

Access to Higher Education and the Chance of Marriage*

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Abstract

We examine the effect of a large-scale expansion of the higher education system to small and medium-sized Iranian counties during the 2000s on the chance of marriage. We match detailed annual university enrollment data with 1997–2013 household surveys and Census 1996 data at county level and find that university openings significantly increased the chance of marriage among both men and women exposed to the expansion. In women, the effect is concentrated at ages 23–27 years and amounts to 8.0 percentage points; in men, it is concentrated at ages 28–32 years and amounts to 10.3 percentage points.

JEL classification: I23, I26, I28, J12, J16.

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1. Introduction

Access and tendency to attain higher education have been constantly increasing over the past decades for both Iranian men and women. As a result, after years of declining gender gap in education, Iranian women surpassed men in rate of university enrollment and graduation in the late 2000s.³ In parallel with the rising educational attainment, young Iranians have kept postponing marriage.⁴ The prevailing opinion suggests that rising college education among young people might have contributed to delay in marriage (Blossfeld and Jaenichen 1992; Rose 2001), which, in turn, is associated with lower fertility rates and slower population growth (Kirdar *et al.* 2009; Majbouri 2016; Hahn *et al.* 2018).⁵ The goal of this paper is to shed new light on the relationship between higher education and marriage using the Iranian context.

In developed countries, the association between higher education attainment and delay in marriage is mainly explained by women's increasing labor market returns to higher education along with the possibility of having intimate relationship before marriage (Goldin 1992; Blossfeld and Jaenichen 1992; Rose 2001). The same explanation may not apply to developing, especially Middle Eastern, countries like Iran where returns to higher education in the labor market and job prospects are not quite promising for women,⁶ and premarital relationship is not socially acceptable, especially in more traditional and conservative small counties (Varzi 2006). Combination of such social settings along with recent marriage squeeze in favor of men, *i.e.*, considerably more marriage-age women than men

³ In 2011, 18.4 percent of Iranian women, compared with 18.2 percent of men, were either enrolled in a university or graduated. In 2006, the enrollment and graduation rate for women and men were 12.3 and 13.1 percent; in 1996, the rates were 4.7 and 7.4 percent; in 1986, the rates were 3.3 and 7.1 percent (Census 1986, 1996, and 2011 Summary Reports, Statistical Center of Iran).

⁴ For women, the average age of first marriage was 19.9, 22.4, 23.3, and 23.4 years in 1986, 1996, 2006, and 2011; for men, it was 23.8, 25.6, 26.2, and 26.7, respectively (Census 1986, 1996, and 2011 Summary Reports, Statistical Center of Iran).

⁵ The Iranian population growth rate has been alarmingly decreasing in the past 40 years: from a 3.91 percent average annual growth rate during 1976–1986 to 2.46, 1.47, 1.62, and 1.29 percent during 1986–1991, 1991–1996, 1996–2006, 2006–2011 (Census 1986, 1996, and 2011 Summary Reports, Statistical Center of Iran).

⁶ According to the World Bank, labor force participation rate of Middle Eastern and North African women was about 20 percent during the 2000s. The same rate for Iranian women remained stagnant around 15 percent.

in the marriage market,⁷ may imply a different connection between increased higher education and delayed marriage in Iran.

Understanding the relationship between marriage and university education is important to deduce proper education, population, and labor policies. Empirical identification of such relationship, however, is challenging because of potential endogeneity problems, arising from the joint determination of education and marriage decisions and unobserved heterogeneity.⁸ Hence, the literature has traditionally relied on structural modeling to explain the relationship (Boulier and Rosenzweig 1984; Chiappori *et al.* 2009; Ge 2011).⁹ One of the rare empirical studies that attempt to account for the endogeneity problems is by Lefgren and McIntyre (2006) who use quarter of birth as an individual-specific source of variation for instrumenting the education level. They find that higher level of education may have a positive effect on marriage stability and husband earnings but not on the probability of being married.

We conduct an empirical analysis that uses county, time, and cohort variations in access to higher education, provided by a massive higher education expansion program during the 2000s in Iran, to identify its effect on women's and men's chance of marriage. Because of tight central controls over the expansion, we argue that the expansion was plausibly exogenous, especially after comparing cohorts with different levels of exposure to the expansion and conditioning on relevant county and province characteristics prior to the expansion and using county-level fixed-effects.

We focus on small and medium-sized counties as the main targets of the expansion. We draw our conclusions based on detailed data on university enrollments matched with the 1997–2013 household data. We find that establishment of a new university in a county is associated with a large, 4.6 to 8.0 percentage point increase in the chance of marriage among 23–27 year old

⁷ Rapid population growth in the late 1970s and early 1980s resulted in an overall younger population. Since traditionally women in Iran marry men who are on average 5 years older, therefore, marriage market has been unfavorable for young women in all the years of this study, a condition known as “marriage squeeze” in the literature (Becker, 1973, Becker 1981, Grossbard-Schetchman 1984).

⁸ Those who pursue higher education may have different attitudes toward marriage than others. Also, Marriage market's return for education may affect educational decisions.

⁹ A series of recent studies have employed changes in compulsory schooling laws, as an exogenous source of variation in education level, to measure its effect on the age of first marriage, but the laws are limited to primary and secondary education, not tertiary education (Devereux and Tripathi 2009; Powdthavee and Adireksombat 2010; Kirdar *et al.* 2009).

women.¹⁰ The effect in men is also significant: men who were exposed to a university opening at ages 28–32 years were more likely, by 2.7 to 10.3 percentage points, to be married than men in comparison groups. The effect in both women and men gradually decreases and eventually disappears with age.

Given the results, we argue that access to university in more traditional small and medium-sized counties may not hinder but facilitate marriage by acting as a platform where young people can meet someone of the opposite sex and possibly choose their future spouse.¹¹ The mechanism is strong in Iran, as most young Iranians, especially women, view university as the only avenue through which they can gain autonomy, escape the pressure of local traditional environments, and develop their social lives (Fereidouni and Mehram 2015). Hence, considering the very low labor force participation of women in the country, young women may seek return to their university education in the marriage market.

Our paper connects to and builds on several emerging strands in the literature. First is the literature that attempt to measure the marriage market return to higher education (Boulier and Rosenzweig 1984; Chiappori *et al.* 2009; Ge 2011; Lafortune 2013). The second is a limited literature that quantifies the role of university as a platform for marriage.¹² The third is a recent literature that uses rapid higher education expansions as a source of variation in access to university to examine its effect on socioeconomic outcomes such as mother’s birth outcomes in the U.S. by Currie and Moretti (2003), equality of educational opportunities in Italy by Bratti *et al.* (2008), and labor market outcomes in the U.K., Russia, and China by Devereux and Fan (2011), Kyui (2016), and Knight *et al.* (2017). To our knowledge this is the first study that examines the effect of university expansion in the marriage market.

This paper is organized in seven sections. The following section describes Iranian higher education system and its expansion during the 2000s. The next section

¹⁰ Iranian household surveys started reporting household’s county of residence from 1997. The 2012–2013 academic year is the last year for which we received detailed enrollment data of all major universities.

¹¹ Women who attend university may receive higher number of marriage proposal, affecting their chance of marriage. They are, also, more likely than others to marry someone with similar age and education, known in the literature as positive assortative mating (Becker 1973; Mare 1991; Pencavel 1999; Elbadawy and Assaad 2007). Moreover, more educated couples often have higher incomes and invest more on their children (Strauss 1995; Behrman 2002; Salehi-Isfahani and Taghvatalab 2018).

¹² The role of university as a marriage platform is also studied in Germany by Pestel (2017).

explains the data refinement and organization processes. The ensuing section deliberates the identification strategy and empirical models. The following three sections present the main results, test their robustness, and discuss the role of university as a channel of the effects. That last section concludes.

