudi Arabia's unemployment rate was relatively low at 7.7% until 2023 (13.7% for females, and 4.6% for males). This led [13] to declare that although the rate of female graduates from higher education is slightly higher than males, this difference was not translated into participation in the labor market, particularly in jobs related to the knowledge economy. As stated in Alotaibi [53], Saudi Arabia is perhaps one of the most controversial countries in terms of its very poor

overall gender gap performance, although it has, according to Pew Research, the fastest-growing female labor force participation rate of all the G20 countries.

The above section highlighted the contradicting views between the massive enrollment of female in higher education and its impact on their labor force participation worldwide. The literature highlighted that there are supporters for each side, but very few touch Arab and Gulf countries. This paper aims to fill in the gap and use statistical methods to uncover the relationship between higher education and participation of females in the labor force (FLFP) in Saudi Arabia. The paper contributes to the ongoing debates and opens the door for further studies.

3. Methodology and Materials

This paper is based on secondary data collected from various sources, including both governmental institutions and international actors. The national sources include the Saudi General Authority for Statistics, the Saudi Ministry of Education, the Saudi Ministry of Finance, Saudi Vision 2030, and the Saudi National Unified Portal. The international sources include UNESCO, the United Nations Development Programme (UNDP), the World Economic Forum (WEF), and the World Bank. The Saudi General Authority for Statistics provided the paper with official figures and detailed information regarding the labor force participation rate. In addition, published documents that highlighted the ongoing debate between higher education and labor force participation were utilized. To achieve the objectives, data for a period of 17 years was used from 2006 to 2022. The paper has employed a regression model and an independent samples T-test with the dependent variables (labor force participation rate and GDP) and independent variables (female graduates and labor force participation rate). The aim of these measures is to examine the long-run causal relationship between female graduates and female labor force participation (bachelor's). Additionally, it aims to test the relationship between Saudi female labor force participation, Saudi labor force participation, and GDP. The paper assumes that there are no statistically significant differences between the numbers of female graduates and female labor force participation. It also assumes that there are statistical differences between labor force participation by gender in Saudi Arabia, as detailed in Figure 1.

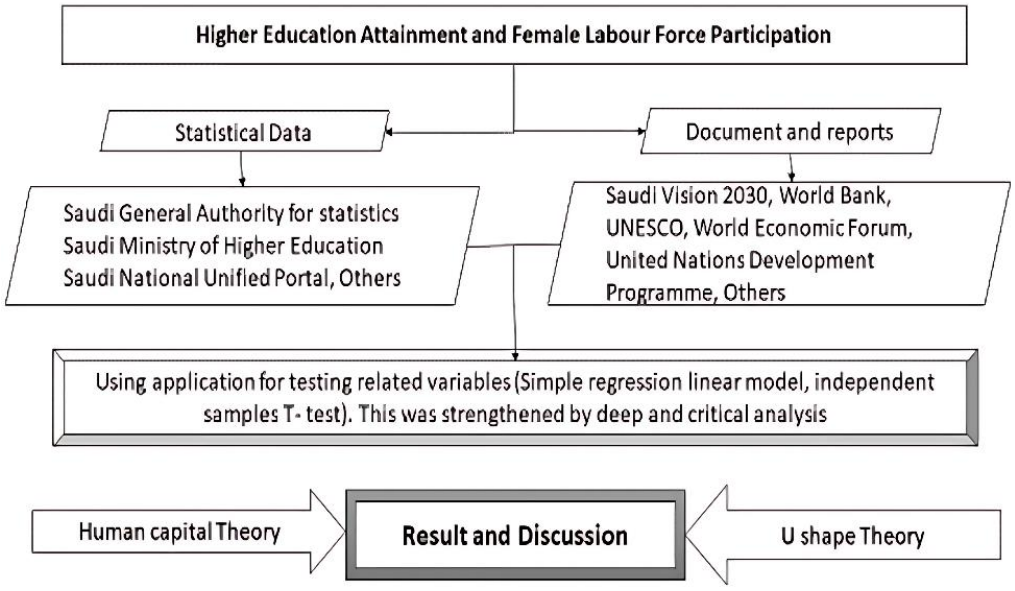

Figure 1.
Methodological Framework.

