



# ETC5513 Project

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## Introduction

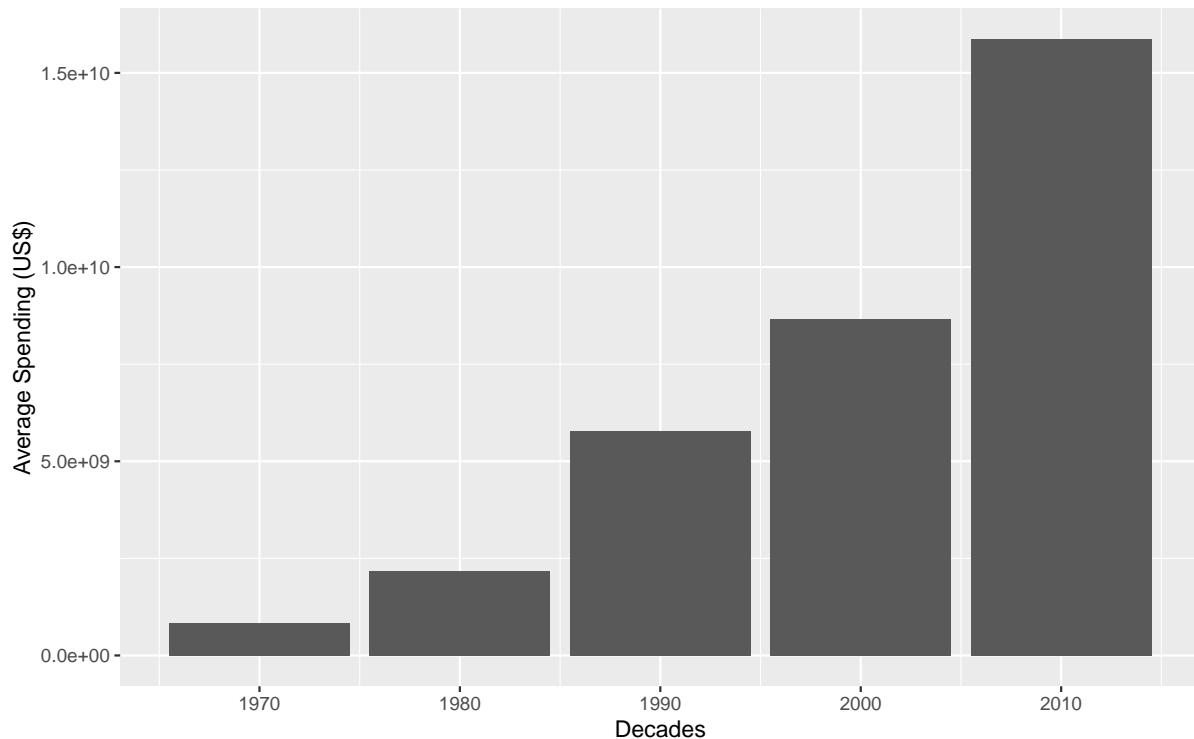
Gender inequality is an issue that is recognised globally. *Something to describe the discrimination.* Israeli law rules that discrimination related to gender in workplaces and wages, yet when observing actual ratios of females to males in the labour force, the number of female to male workers is not equal. *add something about gender stereotypes in religion.*

This report aims to establish possible reasons as to how views towards gender stereotypes have changed over time. To do this, we have selected variables to investigate and establish some relationship with changes in gender stereotypes. The data used has been retrieved from the World Development Indicators dataset from the World Bank [The World Bank \(2020\)](#). Each section will explore the respective variable, and a linear regression model has been developed to determine impact of each investigated variable.

## Education

In the past 50 years, women's participation in the work force has increased steadily (Stier and Lewin-Epstein [2000](#)). It is believed that gender inequality in education is a major contributing factor in gender inequalities in adulthood, especially in the labour market (Marks [2008](#)). In this section, the report is going to examine the state of education in Israel and whether there is an association between education and the increase of women's employment in Israel.

### Education Spending in Israel



**Figure 1:** Average Education Expenditure in Israel by Decades

The education spending spent by the Israeli government is shown in figure 1. The average of funds invested by the government doubled the size almost every decade. It started with average of 834 million US dollars in 1970s, and it reached 15 billion US dollars in 2010s.

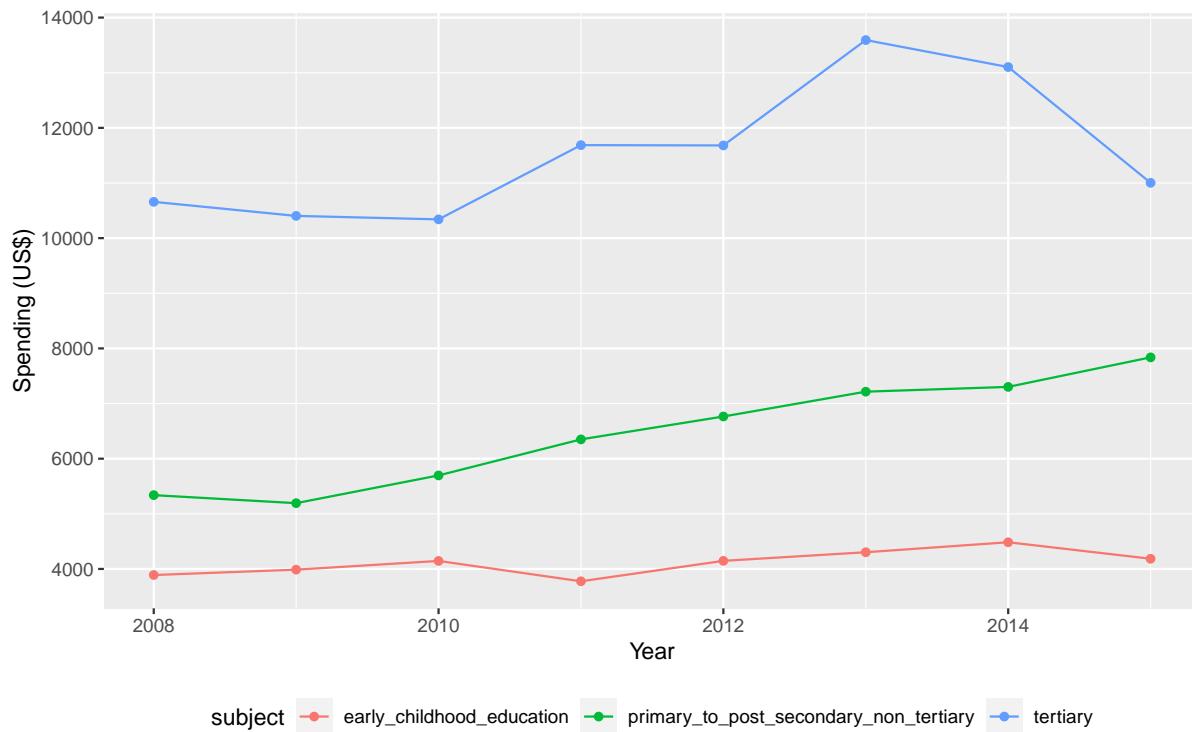
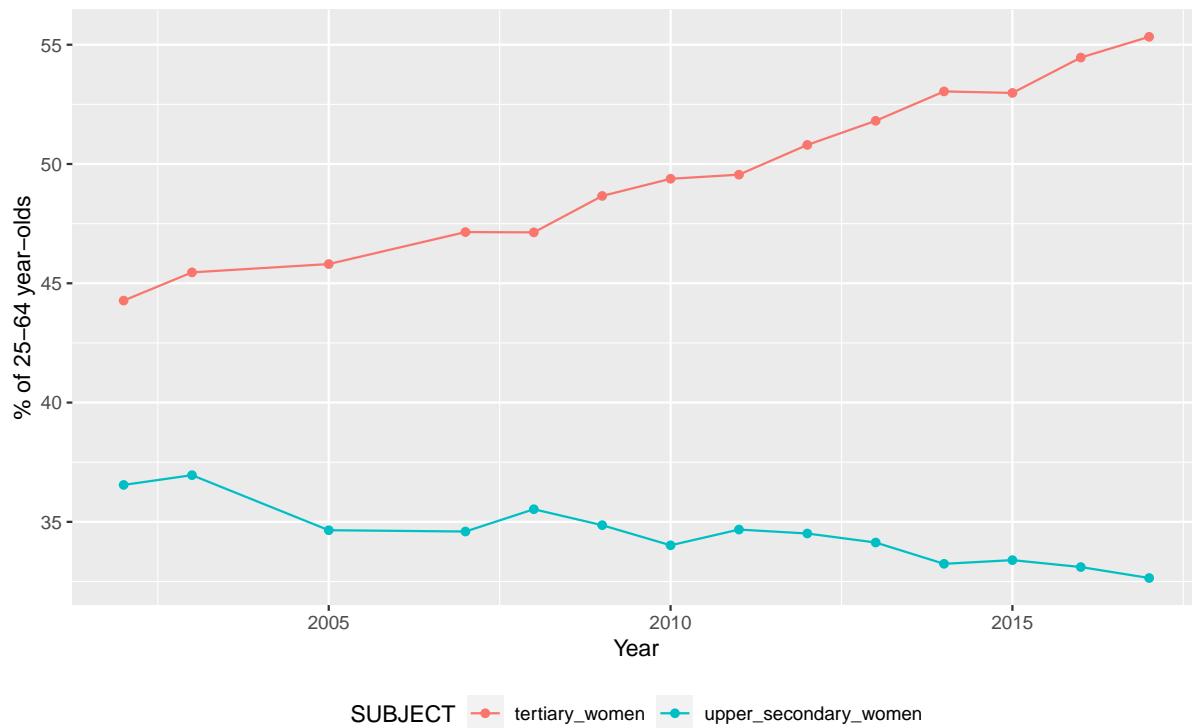
**Figure 2: Education Spending in Israel**