2. The Expansion

In 1978–1979 academic year, when the Islamic Revolution took place, Iran had about 174 thousand university students and a population of about 38 million. After about a decade, in the 1989–1990 academic year, the number of university students almost tripled to about 514 thousand. The fast pace of growth in university enrollment continued in the next decades such that it reached about 1,405 thousand in the 1999–2000 and 3,791 thousand in the 2009–2010 academic years (Ale-Aghaa *et al.* 2009). In the 2015–2016 academic year, the latest year for which aggregate data is available, the country had 4,812 thousand students and a population of about 79 million (IRPHE 2016). As a result of the remarkable growth, the country’s tertiary education gross enrollment ratio passed the world’s average in the 2000s and has approached the level of developed countries such as the US in recent years (Appendix Figure 1).¹³

In the 1978–1979 academic year, more than 98 percent of students were enrolled in tuition-free public universities (PUB henceforth). The driving force of the university enrollment growth in the next decades, however, was the establishment of public, semi-private, and private universities that charge tuition (Habibi 2015). In effect, enjoying the government’s financial support, four major universities were first established in Tehran, the country’s capital, during the 1980s then branched out to provinces’ capital during the 1990s and to smaller cities during the 2000s. The universities are Islamic Azad University (IAU), Payame Noor University (PNU), independent non-profit universities (GEU henceforth), and occupational colleges (F&H).

The IAU, founded as a non-profit private university in 1982, is the largest university system in Iran. The enrollment in the IAU branches grew quickly such that after a decade it hosted about 50 percent of all university students (Ale-Aghaa *et al.* 2009). The IAU’s share of total enrollments remained between 50

¹³ Gross enrollment in tertiary (or university) education is defined as total enrollment in tertiary education (ISCED codes 5 to 8), regardless of age, divided on the total population in the 5 year age group of 18-22.

and 55 percent until the mid-2000s when the PNU, a public university established in 1987, started its rapid expansion. As a result, in the 2008–2009 academic year, about 27 percent of all new enrollments belonged to the PNU, and the IAU received about 40 percent of them. In the same year, the GEU and the F&H received about 9 and 7 percent of all new enrollments. The rest belonged to the PUB, managed directly by the Ministry of Higher Education. Enrollment in the GEU also gained momentum from late 2000s, but it remained stagnant in the F&H branches (Table 1).

During the period of interest, 1997–2013, the period of the university systems’ expansion to small and medium-sized cities, they had phases of rapid and slow growth in number of branches. For example, we distinguish three phases for the IAU: pre–2004, 2004–2008, and 2008–2013. Figure (1) maps the expansion phases of the IAU, PNU, GEU, and PUB.¹⁴ Each segment in the maps shows a county. If a county’s segment is black, the county had at least one branch of the corresponding university system before 1997. If the county received a branch later in the period, its segment is lighter such that a white segment shows a county that did not receive any branch of the university system by the end of the period, 2013. The maps show large variations and rapid expansion during the period of the study, especially in the IAU and the PNU.

Figures (2) illustrates the trends in enrollment. “Total” enrollment in the IAU branches was consistently increasing during 1997–2013. “New” enrollments in the GEU and PUB, also, continuously grew, but the two spikes in the PNU “new” enrollment are noteworthy: in the 2007–2008 and 2011–2012 academic years, the PNU extended its branches to many small and medium-sized counties.

Figures (3) shows the female-to-male enrollment ratios by university. In the IAU, the number of female students surpassed the number of male students in the 2004–2005 academic year. In the last year, the 2012–2013 academic year, the IAU had about 160 thousand more female than male students. In the PNU, however, the female-to-male not only was always above 1.0 but around 2.0 in most of the period, indicating the PNU’s attractiveness in women.

¹⁴ We do not discuss the F&H occupational universities further because the university system’s detailed enrollment data is not available to us.

3. Data

Our sources of individual-level information are annual Iranian Household Expenditures and Income Surveys (HEIS, henceforth) collected by the Statistical Center of Iran, SCI. The surveys provide nationally representative cross-sectional data on households' amenities and detailed expenditures and on their members' socioeconomic characteristics and income. Although the HEIS microdata are available from 1984 we use data from 1997, since households' county of residence is reported from 1997 onwards. We use county of residence and month of surveying to match the household data with the university enrollment data.

We received annual university enrollment data from two sources. The IAU Information Center provided us with the data on *total* enrollments in all its sites across the country for 1997 to 2014 academic years. Also, the Iranian Institute for Research & Planning in Higher Education (IRPHE) provided us with the data on *new* enrollments in all units of the other three university systems, namely the PNU, GEU, and PUB for 1997 to 2013 academic years.

We have university enrollment data for all counties, but the HEIS data do not cover all counties: the HEIS data are from 251 counties in 1997–2002, from 300 counties in 2003–2007, and from 336 counties in 2008 onwards.¹⁵ Because of the mismatch, using the HEIS data from 2003 or 2008 will result in the inclusion of more counties in the sample but the exclusion of at least six years of data of all counties. The excluded years are pre-university-opening years in many counties since the expansion gained momentum from the mid-2000s. Therefore, we focus on the widest period, 1997–2014, and use variations in the timing of university establishment among 251 counties.

Using the wide period of 1997 to 2014, nonetheless, invites its own challenges: counties that started to appear in the HEIS data from 2003 (or from 2008) had been separated from larger counties a few years earlier and might have been surveyed prior to their appearance in the HEIS data and included in their mother counties.¹⁶ Our focus on small and medium-sized counties reduces the effect of such uncertainty because the new counties were typically separated from

¹⁵ Total number of counties constantly increased during the period. The increase was reflected in censuses: Censuses 1996, 2006, and 2011 report information on 287, 332, and 389 counties. The HIES adopts newly formed counties right after census years but does not commit to collecting data from every single county (censuses have become quinquennial since 2006).

¹⁶ Based on our conversations with experts in the HIES bureau of the SCI, distinguishing such cases is not possible.

province capitals or large counties. Specifically, we work with the counties that had a population of 300,000 thousand or less according to Census 1996, one year prior to our period of interest, 1997. This constraint limits the total number of counties to 199 in our study.

For each university system, we group the 199 counties into three types. Type 1 counties that had a unit of the corresponding university system prior to the period of our study and maintained it; Type 2 counties that received a unit of the corresponding university system during the period of interest and maintained it; Type 3 counties that had no unit of that university prior to the period of interest nor during it.¹⁷ For the IAU, for example, types 1, 2, and 3 includes 67, 116, and 16 counties. For the PNU, types 1, 2, and 3 includes 85, 104, and 10 counties (Table 2).

4. Method

We adopt a program introduction research design, *a la* Duflo (2001), Finkelstein and McKnight (2008), and Hoynes and Schanzenbach (2009), among others,¹⁸ and use establishment of universities in Iranian counties during the 2000's expansion as a proxy for access to university. Identifying the effect of university establishment on the chance of marriage, however, requires the independence of university opening from the concurrent county-level trends that may affect the chance of marriage. In the following, we explain why we believe the condition is not severely violated under the proposed empirical design.

The expansion, mainly attributable to the IAU and the PNU, was tightly controlled by the universities' central offices in Tehran. Besides, both IAU and PNU followed the government's higher education expansion policies requiring the consideration of local and regional higher education capacities. The central control over the universities' expansion was applied by licensing and accreditation. Following the government's policies, in the early 2000s, the IAU

¹⁷ Among the 199 counties, none received and lost a unit of one of the universities during the period. Also, none had a unit of one of the universities before 1997 but lost it during the period.

¹⁸ Duflo (2001) examines the labor market consequences of expansion of primary schools in Indonesia. Finkelstein and McKnight (2008) examines the effect on mortality of introduction of Medicare program in the US. Hoynes and Schanzenbach (2009) examine the introduction of Food Stamp Program in American counties.

and PNU announced their willingness to accept applications to license franchised units anywhere in the country and provided detailed guidelines for applications.¹⁹ An application must include academic details of proposed educational programs and detailed capital and labor resources prepared to run the programs successfully. The minimum requirements for each type of capital and labor resources were also announced. In addition, an application must include a strategic financial plan showing a strong demand for higher education in the county and the province, accounting for the province's economic and demographic potentials and capacities. Specifically, the strategic plan must account for the province's relative economic advantages, the size of its 18–24 year old population, the size of its high school student population, the number of its university students per 100,000 population, and the distribution of disciplines in its neighboring counties. Similar controls were also applied to the accreditation of new academic programs proposed by existing university units.

Counties, however, may differ in their ability to prepare the required resources. If counties' ability—unobserved to us—is time-invariant, then we can plausibly assume that the expansion is exogenous given its regulated nature and conditional on county-level fixed-effects and on the relevant county and province characteristics before the expansion. That is, high school and collage aged men and women might not predict the university opening in their county beforehand. Hence, we control for county fixed-effect, county pre-university-opening conditions, and for province level trends.