Figure 1 summarizes the general structure of the adopted methodology. It includes three phases: the first focuses on data collection, mainly statistical data, documents, reports, and literature. This phase supported the paper with the previous studies and identified the theoretical thoughts for the higher education and female labor force participation relationship. It is important to note that most of the statistical data came from the Saudi General Authority for Statistics. The second phase highlighted the statistical method employed by the paper, which is simple regression and an independent samples T-test. These measures are useful in testing the relationship between higher education and female labor force participation. The third phase was the discussion based on the test of the three hypotheses as shown in the following:

1. There are no statistically significant differences between female graduates and female labor force participation.
2. There are no statistically significant differences between male and female graduates in labor force participation.
3. There are no significant differences between female labor force participation and GDP rate.

4. Results and Discussion

4.1. Female Graduates and Female Labor Force Participation (Bachelor's)

As stated in the first hypothesis, there are no statistically significant differences between female graduates and female labor force participation. This section has employed data collected from the Saudi Ministry of Education and the Saudi General Authority for Statistics (Appendixes 1, 2). Using simple regression analysis, female graduates are the independent variable (x), the female labor force participation rate (y) is the dependent variable, and the model is:

$$y = ax + b$$

Table 1.
Model Significance.

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	368.177	1	368.177	1090.230	0.000[b]
	Residual	5.066	15	0.338		
	Total	373.242	16			

Note: a. Dependent Variable: Female labor force participation rate (bachelor's)
b. Predictors: (Constant), female graduates (bachelor's).

From the above table, it is found that the value of (F) equals 1090.230 with a level of significance of 0.000, a value less than 0.05. This means the model is significant and fits the data; therefore, the model can be used for prediction as highlighted in Table 2.

Table 2.
Model Coefficients.

Coefficients[a]						
		Unstandardized Coefficients		**Standardized Coefficients**		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	29.023	0.402		72.199	0.000
	female graduates (bachelor's)	0.647	0.020	0.993	33.019	0.000

Note: a. Dependent Variable: Female labor force participation rate.

Table 2 shows that the predictor variable (female graduates) is significant because the sig value (0.000) is less than 0.05; then female graduates do impact female labor force participation. This indicates a very strong relationship between female graduates and female labor force participation; see Table 3.

Table 3
Model Summary.

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.993[a]	0.986	0.986	0.58112

Note: a. Predictors: (Constant), female graduates (bachelor's).

Table 3 confirms that the correlation coefficient (R) between female graduates and female labor force participation is very strong (0.993). This finding indicates a high value of the coefficient of determination (R-squared), which is equal to 0.986. This confirms the positive relation between the two variables and also confirms the influence of the predictor one. It shows clearly the positive impact of higher education on Saudi female labor force participation. This result is in line with Becker [24], Khanie [25], Shuangshuang, et al. [26], Steinberg and Nakane [34] and Kazandjian et al. [28] which state that an increase in the gross enrollment in tertiary education, especially for female, will lead to an increase in the rate of participation in the labor force. On the other hand, it rejects the notion that there is no positive correlation between the number of female graduates and women's participation in the labor market.

The Saudi government has invested heavily in higher education and made intensive efforts to close the gender gap by increasing female enrollments at universities. One of the main targets of Saudi Vision 2030 is to continue investing in female higher education and close the gap between the outputs of higher education and the requirements of the job market. Moreover, the vision seeks to provide equal opportunities and empower women. Accordingly, the female gross enrollment ratio reached 73.56 in 2020 [11], and the number of female graduates has increased from 51,289 in 2006 to 127,985 in 2022 (Appendix 1). This procedure coincided with the increase in job opportunities. For example, 41% of Saudi graduates were employed within 1 year after their graduation date, of which 10% were employed before graduation and are still on the job after graduation. Moreover, the employment rate for Saudi graduates employed 12 months after graduation reached 14% by the end of 2022 [58].

4.2. Male and Female Graduates in Labor Force Participation

Concerning the second hypothesis, there are no statistically significant differences between male and female graduates in labor force participation. Using an independent sample t-test, statistical analysis indicated significant differences in favor of males (Table 4).

