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Research on the Economic Effects of Childcare Costs on Women's Employment Decisions

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Abstract: The dynamics of female labor force participation is a critical factor in promoting economic sustainability. This study examines the impact of childcare costs on women's employment decisions, utilizing a comprehensive dataset encompassing 753 observations from the U.S. Women's Labor Force Participation Database. By employing a Multiple Linear Regression (MLR) model with interaction terms, this paper investigates various factors, including age, income, education level, number of children, and their influence on employment outcomes. The results indicate significant negative impacts of childcare costs on employment probabilities, particularly among mothers with young children, highlighting a critical barrier to labor market entry. The findings support the need for targeted policy interventions that reduce childcare costs and promote greater economic stability and gender equality in the labor force. By offering empirical evidence on the quantifiable impact of childcare expenses, this research contributes valuable suggestions to enhance women's labor market participation through supportive childcare initiatives and flexible work policies.

Keywords: Childcare costs, women's employment, labor force participation, multiple linear regression, interaction effects.

1. Introduction

The dynamics of female labor force participation is a critical factor in promoting economic sustainability and gender equality. As more women have gained access to higher education and various opportunities, they enter professional fields previously dominated by men. However, high childcare costs pose a massive obstacle to women's continued participation in the labor force. In the survey by Bakkensen et al., women physicians indicated that childcare pressures impacted their family planning and significantly altered their career paths [1]. This problem could continue to severely affect families with many children and increase the economic gap between low- and middle-income families. High childcare costs also have broader consequences on economic productivity and gender division in the workforce, as age is essential for career advancement and a golden period for childbearing. For women, the overlap of these two periods often forces them to make a choice and also leads to the issue of the motherhood penalty. Torres et al. suggested that mothers are less likely to hold leadership roles than men, including fathers and women without children [2]. More women are now delaying childbirth. According to De Silva and Tenreyro's study, global fertility rates fell from roughly 5 in 1960 to just below 2.5 by 2015, signaling a major change in trends [3]. In addition, raising children incurs financial stress and time costs, such as maternity leave and daily childcare

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activities, along with opportunity costs like decreased work skills and competitiveness, leading to potential job transfers, salary cuts, and limited career opportunities upon returning to work. As stated in the research, 24% of women, on average, leave the labor force in the first year, with 17% still absent five years later [4]. On the other hand, data from the 2018 American Time Use Survey analyzed by the Institute for Women's Policy Research showed that women, on average, spend 37 percent more time on unpaid household and care work per day than men, amounting to 5.7 hours compared to 3.6 hours for men [5]. Accordingly, women contribute much more to the household than men, which usually divides the family labor supply.

The objective is to assess how childcare costs impact women's employment decisions, demonstrating the potential effectiveness of increased childcare subsidies and related beneficial policies in enhancing woman labor participation. Many researchers utilize diverse economic models to support their data analysis and establish relationships. Blau and Robins applied an event-history analysis over a 22- month period of a family's life based on the hazard rate model that focuses on correlation between child-care costs on labor supply and fertility decision, indicating higher childcare costs lead to increased rates of leaving employment and decrease the likelihood of entering employment [6]. Han and Waldfogel included demographic and employment data from the March Current Population Survey to analyze how childcare costs affect employment among mothers with preschool-aged children. They found that higher childcare costs significantly reduce employment, with greater impacts on single mothers [7]. Herbst used an OLS model to analyze the effects of childcare costs on women's employment, indicating that higher childcare costs significantly reduce employment probabilities among mothers with young children, highlighting these costs as a major barrier to workforce entry [8]. From a different angle, Haan and Wrohlich investigated relevant child care policy and examine its impact on employment and fertility by using a first order Markov model, showing that child care subsidies aimed at working mothers lead to significant increases in employment but do not have a positive or significant impact on fertility rates [9]. Connelly combined the predictions of the utility-maximizing framework and used evidence from the structural probit model to support her statements, concluding that reduced labor force participation among mothers of preschoolers is directly related to higher childcare costs. Additionally, the study addresses the endogeneity of the number of young children in the participation equation, demonstrating that this factor further impacts mothers' employment decisions [10].

In summary, this paper will focus on the dataset from the Kaggle U.S. Women's Labor Force Participation Database to employ multiple linear regression model to analyze how various factors such as age, income, education, and numbers of child influence women's labor market decisions. By providing empirical insights, this study aims to improve policy setting and the labor market environment that support gender equality and economic inclusion.

2. Methods

2.1. Data Source

The U.S. Women's Labor Force Participation Dataset provides an in-depth information at women's involvement in the labor market across the United States. This dataset includes information on wage, age, work hours, and the number of children, encompassing a total of 753 observations.

