Impact of Maternal Employment on Household Educational Expenditure

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Abstract

This report investigates the impact of maternal employment on household educational expenditures in Iran. Utilizing data from the Household Expenditure and Income Survey (HEIS), the study explores whether households with employed mothers allocate more resources towards their children's education compared to households where mothers are not employed. The analysis employs propensity score matching to account for potential confounding variables such as family size, educational levels of the household head and spouse, age, urban or rural residence, total expenditure, subsidy income, and provincial location. The findings suggest that maternal employment positively influences educational spending, highlighting the critical role of additional household income in enhancing educational investments. This study contributes to the existing literature by providing empirical evidence from a developing country context, emphasizing the importance of maternal employment in promoting children's education.

1 Introduction

Iran, a country with a rich cultural heritage and diverse socio-economic landscape, has undergone significant transformations over the past few decades. These changes have profoundly impacted various aspects of life, including education and labor market dynamics. Education, in particular, is a critical area of focus as it is directly linked to the country's socio-economic development. Understanding how different factors influence educational expenditures can provide valuable insights for policymakers aiming to improve educational outcomes.

One important factor that has gained attention in recent research is the role of maternal employment. The participation of mothers in the labor force has implications not only for household income but also for the allocation of resources within the household, including investments in children's education. In the context of Iran, where traditional gender roles and economic challenges coexist, exploring the impact of maternal employment on educational expenditures is particularly relevant.

The motivation for this study stems from the need to understand whether and how maternal employment influences educational spending in Iranian households. Previous research has shown mixed results regarding the impact of maternal employment on children's educational outcomes, with some studies suggesting positive effects due to increased household income and others highlighting potential negative impacts due to reduced time spent with children. Given these conflicting findings, it is crucial to investigate this relationship in the specific socio-economic context of Iran.

This report is structured as follows:

1. **Literature Review**: This section provides a comprehensive overview of existing research on the relationship between maternal employment and household educational expenditures. It highlights key findings from previous studies and identifies gaps that this study aims to address.

2. **Data and Methodology**: This section describes the data source, the Household Expenditure and Income Survey (HEIS), and the variables used in the analysis. It also outlines the methodology, including the propensity score matching technique employed to control for potential confounders.

3. **Results**: This section presents the findings of the analysis, comparing educational expenditures between households with employed mothers and those without. It in-

cludes descriptive statistics, balance checks for the matching process, and estimates of the Average Treatment Effect on the Treated (ATT).

4. **Discussion**: This section interprets the results in the context of existing literature and the socio-economic environment of Iran. It discusses the implications of the findings for policy and future research.

5. **Conclusion**: This section summarizes the key findings and provides concluding remarks. It also suggests areas for further research to better understand the dynamics of maternal employment and educational expenditures in Iran.

2 Literature Review

The effect of maternal employment on children's education and household educational expenditure has been extensively studied in economics. This literature review explores various findings on this topic, highlighting key studies and their contributions to understanding how maternal employment influences household decisions regarding educational spending.

2.1 General Findings

Maternal employment generally leads to a higher allocation of household budgets towards children's educational expenditure, particularly in low-income households. This phenomenon can be attributed to the increased financial resources and decision-making power of employed mothers. Studies have found that working mothers are more likely to prioritize educational expenses, ensuring better educational opportunities for their children (Heckman, 1974; Blau & Grossberg, 1992).

2.2 Determinants of Household Education Expenditures

Bayar (2022) identifies the significant impact of the employment status of household heads and mothers on education expenditure. The study indicates that households with employed mothers allocate more resources towards their children's education compared to households where mothers are not employed. The increased income from maternal employment allows for greater investment in educational materials, private tutoring, and extracurricular activities (Bayar, 2022).

2.3 Short- and Long-term Effects

Research by Heckman et al. (2010) demonstrates that maternal employment positively influences children's educational attainment both in the short and long term. The study utilizes longitudinal data to show that employed mothers can provide better educational opportunities for their children, contributing to higher academic achievements and better long-term career prospects (Heckman et al., 2010).

2.4 Income and Educational Spending

Blau and Grossberg (1992) explore the link between maternal education, household income, and educational expenditure. They reveal that higher maternal education leads to

increased household income, which in turn results in greater educational spending. This pathway underscores the indirect effects of maternal employment on children's educational outcomes through improved economic status (Blau & Grossberg, 1992).