In practice, we use Census 1996 county-level data to compare a vast array of characteristics between counties that received a university unit and those that remained without a unit of the corresponding university system during 1997–2013.²⁰ The comparisons, reported in Appendix Table (1), hint to moderate differences between the counties in population, percentage of urban population, percentage of urban population in ages 7–18 years (which covers primary school to high school graduation age), and percentage of population in manufacturing.²¹

¹⁹ We have received and reviewed both IAU and PNU university establishment application guidelines. The guidelines, written in Persian, are very similar.

²⁰ The closest Census year to the period of this study is 1996; the previous census year is 1986. Census 1986 is too far from the period thus cannot be credibly used for our purpose.

²¹ We also run county level regressions to examine the correlations between 1996 county characteristics and introduction of a university. Although the regressions lack enough power, we measure correlations—although not statistically significant—between the listed characteristics and university opening.

Therefore, in addition to the control variables deducted from the strategic plans, we include the above county-level characteristics in our estimations.

We further address uncontrolled endogeneity of university openings with respect to county characteristics by comparing individuals who differed in age of exposure to university opening. Specifically, we divide individuals into five year age groups 13–17, 18–22, 23–27, 28–32, 33–37, and 38–42, with the last age group as the reference.²² Ages 18–22 and 23–27 years encompass both Iranian women’s and men’s average ages of first marriage and the most-likely ages of university enrollment; thus, the degree of exposure of 18–22 and 23–27 year old women and men to university openings is the greatest among the age groups.

We estimate the effect of university opening on the chance of marriage for men and women separately. For each, we specify the following model:

$$\begin{aligned}
Y_{ict} = & \alpha + \sum_a \beta_1^a \cdot IAU_{ict}^a + \sum_a \beta_2^a \cdot PNU_{ict}^a + \sum_a \beta_3^a \cdot GEU_{ict}^a + \sum_a \beta_4^a \cdot PUB_{ict}^a \\
& + \theta_1 \cdot IAU_{ct} + \theta_2 \cdot PNU_{ct} + \theta_3 \cdot GEU_{ct} + \theta_4 \cdot PUB_{ct} \\
& + \mu_1 \cdot provIAU_{pt} + \mu_2 \cdot provPNU_{pt} + \mu_3 \cdot provGEU_{pt} + \mu_4 \cdot provPUB_{pt} \\
& + \gamma_1 \mathbf{Z}_{c96t} + \gamma_2 \mathbf{W}_{p96t} + \mathbf{X}_{ic} \delta \\
& + \eta_c + v_t + \lambda_p t + \varepsilon_{ict}
\end{aligned} \tag{1}$$

Where subscripts i , c , and t indicate individual, county, and academic year, respectively. Superscript a indicates age range and is either 13–17, 18–22, 23–27, 28–32, 33–37, or 38–43 years. The dependent variable Y_{ict} is individual i ’s marriage status: it is equal to 1 if the individual is currently married; 0 if never married.²³ Variables IAU_{ict}^a , PNU_{ict}^a , GEU_{ict}^a , and PUB_{ict}^a —the variables of

²² We started with 18–22 years, the five year period immediately after high school and the most likely ages of college enrollment, and added next five year age groups accordingly. Since some may marry before the age of 18, we also include a pre-college five year age group, 13–17 years. Our results, nonetheless, are not sensitive to the choice of age range. Also, for relevancy to the study of marriage, we dropped individuals who are younger than 13 and older than 42 years. In our data, there are very few (less than 0.16 percent of) married females who are younger than 15 years; the number of married females picks up from 15 years of age.

²³ We do not include divorced individuals, who constitute only about half a percent of men or women, into the regression sample.

interest—indicate if the individual was exposed to the IAU, PNU, GEU, and PUB at age a years.²⁴ Variables IAU_{ct} , PNU_{ct} , GEU_{ct} , and PUB_{ct} indicate the presence of an IAU, a PNU, a GEU, and a PUB unit in county c in academic year t . Variables $provIAU_{pt}$, $provPNU_{pt}$, $provGEU_{pt}$, and $provPUB_{pt}$ contain the number of IAUs, PNUs, GEUs, and PUBs in the individual’s province of residence in academic year t , excluding the one in the individual’s county of residence. Vector \mathbf{Z}_{c96} contains county level characteristics in 1996,²⁵ vector \mathbf{W}_{p96} contains province level characteristics in 1996,²⁶ vector \mathbf{X}_{it} contains individual and household level characteristics,²⁷ η_c is county fixed effect, v_t is academic year fixed effect, and $\lambda_p t$ is province-specific linear time trends.

We estimate Model (1) using the ordinary least square method (OLS) and report the β s.²⁸ If women are considered, β_1^{18-22} , for example, measures the differential effect on the chance of marriage of an exposed 18–22 year old woman versus an exposed 38–42 woman and versus a non-exposed 18–22 year old woman. We use the HEIS sampling weights in all regressions and cluster standard errors at county level.

²⁴ Specifically, IAU_{ict}^a is a dummy variable that is equal to 1 if there was an IAU unit in the individual’s current county of residence, c , when the individual was a year old (the individuals is surveyed in academic year t). Definitions of PNU_{ict}^a , GEU_{ict}^a , and PUB_{ict}^a are similar to the definition of IAU_{ict}^a .

²⁵ \mathbf{Z} includes the logarithm of population, the shares of 7-18 and 19-24 years urban population, the shares of primary, secondary, and high school students and graduates in the population, the shares of manufacturing, construction, and educational workers in-total employed population, and the share of public sector workers in total employed population.

²⁶ \mathbf{W} includes high school student population, 18-24 years population, the number of college students per 100,000 population, the shares of workers by economic sector.

²⁷ \mathbf{X} includes an urban/rural indicator, exact age over years, and cohort.

²⁸ We also estimate Model (1) using logit regression method and calculate marginal effects at means for the variables of interest, *i.e.*, IAU_{ict}^a , PNU_{ict}^a , GEU_{ict}^a , and PUB_{ict}^a where a is 14-18, 19-23, 24-28, 29-33, and 34-38 are these age groups different than the ones in the model?. The sizes of the marginal effects are very close to the effects found from estimating the linear probability models (LPMs). Besides, we calculate the LPM models’ predicted values and observe that they comfortably remain between zero and one: only less than 5 percent of the predicted values marginally fall outside the range. Given the similarity of the results from logit models and from LPMs, we only report estimates from the LPMs’ since they are easier to interpret.

5. Main results

We estimate the effects in two different samples: an unrestricted sample that includes all counties with a population of 300,000 or less in 1996 and a restricted sample that excludes counties with a unit of any of the four university systems before 1997 from the unrestricted sample. Since we use county and province information from Census 1996, to control for the pre-university opening conditions, we would prefer to work with the restricted sample. The restricted sample, however, significantly limits the variation in the treatment variables IAU_{ict}^a , PNU_{ict}^a , GEU_{ict}^a , and PUB_{ict}^a .²⁹ As a result, the effect of the GEU and the PUB, whose expansion was limited, cannot be precisely estimated.³⁰ Therefore, we focus on the unrestricted sample that provides about three times more observations per each cell of the treatment variables.

The large sample includes counties that had at least one of the universities prior to 1997–2013. Since we control for pre-university-opening conditions in 1996, inclusion of such counties in the analysis can introduce uncontrolled heterogeneity into the sample. To check the extent of such effects, we estimate Model (1) with and without Census 1996 county level variables, using both samples. The estimated results, presented in Appendix Tables (2.1) to (2.4), however, show that inclusion of the Census 1996 variables has only minor effects on the magnitude of the effects.

Table (3) presents the estimated effect on the chance of marriage of exposure to university opening at different age ranges—the estimated β s in Model (1) times 100—using the unrestricted sample and including all control variables. Key takeaways from the results follow. In women, the effect of university opening for the three age ranges encompassing 18 to 32 years is positive and statistically significant. The largest effect in women is the result of exposure to the opening

²⁹ For example, in the restricted sample, the total number of 13 to 42 year old women who live in the 13 counties without an IAU during the period is 13,881: on average, about 1,078 women per county. The number divided on 6 (the number of age groups) is 178, the average per age-group number of women. That divided on 2 (to account for pre- or post-university opening periods in the treated counties) gives 89: the average number of women in each period. Among them, the fraction of married ones differs significantly by age group. The number of observations in each cell of PNU_{ict}^a in counties without a PNU unit is also small (about 108). On the other hand, the number of observations in each cell of GEU_{ict}^a and PUB_{ict}^a in counties with a unit of the universities is small: about 118 and 144, respectively.