2.2. Variable Selection

As can be seen from the graph of the female labor force participation rate in the United States from 1990 to 2023, it is evident that the participation rate experienced significant fluctuations over the period. Initially, the rate rose steadily and peaked around the year 2000. This growth reflects broader

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socio-economic changes, including increased educational attainments and shifts in societal norms regarding women's roles in the workforce, as showed in Figure 1:

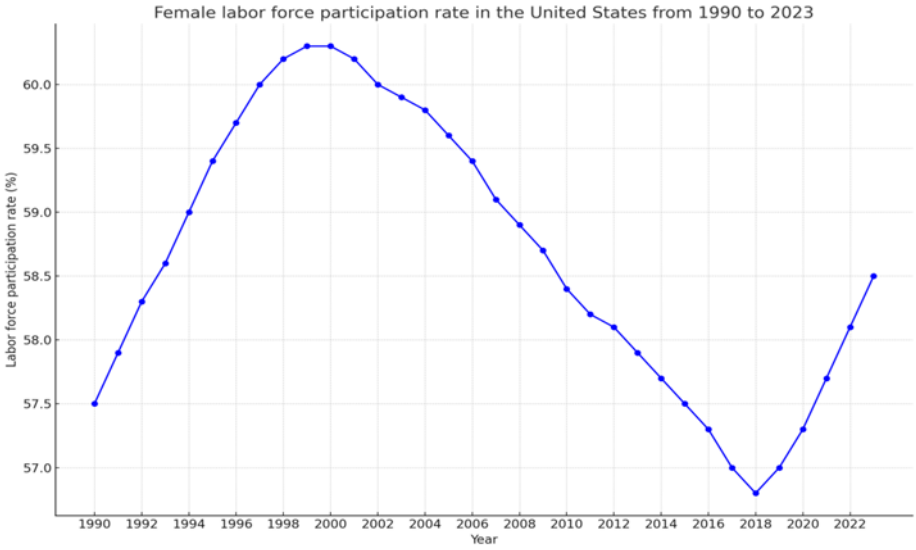

Figure 1: Female Labor Force Participation Rate

However, there was a notable decline following this peak, accelerating around 2010 and continuing until around 2020. This decline could be attributed to various factors, such as economic recessions, changes in industry employment opportunities, or alterations in family dynamics and childcare availability.

After careful consideration and data cleaning, the key variables are below. The description of these variables is as follows (Table 1):

Table 1: List of Variables

Variable Type	Name	Meaning
Dependent Variable	Hours Worked	Total hours worked per week
Independent Variable	Kids Under 5	Number of children aged 5 and under
	Kids 6 to18	Number of children aged between 6 and 18
	Age	Age of the respondent
	Education	Highest level of education attained
	Wage	Hourly wage
	Family Income	Total annual family income

2.3. Model Introduction

This study will employ a Multiple Linear Regression (MLR) model to analyze how childcare costs affect women's employment decisions. The MLR model is chosen for its ability to interpret the impact of multiple predictors on a continuous outcome variable. To ensure the consistency and accuracy of the outcomes, the study may conduct multicollinearity tests to detect any correlation issues among independent variables and normality tests to verify that the residuals are normally distributed. If any deviations from these assumptions are detected, corrective measures will be applied to maintain the reliability of the model's outputs.

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3. Results and Discussion

3.1. Multiple Linear Regression Analysis

The regression analysis focuses on understanding how various factors impact the total hours worked by women per week. The correlation matrix below provides foundational insights into these relationships, helping to frame the regression analysis.

Table 2: Correlation Matrix Between Dependent and Independent Variables

	hours	kids5	kids618	age	educ	wage	faminc
hours	1.0	-0.2221	-0.0906	-0.0331	0.106	0.4229	0.1463
kids5	-0.2221	1.0	0.0842	-0.4339	0.1087	-0.1229	-0.0278
kids618	-0.0906	0.0842	1.0	-0.3854	-0.0589	-0.0473	-0.0195
age	-0.0331	-0.4339	-0.3854	1.0	-0.1202	-0.0346	0.0524
educ	0.106	0.1087	-0.0589	-0.1202	1.0	0.3184	0.3613
wage	0.4229	-0.1229	-0.0473	-0.0346	0.3184	1.0	0.2312
faminc	0.1463	-0.0278	-0.0195	0.0524	0.3613	0.2312	1.0

From Table 2, it shows how personal and economic factors influence women's work hours. A strong negative correlation of -0.2221 with children under 5 indicates that young childcare significantly reduces labor participation, while children aged 6 to 18 have a lesser but still negative effect (-0.0906). Age also shows a slight negative impact (-0.0331), suggesting older women work fewer hours due to life-cycle responsibilities. Conversely, education (0.106) and wage (0.4229) positively correlate with work hours, emphasizing that higher education and wages incentivize greater labor participation. Family income (0.1463) also supports increased work hours, likely through improved economic stability and access to childcare resources.