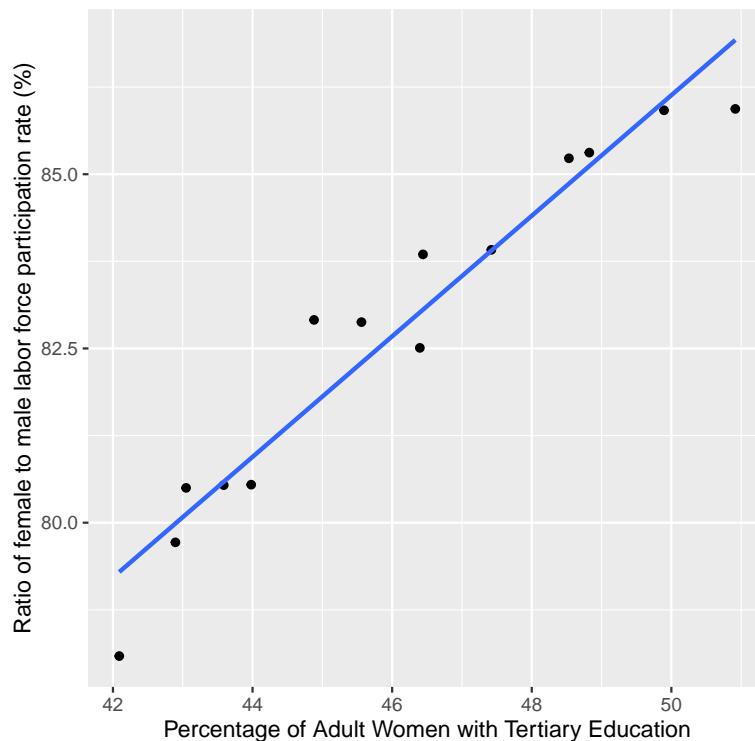
Figure 2 reflects how the Israeli government invested the education spending from 2008 to 2015. The figure shows that the government spent the majority of the funds on tertiary educations. It is then followed by primary to post secondary (non-tertiary) and early childhood education respectively.



### Adult Education Level in Israel

The percentage of adult female education level in Israel is reflected in figure ???. The figure shows that the percentage of women with tertiary education in Israel increases over the years. Conversely, the percentage of women with upper secondary education in Israel decreases over the years.

### Education and Female Participation in Labour Force



**Figure 3: Scatterplot of Female Labour Participation Ratio and Adult Women Education Level**

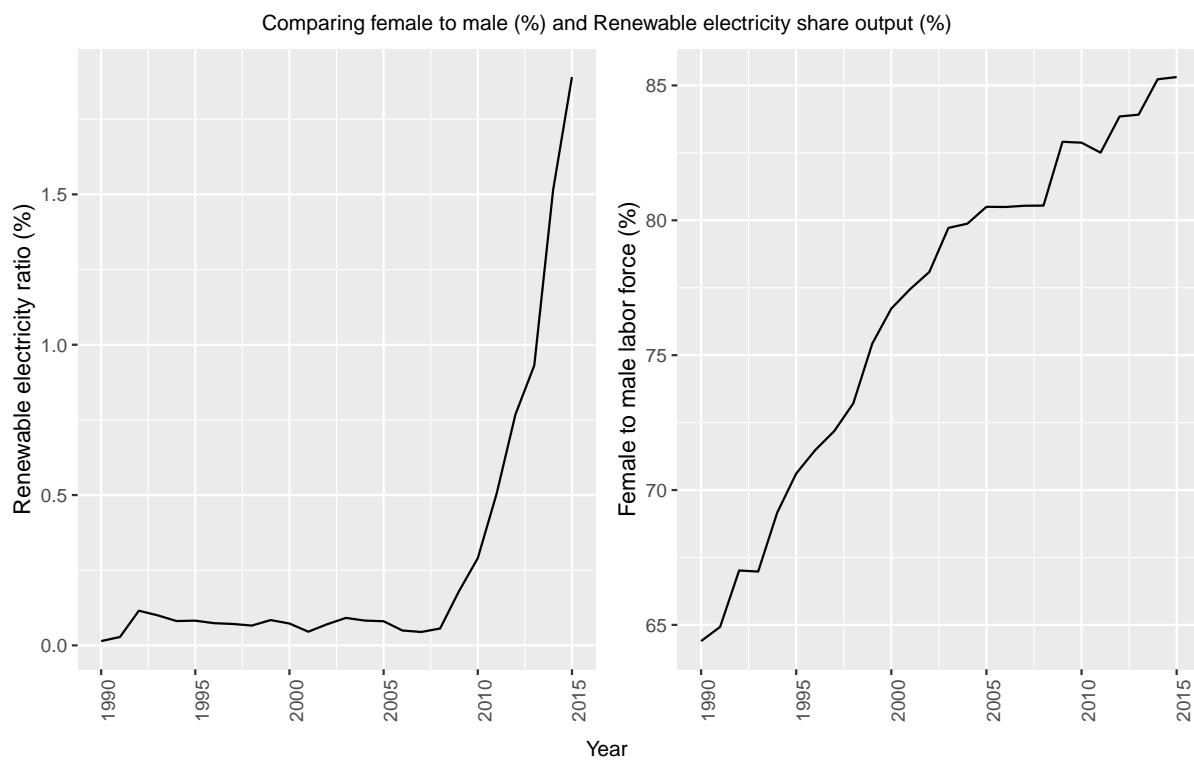
The scatter plot in figure 3 shows the relationship between the ratio of female to male labour force participation rate in Israel and the percentage of women between 25 - 64 years old with tertiary education in Israel. It is reflected in the figure that there is a positive relationship between percentage of adult women with higher education and female participation in labour force. In other words, the ratio of female to male labour force participation rate in Israel tend to increase on average when the percentage of adult female with tertiary education increases. With the increases of the ratio of female to male labour force participation rate in Israel, the trend shown in figure 3 is well expected. It was found that tertiary education strongly influences the labour market as adults with tertiary education in Israel have relatively high employment rate at 86% ([OECD 2004](#)). The main factor that explains labour force involvement for women is education ([Stier and Herzberg 2013](#)). This is due to the fact that people with higher educations have better employment opportunities and

