# A look at the article on the development of higher education and the gender gap in education in Iran

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## INTRODUCTION

Higher education in Iran has grown significantly in recent decades, but the challenge of gender gap still exists. This gap, which means the difference in access, participation and progress between women and men, has arisen for many reasons, including culture, economy, etc., which can have many negative effects on social and economic development and women's empowerment. The importance of this issue is undeniable for countries that want sustainable development and gender equality. Norms and social policies in Iran have also had a significant impact on this field, and understanding the relationship between development and the gender gap is considered vital research.

In this article, the authors have investigated the development of higher education and its impact on years of education and the gender gap in education in Iran. In the 80s, the increase in demand led to the strong growth of higher education centres (Chart 1) and over time, the number of cities that did not have these centres increased from 38% in 1378 to 0% in 1387. (Chart 2) This improvement, in inequality Reduces geographical A large amount of money spent on these centres reminds us of the importance of profitability and appropriate conclusions in this field, which this article deals with for the first time. All the influencing factors are expressed in the literature of the article and then, by analyzing the data, estimation results for the effectiveness of increasing the years of education are obtained, and finally, these results can be summarized. The article begins with an explanation of the literature in the form of 3 important sections. Here we briefly review the literature of the article:[1]

- Factors affecting the decision to enter the university
- The effect of improving educational infrastructure on years of education

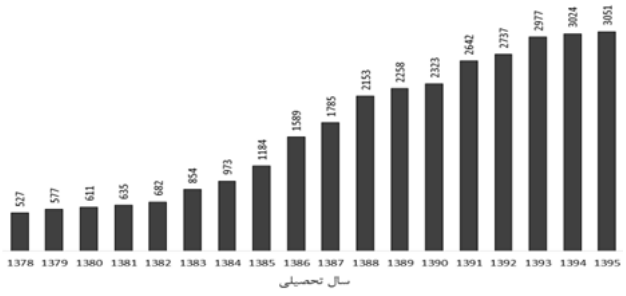


FIG. 1. The number of active higher education centers in different years.

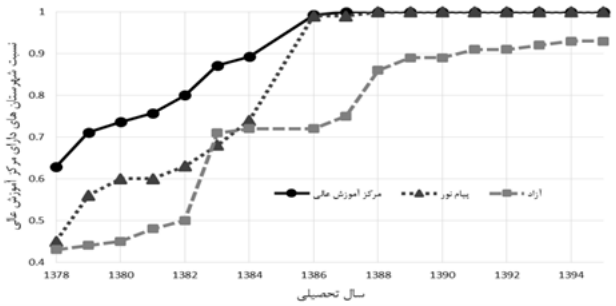


FIG. 2. The proportion of cities with at least one higher education center in different years.

- Consequences of higher education development

The data used were obtained from Iran's higher education centres and the population and housing census, except for people over 35 years of age, people who did not state their education level or could not be calculated, in addition to the assumption of the stability of the centres until 2015 and the stability of the country's divisions, has been cleaned. [2] The results of the data in brief are:

-Increasing the difference between the minimum and maximum number of centres during the study years. -More years of

| متغیر | تعداد مشاهدات (۱) | میانگین (۲) | انحراف معیار (۳) | حداقل (۴) | حداکثر (۵) | چارک اول (۶) | چارک دوم (۷) | چارک سوم (۸) |
|---|---|---|---|---|---|---|---|---|
| تعداد دانشگاه در سال ۱۳۷۸ | ۲۸۰ | ۱،۸۸۲ | ۴،۷۸۹ | ۰ | ۷۲ | ۰ | ۱ | ۲ |
| تعداد دانشگاه در سال ۱۳۸۷ | ۲۸۰ | ۶،۳۷۵ | ۱۴،۲۲ | ۱ | ۲۱۱ | ۲ | ۳ | ۶ |
| تعداد دانشگاه در سال ۱۳۹۵ | ۲۸۰ | ۱۰،۸۹ | ۲۵،۲۶ | ۱ | ۳۷۱ | ۳ | ۵ | ۹ |

FIG. 3. Statistical summary of the number of universities in the country by city.