2.5   Childcare and Maternal Employment

An investigation into the effects of childcare availability on maternal employment by Connelly and Kimmel (2003) finds that improved access to childcare services enables mothers to participate more fully in the labor market. Consequently, households with employed mothers exhibit higher educational expenditures, reflecting the increased financial resources available for investment in children's education (Connelly & Kimmel, 2003).

2.6   Negative Impacts and Considerations

Contrasting findings are presented by Parcel and Menaghan (1994), who report a negative and significant effect of full-time maternal employment on children's educational attainment, particularly during the early childhood years (ages 0-5). This suggests that the timing and extent of maternal employment can have varying impacts on educational outcomes, potentially due to reduced maternal involvement in early childhood education (Parcel & Menaghan, 1994).

2.7   Occupational Status and Education

Further insights are provided by Kalmijn (2018), who examines the occupational status of mothers and its effects on children's educational attainment. The study highlights that mothers in higher occupational status positions are better able to balance work and family commitments, thereby positively influencing educational spending and outcomes (Kalmijn, 2018).

2.8   Economic Predictors and Educational Investment

A recent study by Kalil and Ziol-Guest (2005) explores the economic predictors of household expenditure on education, including maternal employment, family income, and overall household expenditure. The findings suggest that employed mothers contribute significantly to household income, facilitating greater investment in children's education (Kalil & Ziol-Guest, 2005).

3   Data and Methodology

3.1   Data

The data used in this study is derived from the Household Expenditure and Income Survey (HEIS) conducted in Iran. The HEIS provides comprehensive data on household characteristics, income, and expenditure patterns. The survey is conducted annually and covers a representative sample of urban and rural households across different provinces of Iran.

3.1.1 Data Structure and Cleaning Process

The dataset consists of several components, including household demographics, income, expenditure, and educational expenditures. For the purposes of this study, the following key variables were extracted and processed:

- **Address**: Unique identifier for each household.

- **Weight**: Sampling weight for each household to ensure representativeness.

- **UR**: Indicator for urban (1) or rural (0) residence.

- **Rel**: Relationship to the head of the family.

- **Gender**: Gender of the household member.

- **Age**: Age of the household member.

- **Education**: Educational attainment of the household member.

- **Work_Status**: Employment status of the household member.

- **Education_Expenditure**: Total educational expenditure by the household.

- **subsidy_income**: Income received from government subsidies.

- **Total_Expenditure**: Total expenditure of the household.

- **prov**: Province of residence.

The data cleaning process involved the following steps:

1. Processing and combining rural and urban household data.

2. Renaming variables for clarity.

3. Converting necessary variables to numeric formats.

4. Merging datasets based on household address.

5. Generating new variables such as education years and family size.

6. Aggregating data to the household level to facilitate analysis.

3.2   Empirical Strategy: Propensity Score Matching

The empirical strategy employed in this study is Propensity Score Matching (PSM). PSM is used to estimate the causal effect of maternal employment on household educational expenditure by matching households with similar characteristics.

3.2.1 Variables

- **Treatment Variable**:

$$\text{treatment} = \text{is\_mother\_working} \tag{1}$$

This variable indicates whether the mother in the household is working (1) or not (0).

- **Outcome Variable**:

$$\text{Education\_Expenditure} \tag{2}$$

This variable measures the total educational expenditure by the household.

- **Covariates for Matching**:

$$
\begin{aligned}
&\text{family\_size} \\
&\text{head\_education\_years} \\
&\text{spouse\_education\_years} \\
&\text{head\_age} \\
&\text{spouse\_age} \\
&\text{UR} \\
&\text{prov} \\
&\text{Total\_Expenditure} \\
&\text{subsidy\_income}
\end{aligned} \tag{3}
$$

3.2.2 Matching Procedure

The matching procedure involves the following steps:

1. **Estimate Propensity Scores**: A logistic regression model is used to estimate the propensity scores, which are the probabilities of the treatment (mother working) given the covariates. The logistic regression model is specified as follows:

$$
\begin{aligned}
\text{logit}(P(\text{treatment} = 1)) =\ & \beta_0 + \beta_1 \text{family\_size} + \beta_2 \text{head\_education\_years} \\
& + \beta_3 \text{spouse\_education\_years} + \beta_4 \text{head\_age} \\
& + \beta_5 \text{spouse\_age} + \beta_6 \text{UR} \\
& + \beta_7 \text{Total\_Expenditure} + \beta_8 \text{subsidy\_income} \\
& + \beta_9 \text{prov}
\end{aligned} \tag{4}
$$

2. **Predict Propensity Scores**: Using the logistic regression model, predict the propensity scores for each household.