these opportunities usually comes with higher remuneration (The State of Israel 2014). As primary providers for childcare, women weigh the costs of alternative care for children and home against the benefits of paid work (Stier and Herzberg 2013). The higher remunerations came with higher education assist women to afford domestic costs, making the entry to the work force economically more attractive (The State of Israel 2014).

## Analysing energy consumption and renewable sources

Israel has seen significant changes in the distribution of genders in the labour force. Though many direct effects can be explored, this section looks at changes in attitude by analysing Israel's move to more renewable sources of energy. There may be a link between the a transition to change in political thinking in priority. This may also be attributed to a general change in attitude, and could provide a reasonable proxy for our model.

For this section of the report, we will be looking at World Bank Sustainable for All data (The World Bank (2018)). This data set comprises of electricity data between 1990 and 2015.

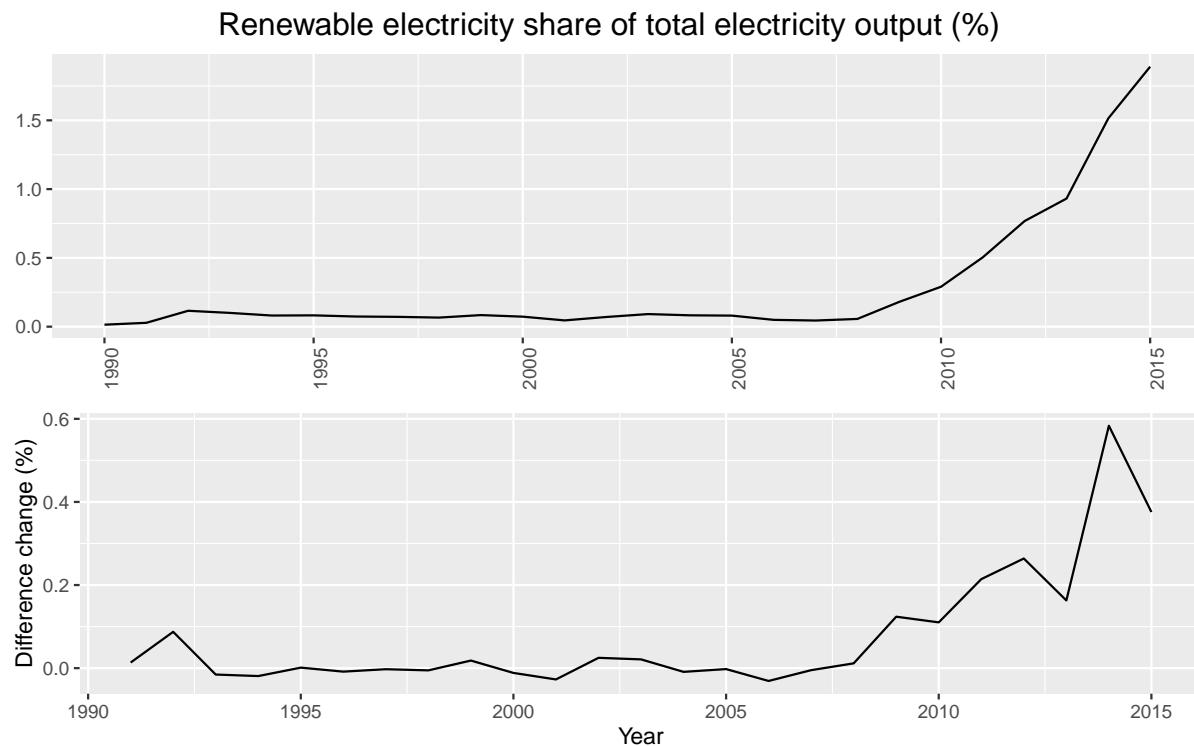


**Figure 4:** Comparing female to male ratio to renewable electricity output share

Comparing the ratio of female to male labor force participation rates to renewable electricity share in Figure 4, we note a more consistent growth of the ratio over time, whereas the renewable electricity ratio stays consistent until 2007, after which we observe a sharp increase. To understand this increase,

we must delve more into the renewables future plan for Israel. Established in 2016 were steps to reach a target of 17% Renewable Energy production by 2030, with interim targets of 10% and 13% by 2020/2023 respectively (International Energy Agency (IEA) (2019)). Unfortunately, the data set used for this analysis does not have data past 2015, and as a result, we cannot identify the effect which the announcement could have made.

Looking at the change in electricity share in Figure 5:



**Figure 5: Looking at Renewable electricity share, and difference change**

We can see that the difference seems to centre around zero prior to 2007, as was noted previously, however no clear perfect correlation can be seen when comparing the differences in Figure 5 and Figure 4.