³⁰ We also provide evidence of instability of the estimated GEU and PUB effects derived from the restricted sample in Section 6.3.

of any of the universities at ages 23–27 years, an effect that is usually statistically different from those exposed at younger or older age ranges. In men, the effect of university opening on marriage appears with a five-year delay, such that it is positive and statistically significant at the three age ranges encompassing 23 to 37 years. The largest effect in men is the result of exposure to the opening of any of the universities at ages 28–32 years, an effect that is usually statistically different than those exposed at younger and older age ranges. In addition, as it is expected, the effects of openings of the IAU and the PNU, the two largest university systems that carried the weight of the expansion, are greater than the effects of the GEU and the PUB. Although the effects of PNU openings are greater than the effects of IAU openings, their differences are rarely significant.³¹

In women, exposure to the IAU at ages 18–22, 23–27, and 28–33 years increases the chance of marriage by 5.2, 7.5, and 5.1 percentage points, respectively. The chance of marriage as a result of exposure to an IAU at ages 33–37 years, however, is significantly smaller than the three previous age ranges: 1.2 percentage points. The differences between each successive pair of the IAU effects are statistically significant. Exposure to the PNU at ages 18–22, 23–27, 28–32, and 33–37 years has also a significant effect on the chance of marriage: the effects amount to 4.8, 8.0, 7.2, and 2.6 percentage points, respectively. The difference between the PNU effects only at ages 23–27 and 28–32 are statistically insignificant. The effects of exposure to the GEU and the PUB at ages 18–22, 23–27, and 28–33 years are statistically significant as well, although the size of their effects is generally smaller than the size of the PNU and the IAU effects.

In men, exposure to any of the universities at ages 18–22 years has no effect on the chance of marriage. Nonetheless, the effects of exposure to a university opening at the next three age ranges are mostly statistically significant. The largest effect, again, belong to the PNU: exposure to the PNU at ages 28–32 years is associated with about 10.3 percentage point increase in the chance of marriage. The effects on the chance of marriage of exposure to an IAU at the same age range is about 9.0 percentage points.

³¹ The relatively greater effect of PNU openings over IAU openings is discussed in Section 7.2.

6. Robustness tests

6.1. An event study analysis

We conduct an event study analysis to check whether there were underlying county level trends in parallel to the university openings in the 2000s. In practice, we estimate the following model for women and men separately:

$$\begin{aligned}
Y_{ict} = & \alpha + \sum_{j=-4}^4 \pi_j^{IAU} 1(\tau_{ct}^{IAU} = j) + \sum_{j=-4}^4 \pi_j^{PNU} 1(\tau_{ct}^{PNU} = j) \\
& + \sum_{j=-4}^4 \pi_j^{GEU} 1(\tau_{ct}^{GEU} = j) + \sum_{j=-4}^4 \pi_j^{PUB} 1(\tau_{ct}^{PUB} = j) \\
& + \theta_1 \cdot IAU_{ct} + \theta_2 \cdot PNU_{ct} + \theta_3 \cdot GEU_{ct} + \theta_4 \cdot PUB_{ct} \\
& + \mu_1 \cdot provIAU_{pt} + \mu_2 \cdot provPNU_{pt} + \mu_3 \cdot provGEU_{pt} + \mu_4 \cdot provPUB_{pt} \\
& + \gamma_1 \mathbf{Z}_{c96t} + \gamma_2 \mathbf{W}_{p96t} + \mathbf{X}_{ic} \delta \\
& + \eta_c + v_t + \lambda_p t + \varepsilon_{ict}
\end{aligned} \tag{2}$$

Where τ_{ct}^{IAU} , for example, is a county and year-specific indicator of IAU event: for all individuals living in counties that were introduced with an IAU during the period, it is set to 0, 1 (−1), 2 (−2), 3 (−3), and 4 (−4) if they were surveyed in the same year, one year after (before), two years after (before), three years after (before), and four year or more after (before) an IAU introduction. Hence, for $\tau_{ct}^{IAU} \leq -1$, marriage is not affected by the IAU opening. τ_{ct}^{PNU} , τ_{ct}^{GEU} , and τ_{ct}^{PUB} are defined similarly. The reference group include individuals living in counties without a unit of any of the universities during the period. Description of other variables is similar to those in Model (1).

The estimated π 's are plotted in Figure (4): pre-trends are rather flat in most cases, indicating that county trends prior to the opening of the universities were not systematically different, but the chance of marriage increases after university opening, especially sharply after PNU opening. These results provide evidence in support of exogeneity of university openings; otherwise, to create a similar pattern, any potential confounding factor would have to very closely follow the timing of university openings.

6.2. Family background

Family background—such as parents’ education and income—is an important unobservable factor that can bias our results since establishment of a university in a county may disproportionately affect the chance of marriage in individuals from more advantaged families. Such effects can cancel each other out on average in our triple difference approach in which we compare individuals from one county but in different age groups at the time of university opening. The effect, however, may be concentrated in individuals with stronger family background. Since the HEIS does not provide information on education and income of individuals’ parents, we cannot effectively control for family background at the time of exposure. Instead, we can test the effect of controlling for their *current* family income, which can hint to the extent of the influence of family background.

We use two different measures of family income—namely, household current total expenditures and household members’ current total income from all sources including self-employed jobs, wage and salary jobs, pensions, interests, rents, aids, transfers, and selling handicrafts—and compare the results with the original ones (Appendix Table 3). In effect, neither the signs nor the sizes of the effects are different from the results found in the models without family income or expenditure controls, reported in Tables (3).

6.3. Potential correlation of the treatment variables

If more than one university was opened in a sufficiently large number of counties in the same year, then the treatment variables in Model (1) are strongly co-linear. As a result, the coefficients estimates will be unstable and hard to interpret. In fact, most of the counties in our study have experienced the opening of units from different university systems (Appendix Table 4). For example, out of 116 counties where an IAU was opened, in 60 a PNU, in 34 a PUB, and in 19 a GEU was opened as well.³² Nonetheless, among the 60 PNU units that were established in counties where an IAU unit was established, only 10 were opened within one year of an IAU opening, 19 in 2 years, 29 in three years, and the rest in four years or more.

To examine the impact of the co-openings of universities, we estimate Model (1) under three scenarios: when we drop all counties where at least two universities

³² More than one university type was opened in some counties.

were opened within one, two, and three year intervals. The results, presented in Appendix Tables (5.1), show that the estimates are very stable and similar to the earlier estimates.³³ The test does not show strong multicollinearity among the treatment variables.

Another useful test to address the problem of multicollinearity among the treatment variables is to examine the effect of a set of general treatment variables indicating the opening of any type of university system. We call that variable *UNI* and estimate the following model:

$$Y_{ict} = \alpha + \sum_a \beta_a \cdot UNI_{ict}^a + \theta \cdot UNI_{ct} + \mu \cdot UNI_{pt} + \gamma_1 \mathbf{Z}_{c96t} + \gamma_2 \mathbf{W}_{p96t} + \mathbf{X}_{ic} \delta + \eta_c + v_t + \lambda_p t + \varepsilon_{ict} \quad (3)$$

where variable UNI_{ict}^a —the variables of interest—indicates if individual i was exposed to either of the university systems (IAU, PNU, GEU, or PUB) at age a years; variable UNI_{ct} indicates the presence of a university in county c in academic year t ; variable $provUNI_{pt}$ is the number of universities in the individual's province of residence in academic year t , excluding the one in the individual's county of residence; the definition of other variables is the same as those in Model (1). We have provided the estimates of β s alongside the estimates of the coefficients of the university-specific treatment variables by gender and sample size in Appendix Tables (6.1) and (6.2). The effect of exposure to UNI is generally larger than the effect of exposure to any of the universities mainly because UNI treatment variable measures the effect of exposure to multiple university openings. For example, out of 116 counties where an IAU was opened during the period, in 89 at least another university was opened; out of 104 counties where a PNU was opened during the period, in 83 at least another university was opened.³⁴ The test addresses multicollinearity problem, but it is

³³ We also estimate the effects under the described scenarios using the restricted sample (Appendix Tables 5.2). Despite stable estimates of the effects of IAU and PNU, the estimates of the GEU and PUN effects are very unstable. The instability is the result of significant decrease in the sample size as a large share of the observations are dropped and fewer counties with a GEU or PUB opening remain in the sample.