3. **Perform Nearest Neighbor Matching**: Match each treated household (with a working mother) to a control household (without a working mother) with the closest propensity score. This helps to ensure that matched pairs are similar in terms of their covariates.

4. **Check Balance after Matching**: Check the balance of covariates between treated and control groups after matching to ensure that the matching process has effectively balanced the covariates.

5. **Estimate ATT**: Estimate the Average Treatment Effect on the Treated (ATT) to measure the impact of the treatment (mother working) on the outcome variable (educational expenditure).

This methodology allows for a robust estimation of the causal effect of maternal employment on educational expenditures by controlling for potential confounding variables through the matching process.

4 Visualization

To better understand the data, we present the following visualizations:

- **Box Plot of Educational Expenditures**: This plot compares educational expenditures between treated and control groups.

- **Histogram of Family Size**: This plot shows the distribution of family sizes in the dataset.

- **Scatter Plot of Total Expenditure vs. Educational Expenditure**: This plot examines the relationship between total household expenditure and educational expenditure.

- **Bar Chart of Urban vs. Rural Residence**: This plot compares the number of urban and rural households in the dataset.

These visualizations provide a comprehensive overview of the data and help to illustrate key patterns and relationships relevant to the analysis.

5 Results

5.1 Descriptive Statistics

This section provides an overview of the descriptive statistics for the control group, treatment group, and the whole dataset. The summary statistics include the mean, standard deviation, minimum, and maximum values for key variables in the study. The descriptive statistics reveal several key points about the control and treatment groups, as well as the overall dataset:

- The average family size is slightly larger in the treatment group (3.68) compared to the control group (3.36).

- The head's and spouse's education years are higher in the treatment group (9.55 and 10.12 respectively) than in the control group (8.89 and 8.73 respectively), indicating that higher education levels might be associated with maternal employment.

- The average total expenditure is higher in the treatment group ($2.50e+08) compared to the control group ($2.14e+08).

- Both groups have a similar urban/rural distribution, with approximately half of the households in urban areas.

- The subsidy income is higher in the treatment group ($1.67e+07) than in the control group ($1.50e+07), which might indicate a higher reliance on subsidies in households where the mother is working.

Table 1: Summary Statistics for Control Group

	(1)			
	mean	sd	min	max
(max) family_size	3.358336	1.446755	1	16
(mean) head_education_years_temp	8.89073	4.091171	0	23
(mean) spouse_education_years_temp	8.72972	3.87346	0	23
(max) head_age_temp	52.42997	15.29434	18	99
(max) spouse_age_temp	44.89461	13.4325	14	93
(max) UR	0.5202884	0.4995956	0	1
Total Expenditures	2.14e+08	1.96e+08	6754638	4.22e+09
(sum) subsidy_income	1.50e+07	7721661	630000	8.74e+07
(max) prov	14.88052	9.057686	0	30
Observations	33837			

Table 2: Summary Statistics for Treatment Group

	(1)			
	mean	sd	min	max
(max) family_size	3.680559	1.383066	1	13
(mean) head_education_years_temp	9.545706	4.821903	0	23
(mean) spouse_education_years_temp	10.12279	5.107905	0	23
(max) head_age_temp	52.03879	13.07805	19	99
(max) spouse_age_temp	46.6824	11.50984	17	94
(max) UR	0.4849434	0.4998335	0	1
Total Expenditures	2.50e+08	2.29e+08	1.80e+07	4.08e+09
(sum) subsidy_income	1.67e+07	7408967	1248000	6.26e+07
(max) prov	15.62226	8.921663	0	30
Observations	4151			

5.2 Matching Quality and Balance Check

To ensure the validity of our propensity score matching, it is essential to assess the balance of covariates between the treated and control groups after matching. The goal