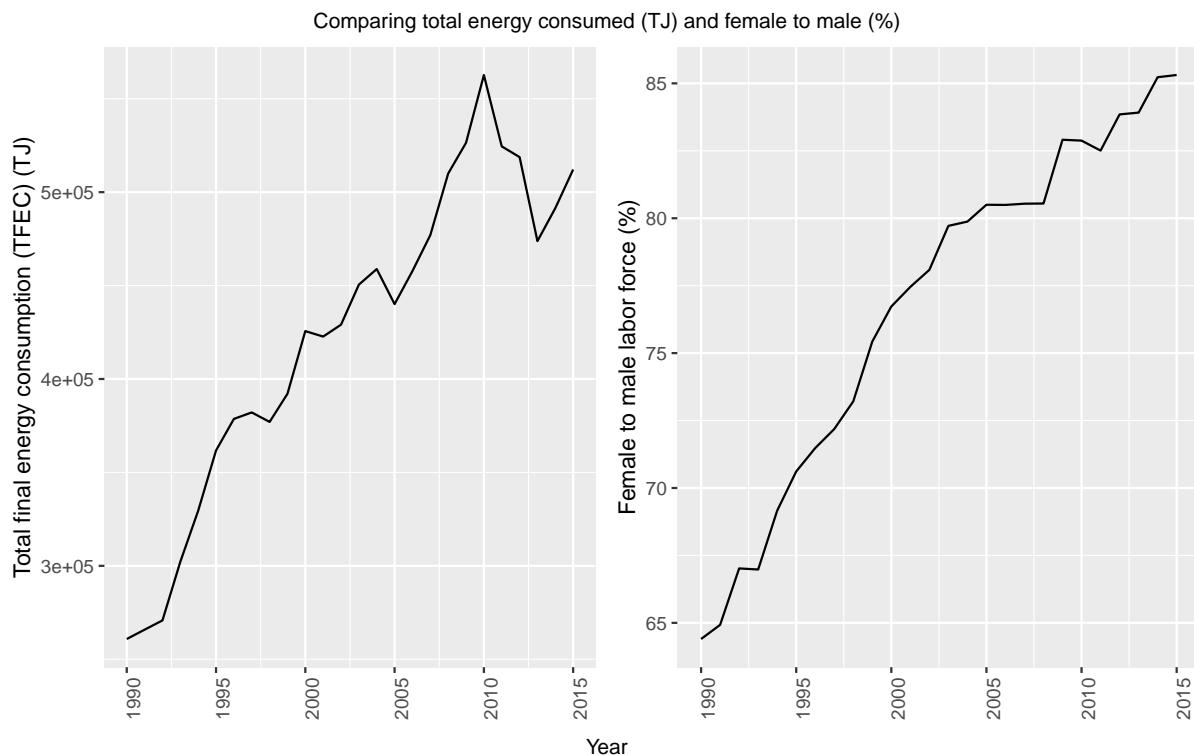
**Table 1:** Forecast of renewable electricity share

	Year	Renewable electricity share of total electricity output (%)
26	2016	1.965234
27	2017	2.040268
28	2018	2.115302
29	2019	2.190335
30	2020	2.265369

Table 1 shows a forecast of the renewable electricity share of total electricity output in the next five years. This was conducted using a mean forecasting method. If current policies were followed, the target set in 2016 may not be met.

Perhaps, renewable energy is not exactly suitable in representing some change in attitude, Burke (Burke and Stephens (2018)) and Sung (Sung and Park (2018)) finds that renewable transition for the energy industry has been promoted by governments and markets, whereas traditional energy companies tend to hamper this progress. they also find that the general public do not have directly influence the transition, but indirectly affects it through the markets and governments. It may be suitable for the ratio of renewable energy output to proxy the strength of effect that the government/market has, and by extension, how the public affects decision making in the government.

Let's look at total energy consumed in relation to the female to male labour force ratio:

**Figure 6:** Comparing total energy consumption and female to male ratio.

We can see a similar trend between series in Figure 6. We could use total energy consumption as a way to proxy general changes in attitudes. Andrae (Andrae and Edler (2015)) discusses the general increase in electricity usage due to evolving communication technologies, including consumer devices. Here we note a significant increase in energy consumption over time, most likely attributable to an increased reliance on technology, including information technology. With access to wider information, it is reasonable to expect some sort of changing attitude.

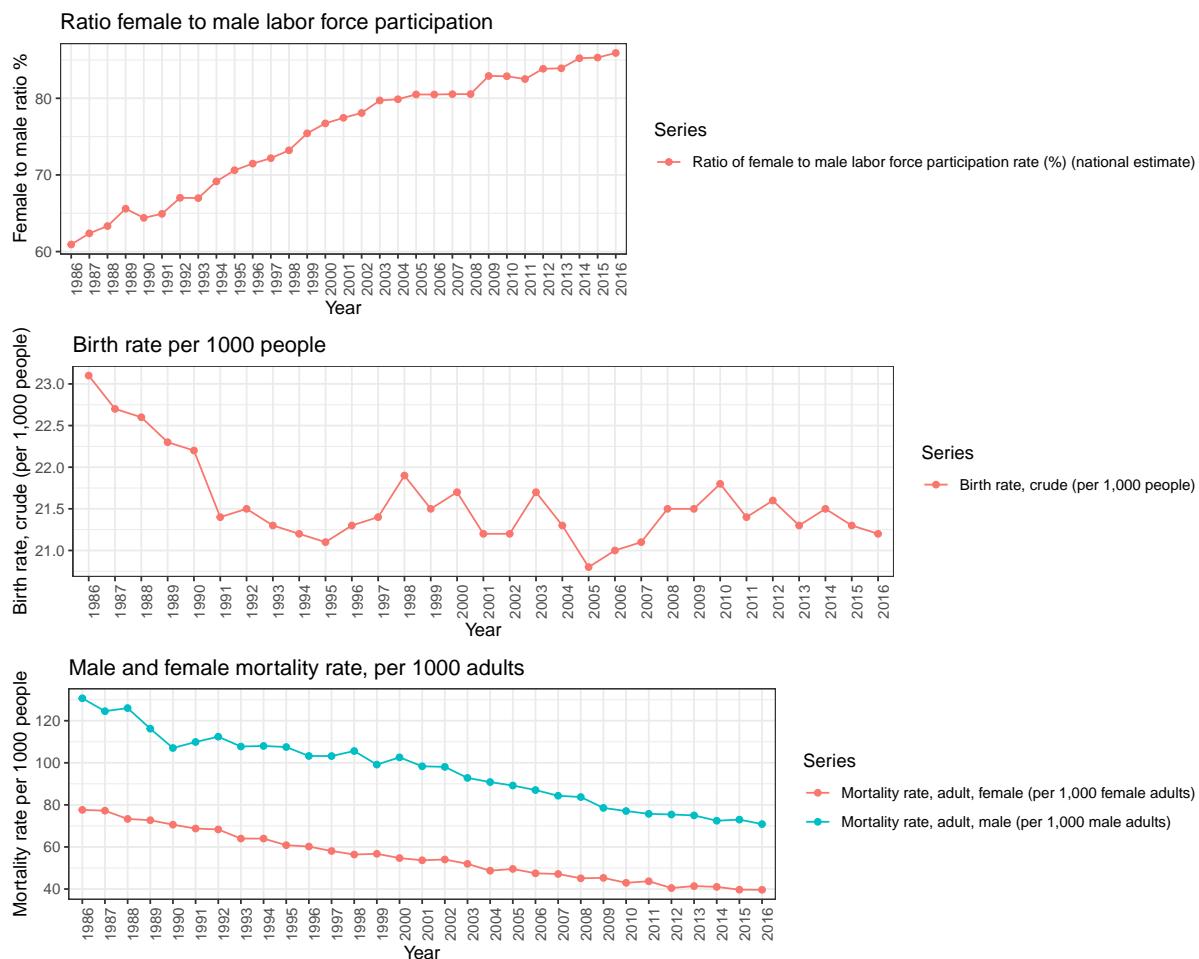
To conclude this section, we can use renewable electricity output ratio to directly model some government/market influence, and indirectly people. It may also be more reasonable to use total energy consumption to model changing attitudes.