³⁴ Also, out of 56 and 67 counties where a GEU and a PUB were opened during the period, in 41 and 57 at least another university was opened, respectively.

not suitable to measure the effect on the chance of marriage of a single university opening.

6.4. *Endogenous migration*

Our treatment variables account for exposure to university opening by university, county, academic year, and age group. Since the HEIS does not provide information on individuals' previous counties of residence, we are forced to assume that individuals' current county of residence is the same as that when the presumed exposure to a university opening took place. This assumption, however, is strong in the presence of endogenous migration: that is, unmarried individuals move from counties without a university to counties where a university is opened to increase their chance of marriage. As a result, the measured effects will be overestimated.

The severity of endogenous migration can, in part, be checked by measuring the effect of exposure to university opening at older ages than the common marriage ages. Any large and significant effects on the chance of marriage of those exposed to university opening at older ages can be a sign of endogenous migration.³⁵ Our measured effects, however, are concentrated on relevant ages of marriage for men and women (Table 3). Concentration of the effect on marriage at younger ages, however, does not completely rule out the presence of endogenous migration since it could have taken place at college ages, but we have two reasons to believe it is limited.

First, the expansion was designed to increase local population's access to higher education. Based on the university manuals (*Daftarche Konkoor*) of 1998 to 2014,³⁶ universities have assigned quotas for the local students on the universities of their county, province, area (*Nahiyeh*, which is a combination of some neighboring provinces), or pole (*Ghotb*, which is a combination of some neighboring areas), depending on the discipline that they choose. The proportions of the seats

³⁵ A better test to assess the endogenous migration is examining the effect in individuals whose birth and current counties are the same *a la* Bratti et al. (2008). The HEIS, however, does not provide information on the place of birth.

³⁶ University manuals are voluminous booklets published by the country's Ministry of Higher Education every year, providing information on all university units' offered programs and the available capacity. Pre-college students who took part in the national entrance exam, use the manual to choose a maximum of field-units. They send their choices back to the ministry, where they a field-unit is assigned to a student given her choices and ranking.

assigned to students in their local universities have varied between 80 percent in the earlier years of the period to 60 percent in the later years. In addition to these quotas, to provide equal educational opportunity and to make the competition fairer to less advantaged students, nine less developed provinces are allowed to set their own quotas.³⁷ More interestingly is the selection in the PNU which is entirely from the local students: 70 percent from the students of the same county; 30 percent from the students of the neighboring counties, defined as the counties in the radius of 120 to 160 kilometers.³⁸

Second, evidence on inter-city mobility, from a set of county level Census 2006 tables that provide the distribution of resident population by place of work or study, shows that the endogenous migration is not extensive. We extract age-specific percentage of county population commuting to another city for work or education. The commuting population is not broken by the purpose of commute, work or education. Nonetheless, decomposing the commuting population by age group can hint at the prevalence of education-related commutes. In Appendix Table (7), we have organized the information by the presence of any of the universities, gender, and age group. The top row of the table indicates the presence of universities in counties in 2006. The body of the table is divided into three panels for both genders, women, and men. In each panel, first the median share of commuter students or workers in the total population is provided then its age structure.³⁹ According to the table, commuting is more prevalent in counties without an IAU or PNU than the ones with these two large university systems: the difference between median share of commuting population in counties without an IAU (a PNU) and the counties with a unit of the university amounts to 1.3 (4.2) percentage points. The differences increase to 3.3 and 5.9 percentage points for IAU and PNU, respectively, if the population aged 20–24 years, the age range with the greatest overlap with the common ages of university enrollment, is considered. In women, the differences are even greater: 8.8 and 10.0 percentage points for IAU and PNU, respectively. We conclude that there is some, but not extensive,

³⁷ The nine provinces are Booshehr, Charmahal & Bakhtiari, Hormozgan, Ilam, Kermanshah, Kohkiluyeh & Boyerahmad, Kurdistan, Lorestan, and Sistan & Bluchestan.

³⁸ A student will be recognized as a local in the province where the student has finished the last three years of the high school. If the student spent the last three years of the high school in different provinces, then the province of birth will be the decision criteria.

³⁹ We find the share of commuting employed or student population in each county. Then, we find the median of the shares in the group of counties specified by their university status in 2006.

endogenous mobility that might have resulted in some degree of overestimation of the effect of university opening on the chance of marriage.

7. Discussion

7.1 *University as a platform*

The positive and significant effect of university openings on the chance of marriage can be explained by the role of university as a platform for marriage. In this section, first, we review the literature underlying this argument along with a brief review of the country's social norms and changes in its demographics. We also review findings of recent qualitative research on social functions of universities in Iran. Finally, we use our data to test how the university openings increased the likelihood of being a university student or graduate.

Opening of a local university reduces the cost of attending university and will possibly motivate to pursue higher education, especially among lower income families (Card 1993). In addition, university education is a human capital investment that can have labor market returns. In fact, the earlier literature is focused on the labor market returns to higher education (Willis and Rosen 1979). However, labor market return to university education cannot solely justify the high university enrollment rates of women along with their low labor force participation rate in many developing countries. Therefore, many recent theoretical studies pay attention to the importance of the return to education in marriage market (Boulier and Rosenzweig 1984; Chiappori *et al.* 2009; Ge 2011; Lafortune 2013). For example, using a dynamic choice model on women's sequential decisions on college attendance, work, and marriage, Ge (2011) predicts that, with no marriage benefit, college enrollment rate in the U.S would drop by 7.5 percentage points.⁴⁰

In Iran, like other Middle Eastern countries, low labor market returns to women's education highlights the importance of its marriage market returns. Iran's marriage market is also governed by the country's demographic patterns and social norms. The age structure of Iran's population has gone through drastic changes over the last decades resulting in an increase in the number of women of marriage age relative to men. Traditionally Iranian women marry men who are

⁴⁰ Ge (2011) defines marriage benefits as receiving higher number of marriage proposals and having lower education and income gaps between the couples.

on average 4 to 5 years older.⁴¹ Because of the baby boom of the early years of the 1979 Revolution, however, women born in the early 1980s reached marriage age several years earlier than the corresponding cohorts of men, a phenomenon called marriage squeeze. Moreover, in Iran, similar to other Middle Eastern cultures, premarital relationship is not socially acceptable. Therefore, for many young women, especially in more conservative and traditional small counties, dating may not be an option to delay marriage (Varzi 2006). Hence, by waiting longer, they may lose their chances to the high number of unmarried women in universities. Segregated primary and secondary schools in Iran, also, provide women with further incentive to attend a university.

In a qualitative research, Fereidoni (2014) investigates the role of universities in empowerment of Iranian women through extensive interviews with female students from the IAU, PNU, and PUB in seven provinces. She emphasizes on the role of universities as *the* major socializing platform for young Iranian women, especially in medium- and small-sized counties.⁴² Majority of interviewees (about 75 percent) mentioned attending university as their only choice after graduating from high school. Only a small percentage of them (about 13 percent), however, believed that university attendance helps their professional development; most of them responded that university attendance allows them experience new environments and enhance their social lives (about 81 percent) and helps the development of their personality and character (about 75 percent). In another study, Fereidooni (2017) investigates the social impacts of the higher education expansion in the 2000s by interviewing university faculties and students from the IAU, GEU, and PUB in three provinces.⁴³ She finds that for the vast majority of interviewees holding a university degree is a key element of social status. Also, a striking impact of the expansion, documented by Fereidooni (2017), has been a visible increase in the number of marriages across ethnic, tribal, religious, or language lines.

Estimating a model similar to Model (1), we show that the higher education expansion of the 2000s increased university enrollment and graduation in men and women resided in small and medium-sized Iranian counties; otherwise, considering university as a platform loses credence. In practice, we replace the

⁴¹ Census 1986, 1996, and 2011 Summary Reports, Statistical Center of Iran.

⁴² The provinces are Gilan, Hormozgan, Khorasan, Khuzestan, Kurdistan, Western Azerbaijan, and Tehran, selected to represent geographical, ethnic, and religious diversities in the country.

⁴³ The provinces are Gilan, Sistan & Baluchistan, and Qom.

dependent variable, Y , in Model (1) with a dummy variable that indicates if an individual is either a university student or graduate.⁴⁴ The results of the model's estimation, presented in Table (4), show an expected pattern:⁴⁵ the effect of university opening at ages 18 to 22 years—the age range with the greatest overlap with the common age of university enrollment—has the strongest effect on the likelihood of holding a university degree or being a university student. Also, the size of the effect decreases if exposure to university takes place at the older ages. In addition, as it is expected, sizes of the corresponding effects are similar for women and men.