Table 4.
Differences between male and female graduates in labor force participation using the Independent Samples T-test.

	Levene's Test for Equality of Variances		Mean	t-test for Equality of Means				
	F	Sig.		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	6.032	0.019	91.29	30.953	34	0.000	27.86	0.90010
Equal variances not assumed			63.43	30.953	25.41	0.000	27.86	0.90010

Table 4 illustrates that the result of the Levene statistic value is equal to 6.032 with a significance level of 0.019, which is less than 0.05. This denotes that there is a variance between females and males, allowing the acceptance of the second row, which is (equal variances not assumed). Moreover, it shows that the value of (t) equals 30.953 with a significance level of 0.000, which is also less than 0.05. This specifies that there are statistically significant differences between males and females, in favor of males, where the average female labor force participation rate was 63.43, compared to 91.29 for males. More details are in Figure 2.

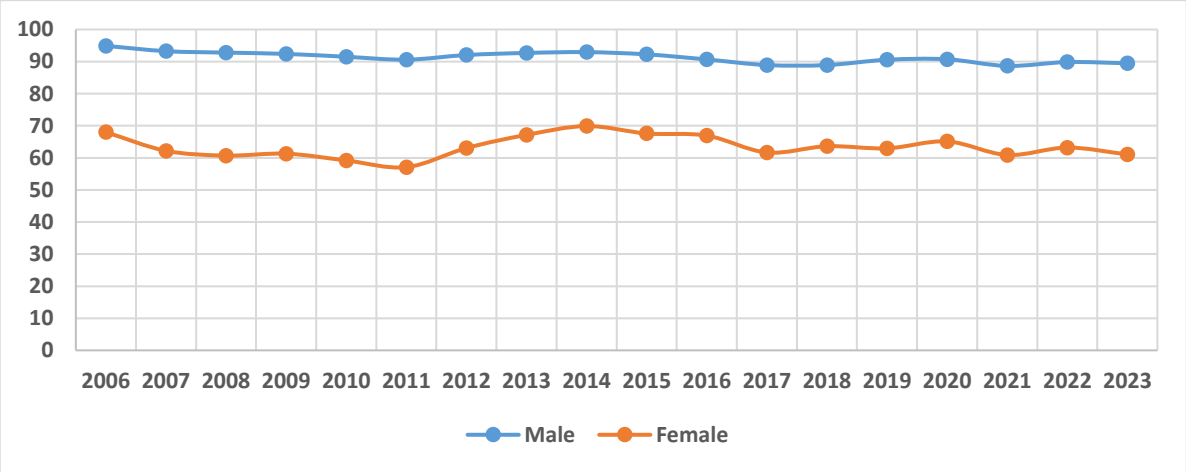

Figure 2.
Labor force participation rate by sex, 2006-2022.

Despite the fact that female are dominating public universities and currently are outnumber males in graduation, their participation in the labor force remains much lower compared to males. According to the Saudi National Labor Observatory [58] in 2022, Saudi male graduates achieved a higher employment rate within one year after graduation as compared to Saudi females. Whereby Saudi males achieved a 42% employment rate within one year after graduation compared to 24% for Saudi female graduates (approximately 46 thousand males, compared to approximately 37 thousand females). Regardless of education level, statistical analysis indicates significant variances between females and males in terms of labor force participation (Table 5).

Table 5.
Saudi labor force participation rate—Differences between males and females, using Independent Samples T-test (2006-2022)

		Levene's test for equality of variances		Mean	t-test for Equality of Means				
		F	Sig.		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
T	Equal variances assumed	14.812	0.000	63.56	21.668	34	0.000	43.44	2.00471
	Equal variances not assumed			20.12	21.668	19.803	0.000	43.44	2.00471