## Male and Female Mortality Rates and Birth Rate

With Israel as our chosen country, this section will be analyzing the relationship between our response variable, *Ratio of female to male labor force participation rate (%) (national estimate)*, and the following economic indicators: *Birth rate, crude (per 1,000 people)*, *Mortality rate, adult, female (per 1,000 female adults)* and *Mortality rate, adult, male (per 1,000 male adults)* to assess their impact on the change of the female to male labor force ratio to ultimately address the change in how the gender stereotype is viewed in Israel. Across history, the traditional stereotype on gender roles has been one that depicts males roles as the provider and women as the caretaker and child bearer resulting in the notion that a woman's role is at home which has led to less occupational opportunities and aspirations Dicke, Safavian, and Eccles (2019). These stereotypes are further perpetuated through religion, as seen by the two most present religion in Israel - Judaism and Islam where the traditional identity for involves leadership for men and domesticity for females Woodhead (2012) in all facets of life from work, private, public and in the army Dr Shfran Gittlemen (2020). However, it does seem as though this traditional view is being confronted and dismantled over time with more religious and non religious Israeli woman taking up education and being accepted in a range of occupational opportunities and army duties Weiner Levy (2006), as such birth rate and male and female mortality rates are prime variables to potentially explain the change in the labor force ratio thus indicating the potential change in how gender stereotypes are viewed.

The variables for this section are isolated into their own data set in both long and wide form.

### 0.0.1 The variable change overtime



**Figure 7:** Each figure visualises the chosen variables

**Table 2:** The total percentage change from 1986 to 2016, per each variable

Series	1986	2016	percent
Mortality rate, adult, male (per 1,000 male adults)	130.69100	70.87300	
Mortality rate, adult, female (per 1,000 female adults)	77.62700	39.63800	
Ratio of female to male labor force participation rate (%) (national estimate)	60.93083	85.91686	
Birth rate, crude (per 1,000 people)	23.10000	21.20000	

Figure 7 visualizes the change over time for each of the chosen variables in this section, with the selected variable on the y axis and year along the x axis.

Key takeaways: - The labor force participation figure shows that the ratio of female to male labor force participation rate has increased from 1986 to 2016, by 41.01% as shown by Table @ref(tab:pct\_change\_mortality\_variables). - The birth rate figure shows the birth rate per 1000 people overall shows a reduction in the birth rate has increased from 1986 to 2016, by -8.23% as

shown by Table @ref(tab:pct\_change\_mortality\_variables). - The mortality rate table shows the mortality rate for females per 1000 female adults in orange and the mortality rate for males per 1000 males in blue. Both indicators have reduced from 1986 to 2016 at a relatively even rate, with female mortality reducing by -48.94% and male mortality reducing by -45.80%, as shown by Table @ref(tab:pct\_change\_mortality\_variables).

### 0.0.2 Correlation comparison

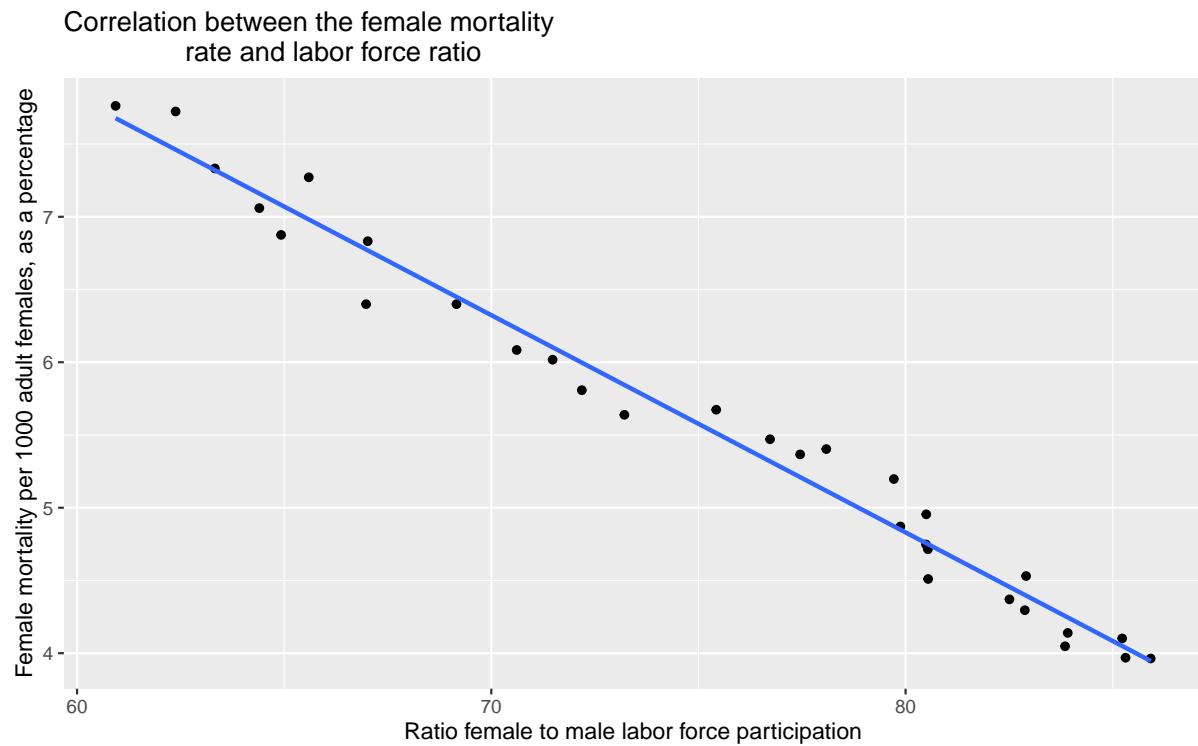
The explanatory variables are presented as ratios and in order for their results to be relative to the explanatory variable and to allow for analysis to take place, they are turned into percentages. The new column percent\_value shows the percentage of birth rate and female and male mortality rates for every 1000 people, from which a new data set will be created showing the percentage results for all the variables in this section.

\begin{table}[!h]

\caption{The correlation between the percentage results, per 1000 people, of the response variables and the ratio of female to male labor force participation rate (%)}