The effect of exposure to all types of universities at ages 18–22 and 23–27 years on the chance of university education is significant for both genders. The educational effect, however, either significantly diminishes or disappears if exposure to university opening takes place at older ages. Specifically, exposure to the IAU, PNU, GEU, and PUB at ages 18–22 years increases the likelihood of university enrollment or graduation in women by 5.7, 3.8, 9.3, and 2.9 percentage points, respectively; in men, the effect of exposure to opening of the universities at same ages is slightly smaller and amount to 5.0, 3.5, 8.9, and 2.5 percentage points, respectively. The effect of exposure to all university openings at ages 23–27 is smaller in men. Exposure to the GEU has a stronger effect on the chance of college education than exposure to other universities at ages 18–22 years. The large effect, however, is limited to a few northern provinces that experienced quick GEU expansion during the period.

7.2 *The PNU versus LAU effect*

The IAU and the PNU are responsible for most of the expansion during the 2000s. In this section, we compare the effect of exposure to the opening of the

⁴⁴ We combine the likelihood of being a university student with the likelihood of being a university graduate to reduce the impact of mis-measuring university student status. The HEIS reports *being student* as an individual's activity status if the individual declares studying as her main activity or is a full-time student. Some students, however, may not declare studying as their main activity. For example, working students may declare *employed* as their activity status. Therefore, the number of university students is potentially greater than what is observed in the data. As a result, the effect of university opening only on the likelihood of being a university student may be significantly underestimated.

⁴⁵ We use the unrestricted sample in the estimation of educational effect of exposure to university opening as well. Our reason for preferring the unrestricted over the restricted sample is increasing the statistical power and stability of the estimations.

two universities. The effects of exposure to the opening of IAU and PNU during common ages of university attendance (18–22 and 23–27 years) on the likelihood of being a university student or graduate are not significantly different, regardless of gender and sample restriction (Table 4). Nonetheless, the effect on the chance of being married of exposure to the opening of PNU during these ages is generally greater than that of exposure to the opening of IAU. Since the PNU is defined as a semi-attendance university,⁴⁶ supposedly providing a rather limited social platform than IAU, how the greater effect of PNU opening on the chance of marriage is justified?

In practice, however, the PNU has not been a distance or online university. Following its mission—making higher education accessible for all, everywhere, and at any time—the PNU requires all its campuses to be fully-equipped.⁴⁷ While attendance is required only for science and lab- and workshop-based courses, regular weekly classes are held for other offered courses, for which attendance is usually encouraged by assigning a 30 percent bonus points for in-class activities.^{48,49} There is no published statistics on the PNU students' attendance rate in classes that do not require attendance. We, however, ran a small survey of current PNU professors and former PNU students, who graduated from units across the country, and asked them of their observations on the rate of students' attendance.⁵⁰ According to their answers, the average attendance rate varied by course and professor, but remained between 60 to 90 percent, with the upper bound belonging to the PNU units in smaller counties.

Our data, also, suggests two reasons for the greater effect on the chance of marriage of a PNU than an IAU opening. First, in the PNU, the number of female students has been about twice as many as the number of male students during most of the period; whereas the female-to-male ratio in IAU has never gone beyond 1.25 (Figure 3). Since young Iranian women are much more restricted in meeting a person of opposite sex outside traditional family settings,

⁴⁶ The PNU's statute is available in the website of Iran's national assembly:

<http://rc.majlis.ir/fa/law/show/99971>

⁴⁷ The PNU defines a fully-equipped campus as an independent institution that provides sufficient classroom, library, laboratory, workshop, and computation environments.

⁴⁸ The PNU Q&As (in Persian):

<http://www.pnu.ac.ir/portal/Home/Default.aspx?CategoryID=98397c67-d682-43ca-83ac-32a52a1271c7>

⁴⁹ From 2010, the PNU has started its transformation to a fully traditional university and requiring attendance for all classes.

⁵⁰ Our survey included 4 professors and 16 graduates.

especially in small communities, the PNU can provide a greater opportunity for them to meet men inside and outside university.

Second, the enrollment growth rate of a PNU is considerably greater than that of an IAU in the first four years of establishment. Among the small and medium-sized counties that were introduced with an IAU (a PNU) during 1997–2013, the median gross enrollment ratio in the first year of establishment was 4.1 percent (1.1 percent).⁵¹ Despite the gross enrollment ratio in the first year of establishment in most IAUs is greater than that in PNUs, its 4 year growth rate is remarkably greater in PNUs.⁵² Specifically, among the small and medium-sized counties that were introduced with an IAU (a PNU) during 1997–2013, the median 4 year growth rate in the gross enrollment ratio is 27 percent (91 percent). Because of the remarkable growth in the number of PNU students, the median gross enrollment ratios in the counties introduced with IAU and PNU converge after 4 years of establishment. If the greater growth rate in PNU enrollment is sustained (or even slashed to half), PNUs gradually provide a more populated platform than IAUs.

A possible force behind the greater growth rate of enrollment in PNUs is their significantly smaller tuitions in comparison to the IAU. Based on our review of the tuition information provided in the universality manuals of 1998 to 2014, among the four universities, the PNU tuition has been the lowest during the period. On average, the PNU tuition has been about 62% of the PUB tuition,⁵³ 36% of the GEU tuition, and 20% of the IAU tuition.⁵⁴ Over the last seven years of our study, except for two years (2008 and 2013), the PNU's fixed and variable tuitions had no increase while the PUB and the GEU had experienced at least 10% increase in tuitions. Also, the PNU tuitions vary across different provinces in favor of less developed regions. For example, students in the least developed

⁵¹ We calculate gross enrollment ratio of a university unit in a year as the ratio of total enrollment in the unit in that year to the 18-22 year old population according to Census 1996.

⁵² We have each year's total enrollments for the IAU units but new enrollments for the PNU units. We use the data on new enrollment in the first four years of the establishment of a PNU in the calculation of the total enrollment in the unit. Such a calculation cannot go beyond four years since we do not know the rate of dropouts and the length of time spent as a student in the universities. Therefore, we limit our comparisons of growth rates of gross enrollment ratios only to four years after establishment.

⁵³ Although the PUB universities offer free tuition, they charge tuition from their evening (*shabaneh* or *nobate dovom*) classes.

⁵⁴ The tuition information for the IAU is only available to us for the last four years of our study.

provinces of Ilam, Kohkiluyeh & Boyer-Ahmad, Kurdistan, Lorestan, and Sistan & Baluchistan pay 80 percent of the tuition charges in the other provinces.

8. Conclusion

In this paper, we examine the effect of exposure to university opening on the chance of marriage. We focus on the 2000s when a large-scale expansion of higher education system was underway in Iran and a vast majority of small and medium-sized counties were introduced with a unit of at least one of the four major university systems. Because of the expansion, the share of women in total university enrollments exceeded the share in men.

We find positive and statistically significant effect of exposure to university opening on both women's and men's chance of marriage. In women, the largest effect on the chance of marriage is the result of exposure to a PNU opening at ages 23–27 years and is about 8.0 percentage points; the effect on the chance of marriage of exposure to an IAU opening at the same ages is about 7.5 percentage points in women. In men, however, the largest effect appears with a 5 year delay: it is the result of exposure to a PNU opening at ages 28–32 year and amounts to 10.3 percentage points. The effect of exposure to an IAU opening at the age range in men is about 9.0 percentage points.

In a series of robustness tests, first we provide evidence that the expansion did not coincided with other major events in the hosting counties. We also show the robustness of the measured effects to the inclusion of variables that indicate family background and to the exclusion of counties where more than one university was opened in one year or in the span of one to three years. In addition, we investigate the potential role of endogenous migration in driving the measured effects: we conclude that it may have led to an overestimation of the effects and therefore our results should be cautiously interpreted.

Measuring a positive effect of access to higher education on the chance of marriage is against the prevailing negative relationship between the two variables. This is a significant finding with important policy implications. In recent years, with increasing number of women attending universities, the government has blamed higher education as the main reason of marriage delay among young

women.⁵⁵ Our study shows that universities may facilitate marriage, at least in small and medium-sized counties, rather than preventing it. Therefore, other factors such as tough economic conditions and imbalances in the number of marriage-age men and women may be more blameworthy.