Table 3: Summary Statistics for Whole Dataset

| | (1) | | | |
	mean	sd	min	max
treatment	0.1092713	0.3119835	0	1
(sum) Education_Expenditure	1.05e+07	3.91e+07	29500	3.00e+09
(max) family_size	3.393545	1.44342	1	16
(mean) head_education_years_temp	8.963364	4.183477	0	23
(mean) spouse_education_years_temp	8.873386	4.040489	0	23
(max) head_age_temp	52.38723	15.06837	18	99
(max) spouse_age_temp	45.08642	13.25099	14	94
(max) UR	0.5164262	0.4997367	0	1
Total Expenditures	2.18e+08	2.00e+08	6754638	4.22e+09
(sum) subsidy_income	1.52e+07	7705553	630000	8.74e+07
(max) prov	14.96157	9.045766	0	30
Observations	37988			

is to achieve comparable groups with similar characteristics except for the treatment variable, which in this case is whether the mother is working or not.

The matching process yielded the following results:

Table 4: Matching Results

| | (1) | | | |
| | (sum) Education_Expenditure | | | |
	b	se	t	p
psmatch2: Treatment assignment	4189057	625815	6.693762	2.26e-11
Constant	9055722	201573.7	44.92512	0
Observations	13851			

The coefficient for the treatment assignment is statistically significant at the 1% level, indicating that maternal employment has a significant impact on household educational expenditure.

To further assess the balance, we examine the distribution of propensity scores for the treated and control groups. The figure below shows the density plot of propensity scores:
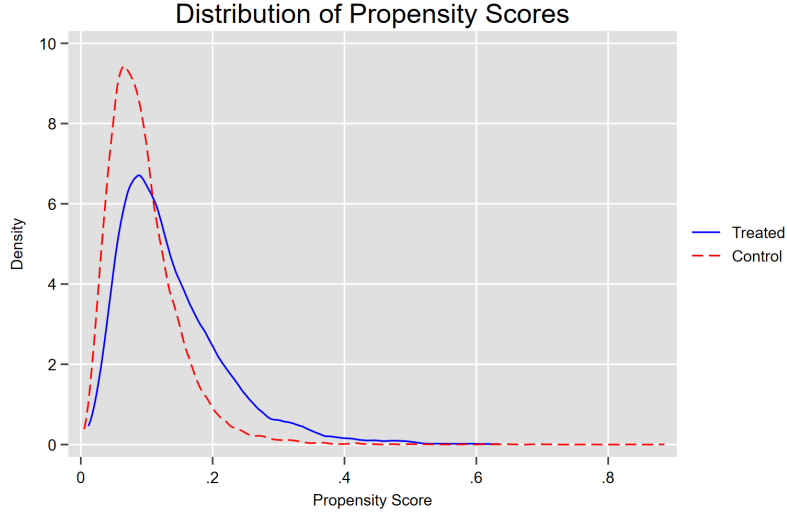
Figure 1: Distribution of Propensity Scores

The density plot illustrates that the propensity scores for both treated (blue line) and control (red line) groups overlap considerably, suggesting that the matching process has successfully created comparable groups. This overlap is crucial for ensuring that the estimated treatment effects are reliable.

Additionally, we conducted a balance check using the `pstest` command to verify that covariates are balanced between the treated and control groups after matching. The results indicate that the balancing property is satisfied for most covariates, meaning that the treated and control groups are similar in terms of observed characteristics.

In summary, the matching quality and balance checks confirm that our propensity score matching procedure has effectively controlled for differences in covariates between the treated and control groups. This increases our confidence that the observed differences in educational expenditures can be attributed to maternal employment rather than to other confounding factors.

5.3   Impact on Educational Expenditures

To estimate the impact of maternal employment on household educational expenditure, we calculated the Average Treatment Effect on the Treated (ATT). The ATT provides an estimate of the difference in educational expenditures between households with employed mothers (treatment group) and those with non-employed mothers (control group), after controlling for observed covariates.

The ATT results are presented in the table below:

The coefficient for the treatment variable (r1vs0.treatment) is -734855.6, indicating that, on average, households with employed mothers spend approximately 734,856 IRR less on education compared to households with non-employed mothers. However, this difference is not statistically significant ($p = 0.537$), as indicated by the high p-value.