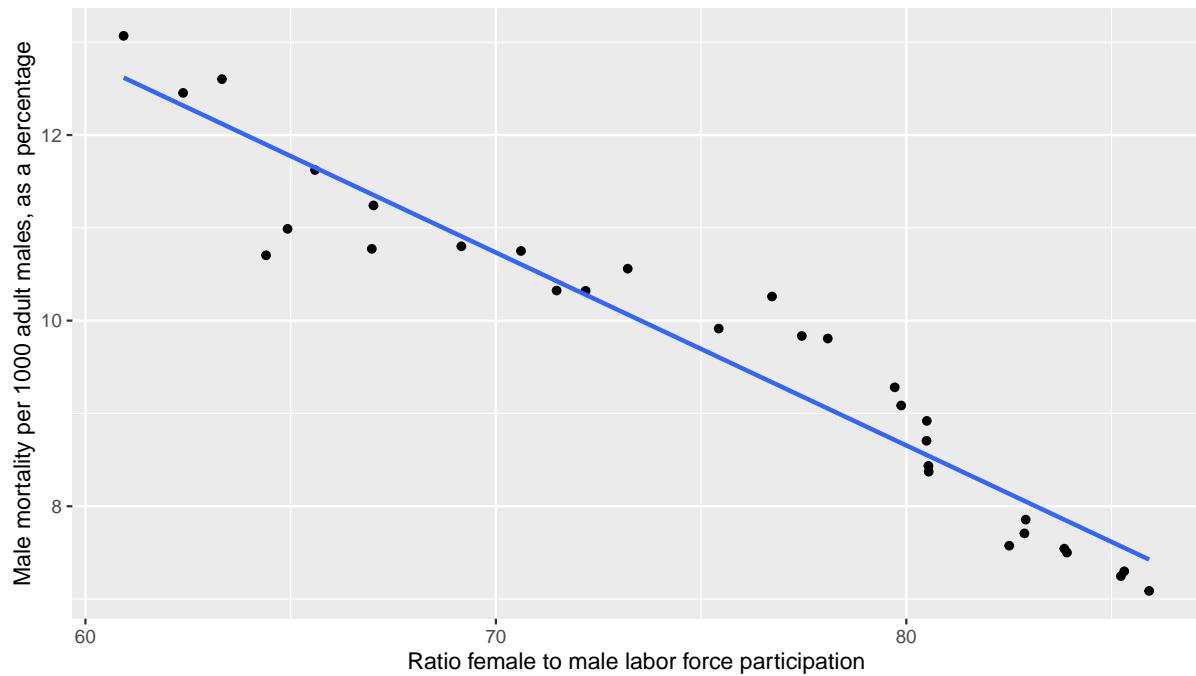
correlation_results_male_mort	correlation_results_female_mort	correlation_results_birth_rate
-0.9602867	-0.9889846	-0.6043269

\end{table}

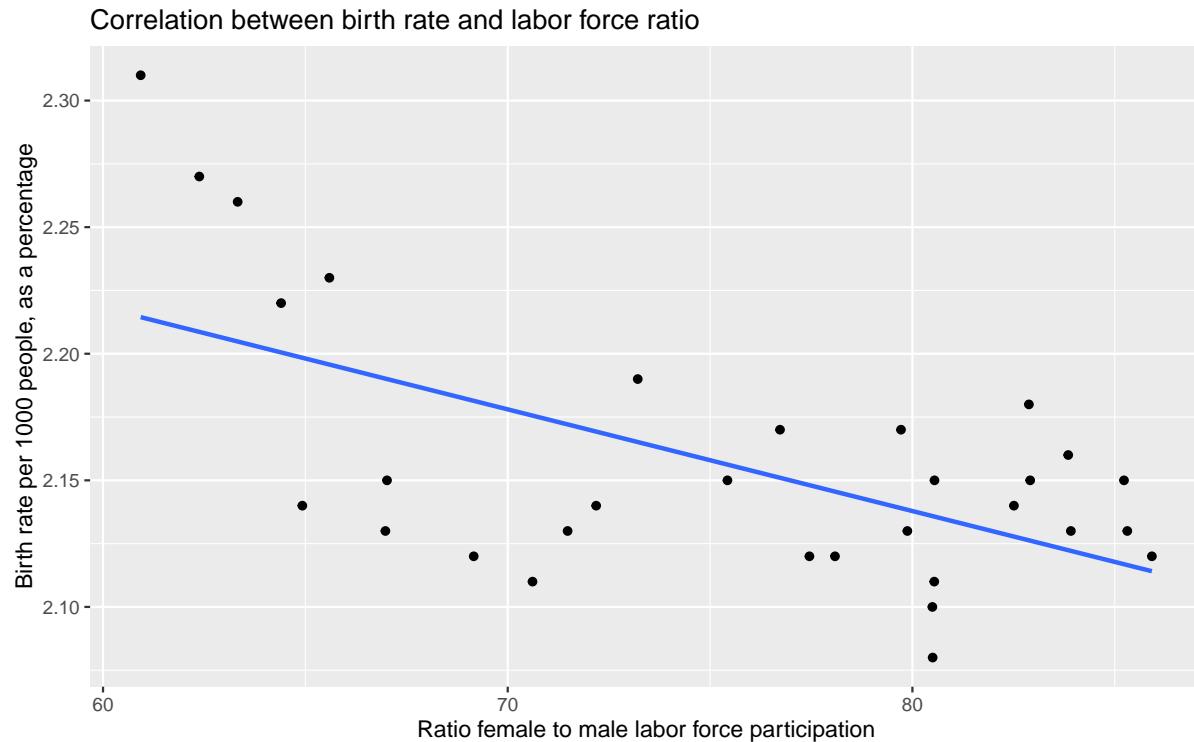


**Figure 8:** The figure displays the relationship between the percentage results of female mortality rates per 1000 adult females and the Ratio of female to male labor force participation rate (%) (national estimate)

Correlation between the male mortality rate and labor force ratio



**Figure 9:** The figure displays the relationship between the percentage results of male mortality rates per 1000 adult females and the Ratio of female to male labor force participation rate (%) (national estimate)



**Figure 10:** The figure displays the relationship between the percentage results of birth rates per 1000 adult females and the Ratio of female to male labor force participation rate (%) (national estimate)

Figure 10 visualizes the correlation between birth rate and the female to male labor force ratio, with birth rate, crude (per 1,000 people) on the y axis and the ratio of female to male labor force participation rate on the x axis. The figure shows a negative correlation between the two variables however, there are some scattered results where both birth rate and female to male labor force ratio are both relatively low which is depicted by the correlation coefficient of -0.60 as shown by Table 0.0.2.

Figure 9 visualizes the correlation between male mortality rate and the female to male labor force ratio, with male mortality rate per 1,000 male adults on the y axis and the ratio of female to male labor force participation rate on the x axis. The figure displays a strong negative correlation between the two variables which is backed up by the correlation coefficient of -.96 in Table 0.0.2.

Figure 8 visualizes the correlation between female mortality rate and the female to male labor force ratio, with female mortality rate per 1,000 female adults on the y axis and the ratio of female to male labor force participation rate on the x axis. The figure displays a strong negative correlation between the two variables which is backed up by the correlation coefficient of -.99 in Table 0.0.2.

As evident by the analysis conducted in this section, there is a clear positive correlation between the three explanatory variables and the the ratio of female to male labor force participation rate and as such can work as indicator for the change in view of gender stereotypes in Israel.