The effect on marriage is a side effect of university opening, which is primarily deemed to increase equal access to higher education throughout the country and ultimately boost economic development. Therefore, an important and still unstudied inquiry, which has lessons for the developing world, is if and how the higher education expansion program has affected local labor market and the level and types of economic activities.

References

Ale-Aghaa, Farideh, Mohsen Keshavarz, Mohsen Rahimi. "Quantitative growth of private and public higher education in Iran." *Danesh va Pajubesh dar Olum e Tarbiati*, 5.20 (2009): 73–110. [in Persian].

Becker, Gary S. "A theory of marriage: Part I." *Journal of Political economy*, 81.4 (1973): 813–846.

Becker, Gary. S. *A treatise on the family*. Harvard University Press (1981).

Behrman, Jere R., Alexis Murphy, Agnes Quisumbing, Usha Ramakrishnan, and Kathym Yount. "What is the real impact of schooling on age of first union and age of first parenting? New evidence from Guatemala." *The World Bank Policy Research Working Paper*, (2006): WSP4023.

Blossfeld, Hans-Peter, and Ursula Jaenichen. "Educational expansion and changes in women's entry into marriage and motherhood in the Federal Republic of Germany," *Journal of Marriage and the Family*, 54.2 (1992): 302–315.

Boulier, Bryan L., and Mark R. Rosenzweig. "Schooling, search, and spouse selection: testing economic theories of marriage and household behavior." *Journal of political Economy*, 92.4 (1984): 712–732.

Bratti, Massimiliano, Daniele Checchi, and Guido de Blasio. "Does the expansion of higher education increase the equality of educational opportunities? evidence from Italy," *LABOUR*, 22.S1 (2008): 53–88.

⁵⁵ Link in Persian: <https://www.mehrnews.com/news/1797375/-/مهمترین-دلایل-تاخیر-از-دواج-از-نظر-پسران-و-دختران>

- Card, David. "Using geographic variation in college proximity to estimate the return to schooling." *NBER Working Paper*, (1993): w4483.
- Chiappori, Pierre-Andre, and Yoram Weiss. "Divorce, remarriage, and child support." *Journal of Labor Economics*, 25.1 (2007): 37–74.
- Chiappori, Pierre-Andre, Murat Iyigun, and Yoram Weiss. "Investment in schooling and the marriage market." *The American Economic Review*, 99.5 (2009): 1689–1713.
- Currie, Janet and Enrico Moretti. "Mother's education and intergenerational transmission of human capital: evidence from college openings," *Quarterly Journal of Econometrics*, 118.4 (2003): 1495–1532.
- Devereuxa, Paul J. and Wen Fan. "Earning returns to British education expansion," *Economics of Education Review*, 30.6 (2011): 1153–1166.
- Devereuxa, Paul J. and Gautam Tripathib. "Optimally combining censored and uncensored datasets," *Journal of Econometrics*, 151.1 (2009): 17–32.
- Duflo, Esther. "Schooling and labor market consequences of school construction in Indonesia: evidence from an unusual policy experiment," *American Economic Review*, 91.4 (2001): 795–813.
- Elbadawy, Asmaa, and Ragui Assaad. "Education returns in the marriage market: does female education investment improve the quality of future husbands in Egypt?" Population Council, Cairo, Egypt, mimeo (2007).
- Fereidouni, Somayeh. *Girls Narratives of University Experience: A Theory of Female Empowerment through Higher Education*. Jameeshenasan Press, Tehran, Iran (2014).
- Fereidouni, Somayeh. "Social impacts of the quantitative expansion in higher education system," IRPHE report, Theran, Iran (2017).
- Fereidouni, Somayeh and Golnar Mehran "Female empowerment in Iran: the voice of Iranian university students," *Higher Education Quarterly*, 69.4 (2015): 366–385.
- Finkelstein Amy, and Robin Mcknight. "What did Medicare do? The initial impact of Medicare on mortality and out of pocket medical spending." *Journal of Public Economics*, 92.7 (2008): 1644–1668.
- Ge, Suqin. "Women's college decisions: how much does marriage matter?" *Journal of Labor Economics*, 29.4 (2011): 773–818.
- Goldin, Claudia. "The meaning of college in the lives of American women: the past one-hundred years." *NBER Working Paper*, (1992): w4099.
- Grossbard-Shechtman, Amyra. "A theory of allocation of time in markets for labor and marriage." *The Economic Journal*, 94.376 (1984): 863–882.

Habibi, Nader. “Iran’s overeducation crisis: causes and ramifications.” Crown Center for Middle East Studies, Brandis University, 2015 working paper.

Hahn, Youjin, Asadul Islam, Kanti Nuzhat, Russell Smyth, and Hee-Seung Yang. “Education, marriage, and fertility: long-term evidence from a female stipend program in Bangladesh,” *Economic Development and Cultural Change*, 66.2 (2018): 383–415.

Hoynes, Hilary W., and Diane Whitmore Schanzenbach. “Consumption responses to in-kind transfers: evidence from the introduction of the Food Stamp Program.” *American Economic Journal: Applied Economics*, 1.4 (2009): 109–139.

IRPHE: Institute for Research & Planning in Higher Education, Tehran, Iran.

Kirdar, Murat G., Meltem Dayıođlu, and İsmet Koç. “The impact of schooling on the timing of marriage and fertility: Evidence from a change in compulsory schooling law.” *ERF Working Paper* (2009) No. 470.

Knight, John, Deng Quheng, and Li Shi. “China expansion of higher education: labor market consequences of a supply shock,” *China Economic Review*, 43 (2017): 127–141.

Kyui, Natalia. “Expansion of higher education, employment and wages: Evidence from the Russian transition,” *Labour Economics*, 39 (2016): 68–87.

Lafortune, Jeanne. “Making yourself attractive: pre-marital investments and the returns to education in the marriage market.” *American Economic Journal: Applied Economics*, 5.2 (2013): 151–78.

Lefgren, Lars, and Frank McIntyre. “The relationship between women’s education and marriage outcomes.” *Journal of Labor Economics*, 24.4 (2006): 787–830.

Majbouri, Mahdi. “Against the wind: labor force participation of women and economic instability in Iran.” *Feminist Economics*, 22.4 (2016): 31–53.

Mare, Robert D. “Five decades of educational assortative mating.” *American Sociological Review*, (1991): 15–32.

Pencavel, John. “Assortative mating by schooling and the work behavior of wives and husbands.” *American Economic Review*, 88.2 (1998): 326–329.

Pestel, Nico. “Searching on campus? marriage market effects of the student gender composition.” *IZA Working Paper*, (2017): 11175.

Powdthavee, Nattavudh, and Kampon Adireksombat. “From classroom to wedding aisle: The effect of a nationwide change in the compulsory schooling law on age at first marriage in the UK.” (2010).

Rose, Elaina. “Marriage and assortative mating: how have the patterns changed?” University of Washington, unpublished (2001).