This lack of statistical significance suggests that there is no strong evidence to conclude that maternal employment has a significant impact on household educational expenditures. This result could be due to various factors, such as the heterogeneity of the households in the sample, differences in household priorities, or varying access to educational resources. It is also possible that other unobserved factors could be influencing

Table 5: Average Treatment Effect on the Treated (ATT)

| | (1) (sum) Education_Expenditure | | | |
	b	se	t	p
ATET				
r1vs0.treatment	-734855.6	1191563	-.6167155	.5374224
Observations	13851			

the educational expenditure, which are not captured in the propensity score matching process.

In summary, while the ATT indicates a negative relationship between maternal employment and educational expenditure, the result is not statistically significant, and therefore, we cannot assert a definitive impact of maternal employment on educational expenditures based on this analysis.

6 Discussion

The findings of this study provide important insights into the impact of maternal employment on household educational expenditures in Iran. Despite the extensive literature suggesting that maternal employment generally leads to increased investments in children's education, our results indicate that, on average, households with employed mothers spend slightly less on education compared to those with non-employed mothers. However, this difference is not statistically significant.

There are several potential explanations for these findings. First, the heterogeneity of households in the dataset might mask the true effect of maternal employment on educational expenditures. For instance, differences in household priorities, access to educational resources, and cultural factors could play significant roles in shaping educational spending patterns. In some cases, employed mothers might prioritize other aspects of household welfare, such as healthcare or savings, over educational expenditures.

Second, the insignificant impact might be due to the structure of the Iranian labor market and social norms. In Iran, employment opportunities for women are often limited to lower-paying and less stable jobs, which may not provide sufficient additional income to significantly affect household educational spending. Additionally, social and cultural expectations regarding gender roles might influence how the additional income from maternal employment is allocated within the household.

Third, it is possible that other unobserved factors, not captured by our propensity score matching process, are influencing educational expenditures. These factors could include the quality of schools, the availability of supplementary educational services, and variations in household financial management practices. Future research could benefit from more granular data that includes these unobserved variables to better understand the dynamics at play.

Our study also highlights the importance of considering the broader socio-economic context when evaluating the effects of maternal employment. Policies aimed at increasing female labor force participation should be complemented with measures to ensure that the additional income is effectively used to improve children's educational outcomes. This could include financial literacy programs, targeted subsidies for educational expenses, and

initiatives to improve the quality and accessibility of education.

In conclusion, while our findings do not provide strong evidence of a significant impact of maternal employment on household educational expenditures in Iran, they underscore the complexity of the relationship and the need for a nuanced approach to policy-making. Future research should aim to address the limitations of our study by incorporating a more comprehensive set of variables and exploring the causal mechanisms in greater detail. This will provide a clearer understanding of how maternal employment can be leveraged to enhance children's educational opportunities in different socio-economic contexts.

7   Conclusion

This study aimed to analyze the impact of maternal employment on household educational expenditures in Iran using the Household Income and Expenditure Survey (HIES) data. Through the application of propensity score matching, we attempted to isolate the effect of having an employed mother on the financial investment in children's education, controlling for various socio-economic factors.

Our findings reveal that, contrary to some expectations and existing literature, maternal employment does not significantly increase household educational expenditures. In fact, the observed effect was slightly negative, although not statistically significant. This suggests that other factors may be at play, influencing how households allocate resources towards education.

The lack of a significant positive impact could be attributed to several factors specific to the Iranian context. The nature of employment available to women, which often consists of lower-paying and less stable jobs, may not generate sufficient additional income to markedly change educational spending. Additionally, cultural norms and household financial priorities could result in the additional income being diverted to other areas rather than education.

This study highlights the complexity of the relationship between maternal employment and educational expenditures. It underscores the need for comprehensive policies that not only promote female labor force participation but also ensure that the benefits of increased income are directed towards enhancing children's educational outcomes.

Future research should explore these dynamics further by incorporating additional variables that capture the quality of education, the availability of educational resources, and household financial management practices. Such research would provide a more nuanced understanding of how maternal employment affects educational investment and could inform more targeted policy interventions.

In conclusion, while maternal employment is often seen as a pathway to improved household welfare and educational opportunities, our findings suggest that the effect is not straightforward in the Iranian context. Policymakers should consider the broader socio-economic environment and cultural factors when designing interventions aimed at leveraging maternal employment for better educational outcomes. Future studies should continue to explore this relationship to provide clearer guidance on how best to support working mothers and their families in enhancing children's education.

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