## **Labour Force Analysis**

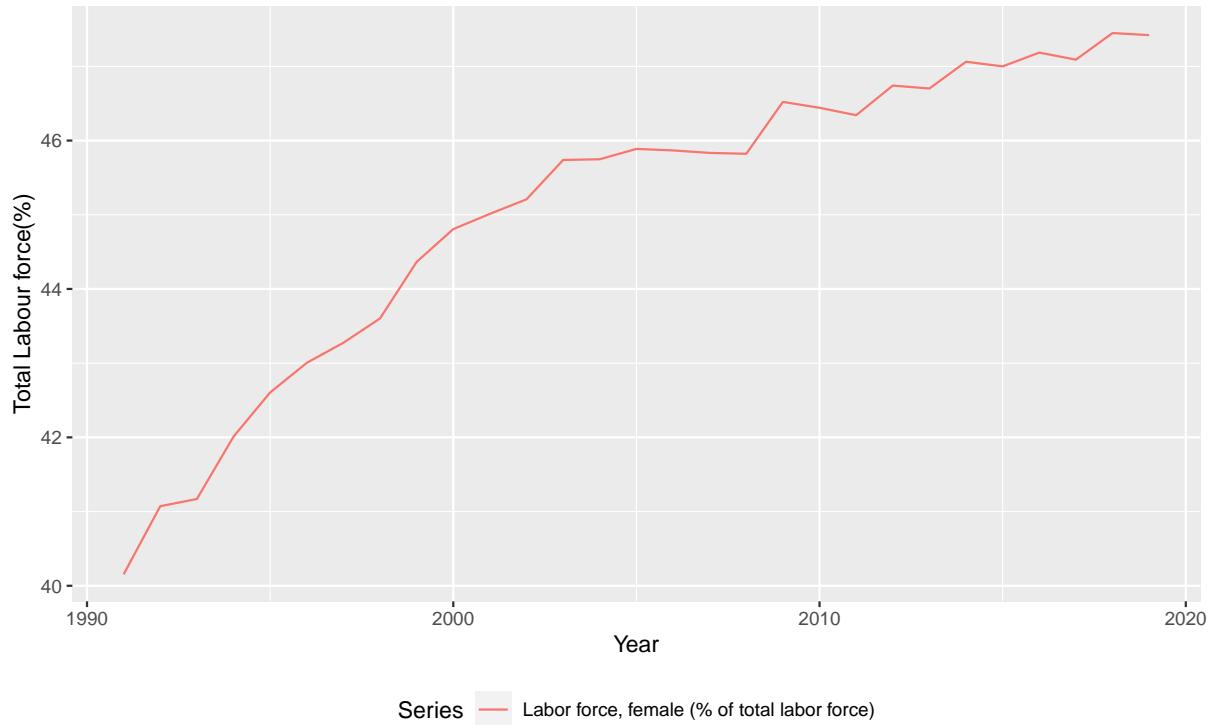
### **1 Overview**

This section of the report will focus on analysing various aspects of the Israeli labour force with respect to the research question that we have chosen which is “How have the views towards gender stereotypes changed over time in Israel?”. The Israeli labour force has come a long way from being male dominated to being almost equally divided between men and women. The transition of the Israeli labour force shall be explored through the years 1991-2019 in this section of the report.

**Table 3: Variables Summary**

Year	Labor force, female (% of total labor force)	Ratio of female to male labor force participation rate (%) (national estimate)	Self-employed, female (% of female employment) (modeled ILO estimate)	Wage and salaried workers, female (% of female employment) (modeled ILO estimate)	Labor force participation rate, male (% of male population ages 15-64) (modeled ILO estimate)	Labor force participation rate, female (% of female population ages 15-64) (modeled ILO estimate)
1991	40.15476	64.92514	5.907	94.093	78.995	53.404
1992	41.07230	67.01756	5.932	94.068	78.643	55.041
1993	41.16972	66.97746	5.900	94.100	80.463	56.408
1994	42.01045	69.15992	5.895	94.105	80.645	58.274
1995	42.60488	70.61269	5.909	94.091	80.267	59.313
1996	43.00450	71.47999	6.159	93.841	79.046	59.308

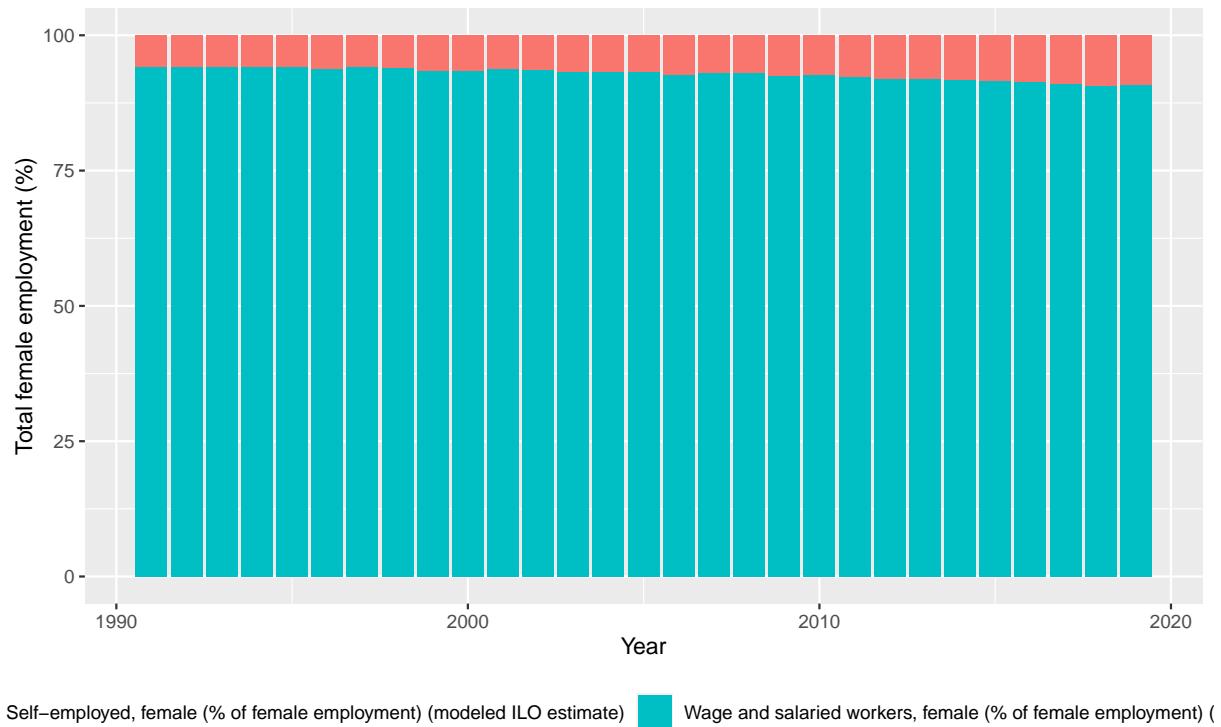
Table 3 exhibits the variables that have been used in this section of the report and displays the first 5 rows. The ratio of self-employed females is the explanatory variable and the ratio of female to male participation rate is the response variable. The table gives a brief overview of how the variables change from the period 1991-1996.



**Figure 11:** % Female labour force out of total labour force

Figure 11 depicts the gentle rise in the female labour force which was around 40% of the total labour force in 1990 to around 47% around 2020. One of the main reasons behind the surge in female participation is due to the educational attainment of women in Israel. Also, in 2006 and 2007 numerous amendments were made to women employment law to protect the rights of women at workplace and provide equal employment opportunities which has proved to be pivotal in increasing female participation in the labour force (Foreign Affairs 2013).