education for younger age groups. - The rate of increase in the years of education of women is higher than that of men. Dur-

| متغیر | جنسیت (۱) | تعداد مشاهدات (۲) | میانگین (۳) | انحراف معیار (۴) | حداقل (۵) | حداکثر (۶) | چارک اول (۷) | چارک دوم (۸) | چارک سوم (۹) |
|---|---|---|---|---|---|---|---|---|---|
| سال‌های تحصیل (کل جامعه) | زن | ۶۶۷۶۴۵ | ۸،۰۹ | ۵،۲۵ | ۰ | ۲۲ | ۵ | ۸ | ۱۲ |
| | مرد | ۶۷۳۳۷۱ | ۸،۷۷ | ۴،۹۰ | ۰ | ۲۲ | ۵ | ۸ | ۱۲ |
| سال‌های تحصیل (افراد ۲۰ تا ۳۰ ساله) | زن | ۱۵۸۱۹۷ | ۱۱،۴۱ | ۴،۲۲ | ۰ | ۲۲ | ۸ | ۱۲ | ۱۴ |
| | مرد | ۱۵۸۰۱۱ | ۱۱،۲۲ | ۳،۹۱ | ۰ | ۲۲ | ۸ | ۱۲ | ۱۴ |
| سال‌های تحصیل (افراد ۳۱ تا ۴۰ ساله) | زن | ۱۴۶۷۰۲ | ۱۰،۲۶ | ۴،۸۰ | ۰ | ۲۲ | ۵ | ۱۲ | ۱۴ |
| | مرد | ۱۴۷۷۰۰ | ۱۰،۴۹ | ۴،۳۶ | ۰ | ۲۲ | ۸ | ۱۲ | ۱۴ |
| سال‌های تحصیل (افراد ۴۱ تا ۵۰ ساله) | زن | ۹۷۴۸۱ | ۷،۵۰ | ۵،۱۰ | ۰ | ۲۲ | ۵ | ۸ | ۱۲ |
| | مرد | ۱۰۰۳۸۳ | ۹،۲۲ | ۴،۹۰ | ۰ | ۲۲ | ۵ | ۸ | ۱۲ |

FIG. 4. Statistical summary of people's years of education by men and women in 2015.

ing the years of development, the number of female students has been more than male students. The authors of the article

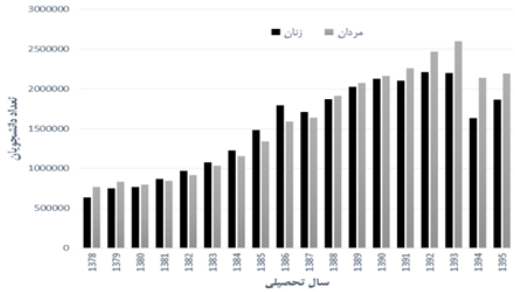


FIG. 5. The number of male and female students during the academic years.

have tried to solve endogeneity by selecting good variables and collecting their data; Here we name some of them.[3]

- Gender
- Access to university at the age of 18
- After the family
- Going to university
- The area of the house
- Urban or rural
- Population in 1995
- Proportion of 50-year-olds with university education
- Proportion of people aged 40 to 50 with university education
- Number of universities per 20 people

## MODEL

The article used the Difference-in-difference method to find the causal effect of increasing centers. The first statement of the article is as follows:

$$y_{ijk} = \alpha_j + \lambda_k + \beta uniavail_{ijk} + \gamma x_{ijk} + u_{ijk}$$

The variable $y_{ijk}$ either represents the years of education of person i in year j living in city k or represents the virtual variable of going to university. $uniavail$ is a virtual variable that indicates access to university at the age of 18. $\alpha_j$ is the constant of the age group, $\lambda_k$ is the constant of the city and $x_{ijk}$ also represents the control variables.[4] Also, estimation for people aged 20 to 35 makes a better model.[5]
Here, the coefficient of the uniavail variable indicates the effect of access to the university on the variable of the year of study. For the coefficient of the variable to mean a causal effect, the assumption of homogeneity must be established and there should be no co-variable correlation with independent and dependent variables outside the model. By using the age constant and city constant, all relevant factors are included in the model.
The effect of one generation on the education of the next age groups is not the same, so we write the second specification as follows:

$$y_{ijk} = \alpha_j + \lambda_k + \alpha_j.perc4050ed_k + \beta uniavail_{ijk} + \gamma x_{ijk} + u_{ijk}$$

Where $perc4050ed_k$ represents the percentage of the population aged 40 to 50 with a university education. Another question is the effect of access on the gender gap or the effect of access to higher education for women and men on their level of education. For this purpose, I write the following statement:

$$y_{ijk} = \alpha_j + \lambda_k + \beta_1 uniavail_{ijk} + \beta_2 gender_{ijk}$$

$$+\beta_3 uniavail_{ijk} \times gender_{ijk} + \gamma x_{ijk} + u_{ijk}$$

That the coefficient of $\beta_3$ is the difference-in-difference variable that shows the difference in the effect of access on men and women.
To improve this regression, in a similar way, we can add the effect of the previous generation according to the age constant:

$$y_{ijk} = \alpha_j + \lambda_k + \alpha_j.perc4050ed_k + \beta_1 uniavail_{ijk} + \beta_2 gender_{ijk}$$

$$+\beta_3 uniavail_{ijk} \times gender_{ijk} + \gamma x_{ijk} + u_{ijk}$$

Controlling all types of variables under the control variable eliminates the endogeneity challenge as much as possible. For example, the fact that household income affects people's education can be controlled under the proxy variable of house area.