As stated in Table 5, the Levene statistic value is equal to 14.812 with a significant level of 0.000, a value of less than 0.05. This denotes there is a variance between females and males. This allows the acceptance of the second row, which is (equal variances not assumed). Moreover, it demonstrated that the value of (t) equals 21.668 with a level of significance of 0.000, a value of less than 0.05. This stipulates that there are statistically significant differences between males and females, in favour of males, where the average of the male labor force participation rate was 63.56% compared to 20.21% for females. This finding confirmed that despite the much effort made to address gender disparity in labor force participation, their contribution is much lower compared to males. This implies clearly that increasing female in higher education is not the sole factor to increase their participation in the labor force, mainly in developing countries. This is due to socio-cultural as the decision to join the labor market is related to family matters rather than personal action. As stated by Elhadary and Ahmed

[59], unlike men, the decision for women to join the workforce is not always theirs. It depends not only on women's preferences but also on the preferences of other family members and the process by which the family makes decisions [60]. This finding is in line with Abalkhail [61] and Naseem and Dhruva [56], who stated that female labor force participation is restricted by many socio-cultural factors. For Abalkhail [61], occupations are typically gender-based. For example, the labor market controls the types of jobs women may undertake, in that women are crowded into "feminine" sectors (e.g., education, health, and social work). However, due to the comprehensive efforts, women are now increasingly entering the workforce at all levels, including in high-skilled and traditionally male-dominated sectors like engineering and finance. Planners and policymakers have to look behind numbers and uncover the socio-economic and cultural factors that hinder females from fully joining the labor force.

4.3. The impact of Saudi female labor force participation on GDP

As stated in the third hypothesis, there are no significant differences between female labor force participation and GDP. This section has employed data collected from the Saudi General Authority for Statistics and the World Bank to prove or reject the hypothesis (Appendixes 3, 4).

Table 6.
Model Significance.

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	18.993	1	18.993	1.785	0.201[b]
	Residual	159.584	15	10.639		
	Total	178.577	16			

Note: a. Dependent Variable: GDP
b. Predictors: (Constant), Saudi female labor force participation

Table 6 has come with the value of (F) equal to 1.785 with a level of significance of 0.201, a value greater than 0.05. This means the model is insignificant and does not fit the data; therefore, the model cannot be used for prediction. This allows the paper to employ the model coefficient as in Table 7.

Table 7.
Model Coefficients.

		Unstandardized Coefficients		**Standardized Coefficients**		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	2.510	.956		2.626	0.019
	Saudi female labor force participation	11.087	8.298	0.326	1.336	0.201

Note: a. Dependent Variable: GDP.

Table 7 shows that the predictor variable (female labor force participation) is insignificant because the sig value is equal to 0.201, and it is greater than 0.05, implying that female labor force does not impact GDP. This can be explained by the weak value (0.326) of the correlation coefficient between the female labor force participation rate and the GDP rate, and also by the value of the coefficient of determination, where R-squared equals 0.106. Based on this finding, the paper argued that there is a very weak relationship between female labor force participation and GDP.

Regarding the impact of Saudi labor force participation on GDP, using a simple regression model, Tables 8 and 9 indicate some statistical results

Table 8.
Model Significance.

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	23.476	1	23.476	2.270	0.153[b]
	Residual	155.101	15	10.340		
	Total	178.577	16			

Note: a. Dependent Variable: GDP
b. Predictors: (Constant), Saudi labor force participation

Table 8 found that the result is equal to 2.270 with a level of significance of 0.153, which is greater than 0.05. This finding implies that the model does not fit the data, and it cannot be used for prediction. This allows the paper to employ the model coefficient as in Table 9.

Table 9.
Model Coefficients.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.339	0.977		2.393	0.030
	labor force (male and female)	12.497	8.294	0.363	1.507	0.153

Note: a. Dependent Variable: GDP.

Table 9 shows that the predictor variable (Saudi labor force participation) is insignificant because the sig value is equal to 0.153, which is greater than 0.05, suggesting that Saudi labor force participation does not impact GDP. This can be explained by the weak value (0.363) of the correlation coefficient between the Saudis' labor force participation rate and the GDP rate, and also by the value of the coefficient of determination, where R-square equals 0.132. This indicates a very weak relationship between Saudi labor force participation and GDP.

This result can be linked directly to the opinion that the main factors that improve an economy are factors such as proper infrastructure and access to quality education; to him, these factors are overlooked while female labor development is wrongly accorded attention as a key driver of the economy, and it can also be discussed under the concept that female labor force participation changes with a country's economic development.