## 2 Self-employed v/s wage & salaried women

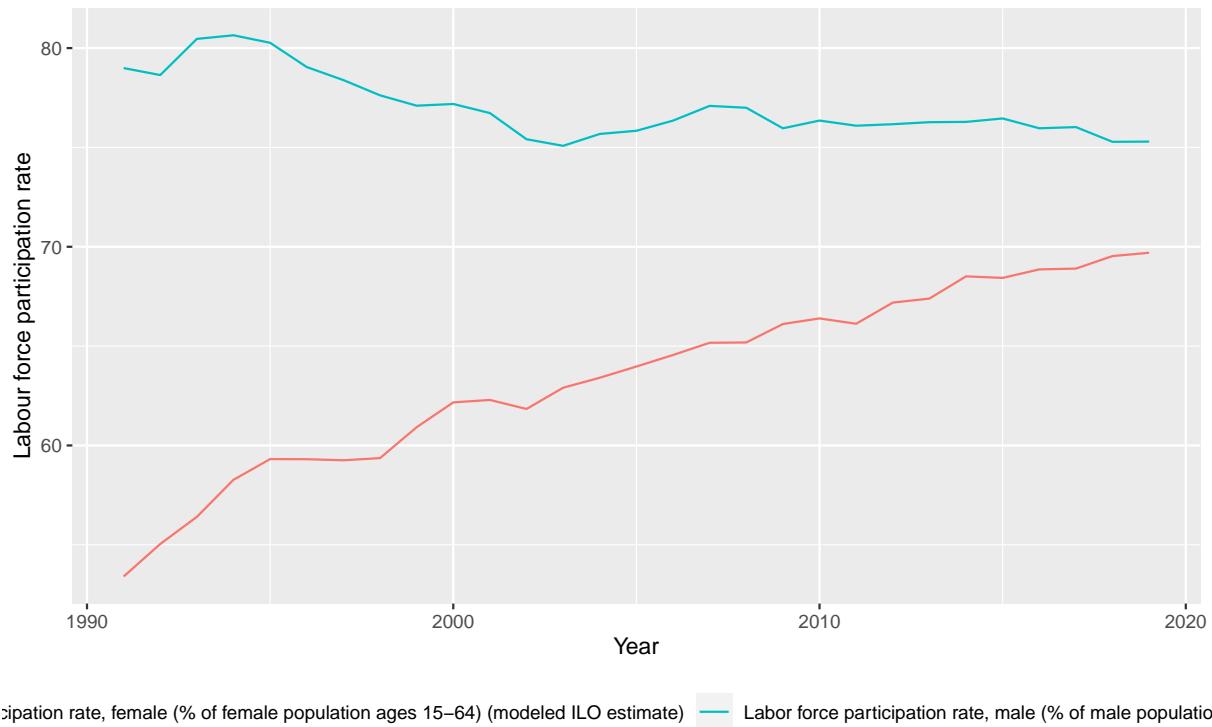


**Figure 12:** Self-employed v/s Wage & salaried female workers

Figure 12 shows the slow but gradual increase in the percentage of self-employed females in the female labour workforce. The female labour workforce comprises of self-employed women and wage and salaried women. The percentage of self-employed women in Israel has increased from 5.9 to 9.2 in 3 decades. The gradual change can be attributed to strong family orientation present in the Israeli culture and the fact that a working mother has to always give priorities to family responsibilities. But the main contributing factor to the increase was achievement motivations and economic necessities more than educational attainment or previous entrepreneurial experience. Lerner, Brush, and Hisrich

(1997)

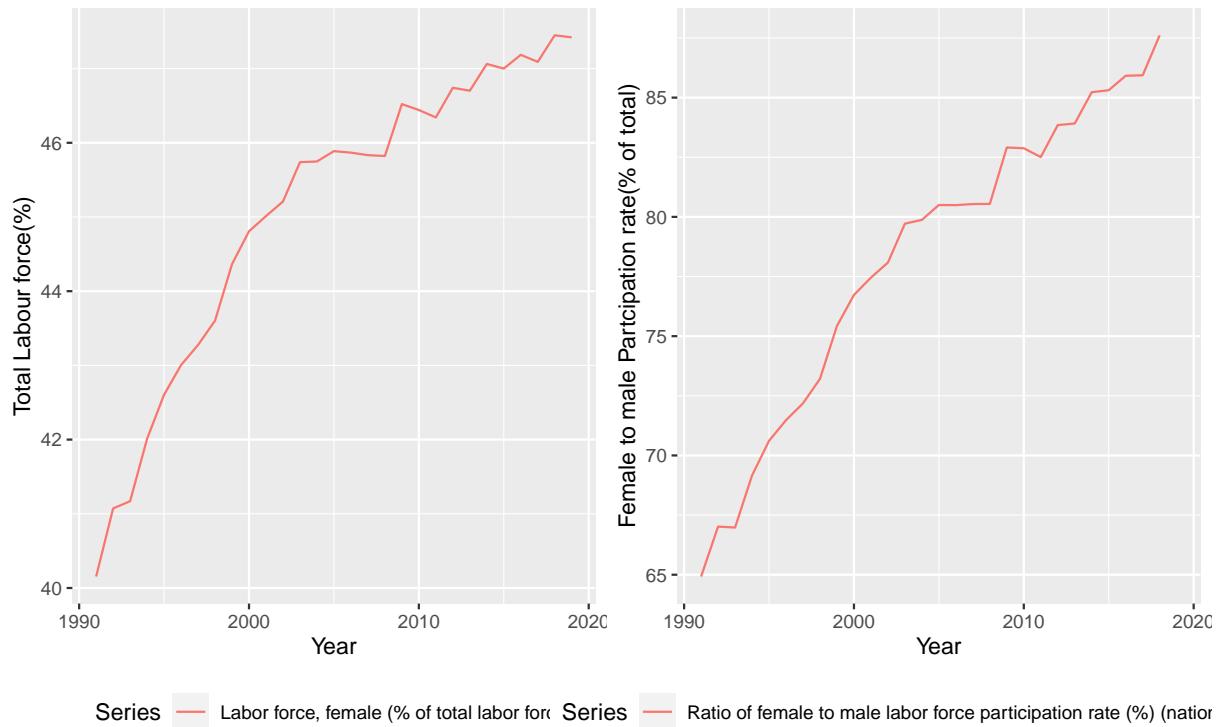
### 3 Female v/s Male labour force participation



**Figure 13:** Female v/s Male labour force participation

Figure 13 compares the female v/s male labour force participation amongst the total population in the age group of 15-64 females and males respectively. It depicts the percentage of the female population that is engaged in the labour force in the working age population. This is a very good representation of the increased number of participation of women in the labour force which has increased almost 20% in the past 30 years which authenticates that views towards gender stereotypes are changing over time in Israel. This shows that Israeli women are more willing and motivated to be involved in the labour force than they ever were.

#### 4 Female labour force v/s female-male participation rate



**Figure 14: Comparing female labour force with female-male participation rate**

Figure 14 verifies that the percentage of females in the total labour force is positively correlated with the female to male labour force participation rate as both show a positive trend over time and have increased significantly since 1991 to 2019.

#### Model

#### Conclusion

references

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