## RESULTS

The result of specification 1 without fixed effects indicates that access to university at the age of 18, other conditions being constant, increases the average of 1.261 units in years of education. But with the addition of fixed effects, this effect decreases and reaches 0.408. Both of these coefficients are significant at the 1% level. The interesting point discussed in the article is when it uses the second specification, i.e. the assumption of parallel trends in the years of education in different cities and is controlled based on the educational background of the previous generation, the coefficient becomes meaningless. As if the development of higher education centres did not affect the number of years of education.[6] This means that what has been observed about the country's movement towards more years of education in these years, was probably caused by a general non-parallel trend in increasing the years of education and was not causally related to the

development of higher education centres.[7]
Now, for the gender gap using the third specification without age and city constant, the average years of education of men, in the stability of other conditions, has increased by 0.934 units, and also for women compared to men, there has been an average increase of 0.658 units, both of these coefficients are significant at the 1% level.
By adding the fixed effect of age and city, which is exactly the third specification, it can be seen that the development of higher education has no significant effect on the years of education of men, but it has increased the years of education of women by an average of 0.0676 units if other conditions are constant.
As we mentioned, the 4th specification is more complete and reliable.[8] In this statement, with the development of centres by 1 unit and the access of people at the age of 18 to the university by 1 unit, in the stability of other conditions, the years of education of men will decrease by an average of 0.359 units and the years of education of women will increase by an average of 0.674 units.[9] This means that the condition of men in education is getting worse and the condition of women is getting better.[10] In the rest of the article, an attempt has been made to eliminate the meaningless coefficients according to the population of the cities. That is, access to these centres has not had an effect on gender discrimination for cities with low populations, but considering cities with medium populations, this effect was positive and significant, and gender discrimination has decreased in favour of women.

## STRENGTHS OF THE ARTICLE

### Challenges facing the authors

- The appearance of bias in case of omission of important variables and inaccuracy in measurement.
- Necessity of completely random selection to be unbiased.
- The difference in the relationship between development and the gender gap in different groups or regions.

### Authors' solution

- Inclusion of relevant control variables in the model to account for potential confounding factors.
- Using the indicators of years of study and entering the university as two variables under investigation.
- Studying cities with different populations and modelling with population impact.
- Subgroup analyses were performed or interaction terms were used to explore potential heterogeneity.
- Use of external validation.

| | (۱) | (۲) | (۳) | (۴) |
|---|---|---|---|---|
| **پنل الف) متغیر وابسته: سال‌های تحصیل** | | | | |
| دسترسی به دانشگاه در سن ۱۸ سالگی | 1.261*** | 1.017*** | 0.408*** | −0.0232 |
| | (0.196) | (0.0649) | (0.110) | (0.0568) |
| مشاهدات | 483,350 | 483,350 | 483,350 | 483,350 |
| ضریب تعیین تصحیح‌شده | 0.113 | 0.162 | 0.169 | 0.172 |
| **پنل ب) متغیر وابسته: دانشگاه رفتن** | | | | |
| دسترسی به دانشگاه در سن ۱۸ سالگی | 0.114*** | 0.0784*** | −0.0120** | −0.00912 |
| | (0.0200) | (0.00522) | (0.00580) | (0.00617) |
| مشاهدات | 445,741 | 445,741 | 445,741 | 445,741 |
| ضریب تعیین تصحیح‌شده | 0.0625 | 0.0926 | 0.102 | 0.102 |
| اثر ثابت شهرستان | خیر | بله | بله | بله |
| اثر ثابت سن | خیر | خیر | بله | بله |
| اثر ثابت سن ضربدر درصد تحصیل‌کرده نسل قبل | خیر | خیر | خیر | بله |

FIG. 6. Estimating the effect of access to university on the variable of years of education