5. Conclusion

This paper examines the impact of higher education on Saudi female labor force participation from 2006 to 2022. During this period, the Saudi Arabian government has implemented several policies and made intensive efforts to empower women through increased access to higher education. Accordingly, the number of female graduates has increased very rapidly and recently surpassed their male counterparts. Besides, the statistical analysis indicates a positive and strong relationship between female graduates and female labor force participation. This progress has positively impacted the participation of females in the labor force. Despite this positive remark, our results have shown that not all female graduates can access jobs, as their participation is still much lower compared to males. Moreover, it shows that there is a very weak relationship between female labor force participation and GDP. Saudi Arabia has achieved gender parity in educational attainment, but it is far from achieving the same for employment. This finding indicates that increasing the number of females in higher education is not the sole factor in increasing their participation in the labor force. Planners and policymakers have to look beyond numbers and uncover the socio-economic and cultural factors that hinder females from fully joining the labor force. Without addressing these issues, achieving gender parity in the labor force through only massive enrollment of females in higher education will be a waste of time. Planners have to formulate policies to eliminate the socio-cultural factors that negatively impact female employment. Thus, further studies are needed to explore the role of socio-economic and demographic factors.

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Appendices

Appendix 1.
Saudi Graduate Students 2006-2022.

year	Male	female
2006	23,108	51,289
2007	23,876	56,302
2008	27,644	61,364
2009	29,704	52,494
2010g	26,543	56,712
2011	30,053	58,059
2012	38,043	60,419
2013	42,500	60,182
2014	53,212	70,734
2015	63,959	84,178
2016	71,540	98,251
2017	81,354	113,014
2018	77,800	117,300
2019	82,000	118,500
2020	74,101*	111,897*
2021	66,202	105,295
2022	82,966	127,985

Source: Saudi Ministry of Education [53] Saudistats [55]* average 2019/2021
Saudi National Labour Observatory [58]. Saudi General Authority for Statistics [62].

Appendix 2.
Labor force participation rate by level of education (bachelor's) 2006-2022

Year	Male	Female	Total
2006	94.9	68	81.9
2007	93.25	62.2	78.15
2008	92.8	60.7	76.8
2009	92.4	61.3	76.4
2010	91.5*	59.2*	74.8*
2011	90.6	57.1	73.1
2012	92.05	63.05	77
2013	92.7	67.15	79.6
2014	92.95	69.9	81.25

2015	92.25	67.6	79.95
2016	90.67	66.93	78.73
2017	88.925	61.675	75.5
2018	88.925	63.625	76.5
2019	90.575	62.975	76.4
2020	90.725	65.125	77.15
2021	88.65	60.9	73.575
2022	89.85	63.2	75.45

Source: Saudi General Authority for Statistics [16]. *average 2009/2011

Appendix 3.
Saudi labor force participation rate 2006-2022.

year	Male	Female	Total
2006	60.3	12.6	36.4
2007	61	12.3	36.6
2008	60.8	11.6	36.2
2009	60.8	12	36.4
2010	62.2	17.8	40.3
2011	61	14.4	37.7
2012	62.1	15.2	38.65
2013	64.4	16.25	40.35
2014	64.85	17.6	41.15
2015	63.7	17.35	41.15
2016	64.13	18.7	41.5
2017	62.5	18	40.8
2018	63.4	19.7	42
2019	65.7	23.2	44.9
2020	66.5	30.5	48.8
2021	65.9	33.6	50.1
2022	67.4	35.6	51.7

Source: Saudi General Authority for Statistics [16].

Appendix 4.
Saudi Real GDP Growth rate 2005-2019.

Year	Annual growth rate
2005	5.6
2006	2.8
2007	1.8
2008	6.2
2009	-2.1
2010	5
2011	11.175
2012	5.5
2013	2.525
2014	3.85
2015	4.5
2016	1.85
2017	0.925
2018	3.175
2019	1.1
2020	-3.6
2021	5.075
2022	7.55

Source: Saudi General Authority for Statistics [63] and World Bank Group [1].