Table 3: Regression Output Table

Variable	B	S.E.	Beta	T	Significance
kids5	-392.328	60.514	-0.236	-6.48	0.000
kids618	-81.260	23.208	-0.123	-3.50	0.000
age	-19.344	4.230	-0.179	-4.57	0.000
educ	-17.220	13.876	-0.045	-1.24	0.215
wage	101.82	9.321	0.379	10.92	0.000
faminc	0.0054	0.002	0.076	2.16	0.031
constant	1611.972	267.265	-	6.03	0.000

Table 3 presents the regression coefficients from the multiple linear regression model. The p-values for key variables, such as kids5, kids618, age, and wage, are all highly significant, indicating a strong influence on the hours worked. Although the variables education and family income do not reach the conventional significance levels, their inclusion still adds relevant insights to the model. The regression equation based on this model can be written as:

$$E(Y) = 1611.97 - 392.328 \times kids + \cdots + 0.0054 \times faminc \quad (1)$$

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The model produces a multivariate correlation coefficient R of 0.236, with an R-squared of 0.236 and an adjusted R-squared of 0.2298. Although the R-squared suggests moderate explanatory power, the model effectively identifies key factors shaping women's work hours, providing valuable outcomes into labor force participation dynamics.

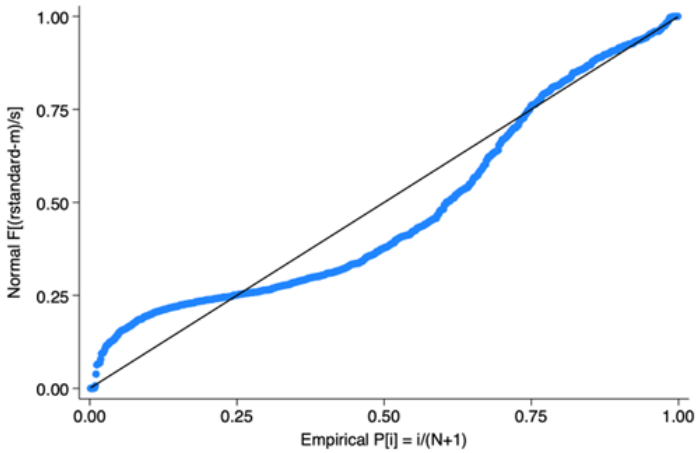

Figure 2: Normalized P-P Plots of Regression Standardized Residuals

Additionally, the P-P plot indicates some deviation from normality in the residuals, showing some non-normality in the middle range of the data (Figure 2). This suggests that the model fits well for most of the data but may not fully capture certain relationships.

3.2. MLR Analysis with Interaction Effects

Interaction terms account for the possibility that the effect of one variable on hours worked might depend on the level of another variable. For example, the interaction between wages and the presence of young children can be more impactful than analyzing each factor separately.

The model suggests that including interaction terms alters the significance of the original independent variables as the combined effects of two or more factors become more prominent. For example, the interaction between education and family income may reveal that women with higher education levels and greater economic stability tend to work more hours than those with lower education, even when family income remains constant. It highlights how interactions between variables can better explain the complexity of labor participation. The table 4 below highlights the results of the multiple linear regression model with interaction terms。

Table 4: Multiple Linear Regression (MLR) Output with Interaction Terms

Variable	B	S.E.	Beta	T	Significance
kids5	-393.016	59.671	-0.236	-6.59	0.000
kids618	-88.229	22.930	-0.134	-3.85	0.000
age	-19.455	4.171	-0.180	-4.66	0.000
educ	30.534	23.940	0.080	1.28	0.203
wage	325.624	50.485	1.211	6.45	0.000
faminc	-0.009	0.0119	0.121	-0.73	0.465
educ_faminc	-0.0002	0.0009	-0.539	-0.28	0.779
educ_wage	-16.634	3.699	-0.887	-4.50	0.000
constant	1029.641	362.218	-	2.84	0.005

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The results show that having young children and older children significantly reduces hours worked, while age also has a negative impact. Higher wages significantly increase hours worked, whereas the effects of education and family income are less direct. However, interaction terms between education, family income, and wages are not statistically significant.

4. Conclusion

This study uses multiple linear regression models with interaction terms to highlight the significant deterrent effect of high childcare costs on women's labor force participation. The analysis demonstrates how economic and demographic factors create complex barriers for women, particularly those with young children, in the employment landscape. These findings emphasize the need for practical approaches to enhance female labor force participation and promote economic stability and gender equality. To overcome these challenges, policy interventions such as subsidizing childcare, encouraging employer-supported childcare initiatives, and promoting flexible work arrangements are essential. Additionally, public awareness campaigns could highlight such policies' social and economic benefits, generating broader support from both the public and private sectors.

However, the cross-sectional data utilized limits its ability to infer causality and may not represent demographic variations across different regions, potentially affecting the generalizability of the findings. Besides, measurement errors in key variables could introduce biases in the results. Future research should address these limitations by using longitudinal data to explore causal relationships, expanding the demographic scope to enhance generalizability, and refining measurement techniques to ensure accuracy.

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