| | (۱) | (۲) | (۳) | (۴) |
|---|---|---|---|---|
| **پنل الف) متغیر وابسته: سال‌های تحصیل** | | | | |
| جنسیت | −0.521*** | −0.538*** | −0.541*** | −0.541*** |
| | (0.131) | (0.129) | (0.129) | (0.127) |
| دسترسی به دانشگاه در ۱۸ سالگی | 0.934*** | 0.681*** | 0.0714 | −0.359*** |
| | (0.168) | (0.0739) | (0.0855) | (0.0798) |
| جنسیت ضربدر دسترسی به دانشگاه در ۱۸ سالگی | 0.658*** | 0.675*** | 0.676*** | 0.674*** |
| | (0.147) | (0.144) | (0.145) | (0.143) |
| مشاهدات | 483,350 | 483,350 | 483,350 | 483,350 |
| ضریب تعیین تصحیح‌شده | 0.113 | 0.162 | 0.169 | 0.173 |
| **پنل الف) متغیر وابسته: دانشگاه رفتن** | | | | |
| جنسیت | −0.00790 | −0.0102 | −0.0101 | −0.0102 |
| | (0.00769) | (0.00735) | (0.00739) | (0.00737) |
| دسترسی به دانشگاه در ۱۸ سالگی | 0.0944*** | 0.0579*** | −0.0323*** | −0.0295*** |
| | (0.0184) | (0.00753) | (0.00778) | (0.00825) |
| جنسیت ضربدر دسترسی به دانشگاه در ۱۸ سالگی | 0.0397*** | 0.0412*** | 0.0407*** | 0.0410*** |
| | (0.0107) | (0.0103) | (0.0103) | (0.0103) |
| مشاهدات | 445,741 | 445,741 | 445,741 | 445,741 |
| ضریب تعیین تصحیح‌شده | 0.0626 | 0.0927 | 0.102 | 0.102 |
| اثر ثابت شهرستان | خیر | بله | بله | بله |
| اثر ثابت سن | خیر | خیر | بله | بله |
| اثر ثابت سن ضربدر درصد تحصیل‌کرده نسل قبل | خیر | خیر | خیر | بله |

FIG. 7. Estimating the heterogeneous effect of access to university on the years of education of men and women.

| متغیر وابسته | سال‌های تحصیل | | دانشگاه رفتن | |
|---|---|---|---|---|
| | (۱) | (۲) | (۳) | (۴) |
| دسترسی به دانشگاه در ۱۸ سالگی | −0.108 | −0.144 | −0.00922 | −0.0152 |
| | (0.0961) | (0.0873) | (0.00830) | (0.00923) |
| جنسیت | −0.408** | −0.505*** | −0.00987 | −0.0178* |
| | (0.166) | (0.142) | (0.00870) | (0.0101) |
| جنسیت ضربدر دسترسی به دانشگاه در ۱۸ سالگی | 0.244 | 0.400*** | 0.0103 | 0.0176* |
| | (0.150) | (0.135) | (0.00920) | (0.0103) |
| مشاهدات | 39,258 | 89,387 | 115,054 | 134,510 |
| ضریب تعیین تصحیح‌شده | 0.160 | 0.162 | 0.0909 | 0.0923 |
| حد بالای جمعیت | 101000 | 170000 | 217000 | 248000 |
| تعداد شهرستان | 99 | 161 | 187 | 201 |
| اثر ثابت شهرستان | بله | بله | بله | بله |
| اثر ثابت سن | بله | بله | بله | بله |
| اثر ثابت سن ضربدر درصد تحصیل‌کرده نسل قبل | بله | بله | بله | بله |

FIG. 8. Estimating the effect of access to university on years of study and going to university for cities with different populations.

**Reviews**

Topics that are not covered in the article include:

**Criticism 1:** There may be an inverse relationship between the development of higher education and the gender gap, and to answer this criticism, I propose to use the analysis of variables to determine the direction of causality.

**Criticism 2:** Higher education development and the gender gap may simultaneously affect each other, and the use of dynamic models or instrumental variables approaches can address this criticism.

**Criticism 3:** Spillover effects should be studied to obtain the impact of changes in the development of higher education in one region on neighboring regions.

**Criticism 4:** There is a crisis in establishing the assumption of parallel trends.

**Criticism 5:** Lack of arguments in justifying the variables and the model used.

**Criticism 6:** It is possible that the effects of the study will appear in the coming years and it is better to use dynamic and time-varying models.

Finally, it can be said that this article has been able to express the effect of the development of higher education on the gender gap and show it well with specific meanings. The fact that the development of higher education has generally increased the number of years of education but has reduced the gender gap is an important factor that makes this article valuable.

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[1] More explanations of each section are comprehensively stated in the article, which are not included in this text.

[2] The information in each data and their allowed values are explained in detail in the article.

[3] Additional explanations and allowed values of these variables are explained in detail in the article.

[4] Including household dimension, house area, gender and urban or rural.

[5] Because it is possible that 18- and 19-year-olds did not enter the university due to their young age.

[6] If the variable of going to university is used instead of the variable of years of education, the results are still the same.

[7] In fact, neither in the whole country, nor in cities with low population or with medium population, there is no significant effect for access to higher education centers.

[8] Adding the variable resulting from the constant coefficient of age in the percentage of people with university education of the previous generation.

[9] All these coefficients are significant at the 1% level.

[10] Also, the probability of men going to university decreased by 2.95% and increased by 4.1% for women.

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