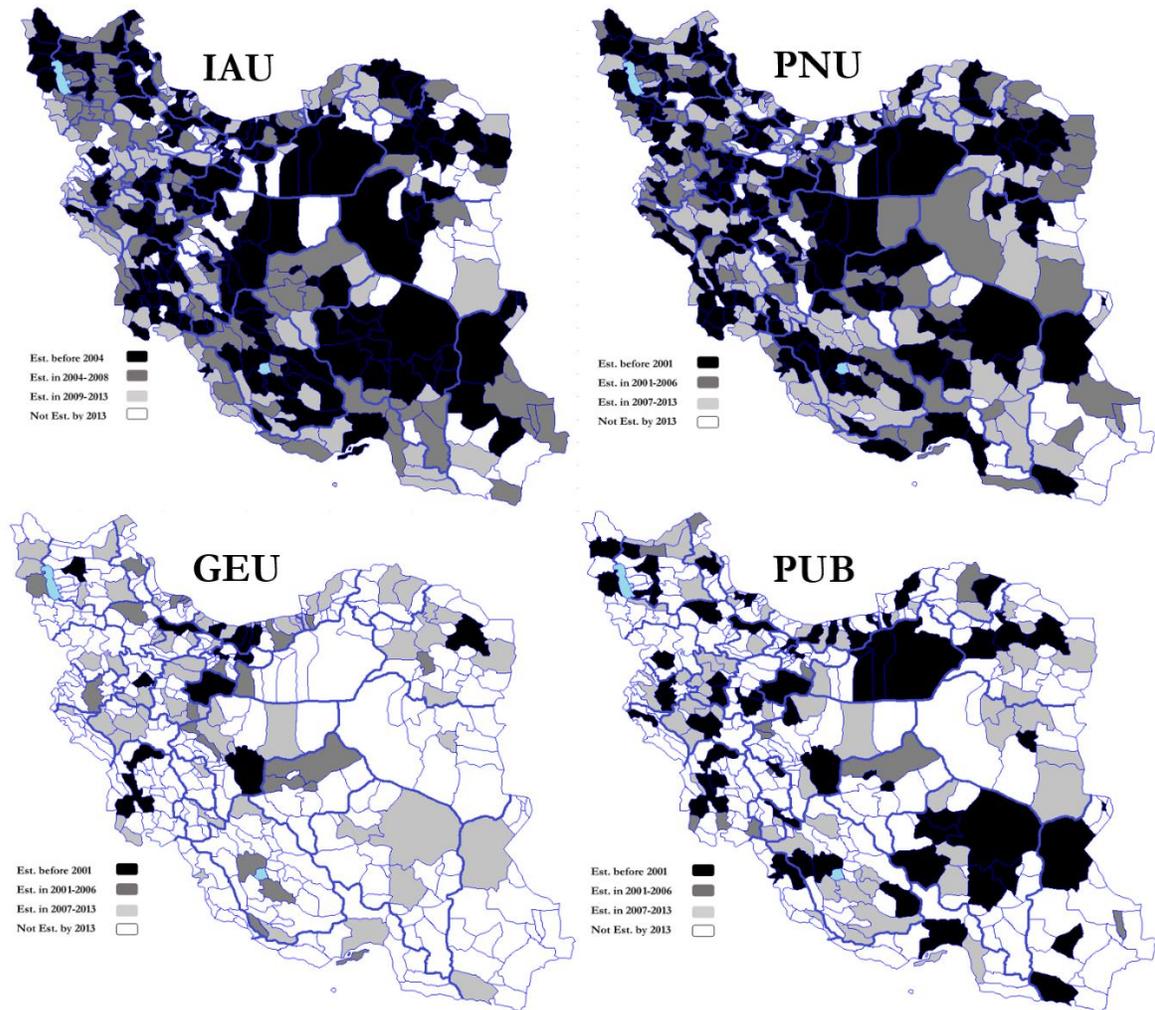
Salehi-Isfahani, Djavad, and Sara Taghvatalab. "Education and the allocation of time of married women in Iran." *Review of Economics of the Household* (2017): 1–33.

Strauss, John, and Duncan Thomas. "Human resources: Empirical modeling of household and family decisions." *Handbook of Development Economics*, 3 (1995): 1883–2023.

Varzi, Roxanne. *Warring souls: youth, media, and martyrdom in post-revolution Iran*. Duke University Press (2006).

Willis, Robert J., and Sherwin Rosen. "Education and self-selection." *Journal of Political Economy*, 87.5 Part 2 (1979): S7–S36.

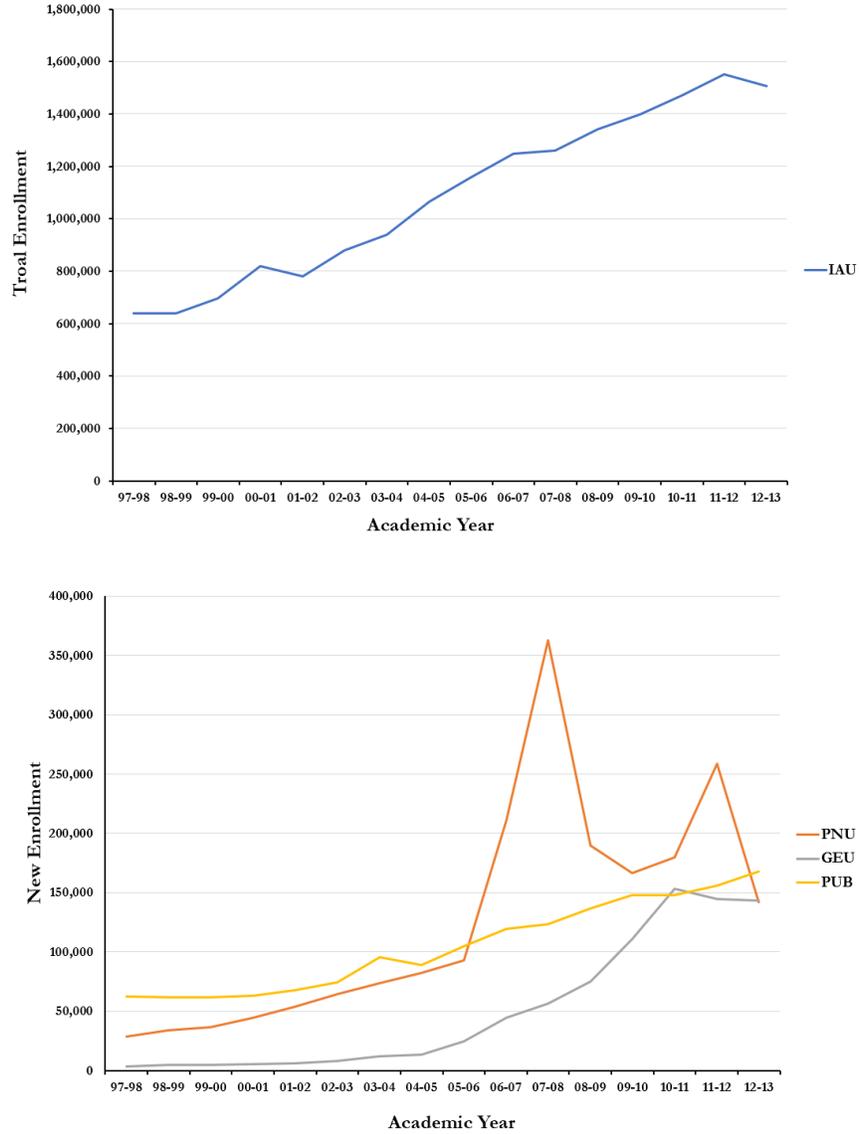
Figure 1: Expansion of the university systems during 1997–2013



Notes IAU, PNU, GEU, and PUB are the major university systems in Iran. The country's population is concentrated in northern and western areas; the large counties in central and eastern areas are sparsely populated. Periods 2004–2008 and 2009–2013 are two phases of the IAU's rapid expansion; the same for PNU, GEU, and PUB are 2001–2006 and 2007–2013.

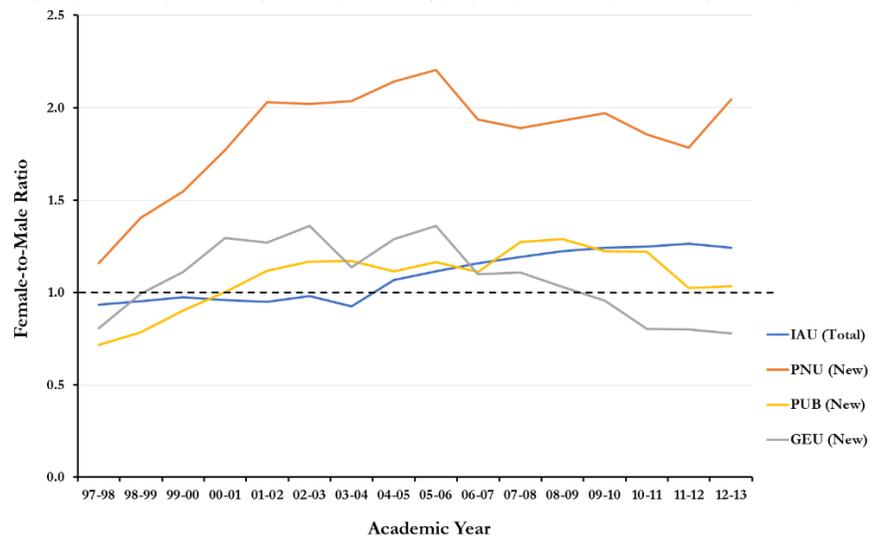
Sources Authors calculations from the Universities' enrollment data from the IRPHE and the IAU.

Figure 2: Number of “total” IAU and “new” PNU, GEU, and PUB enrollments



Sources Authors calculations from the universities’ enrollment data from the IRPHE and the IAU.

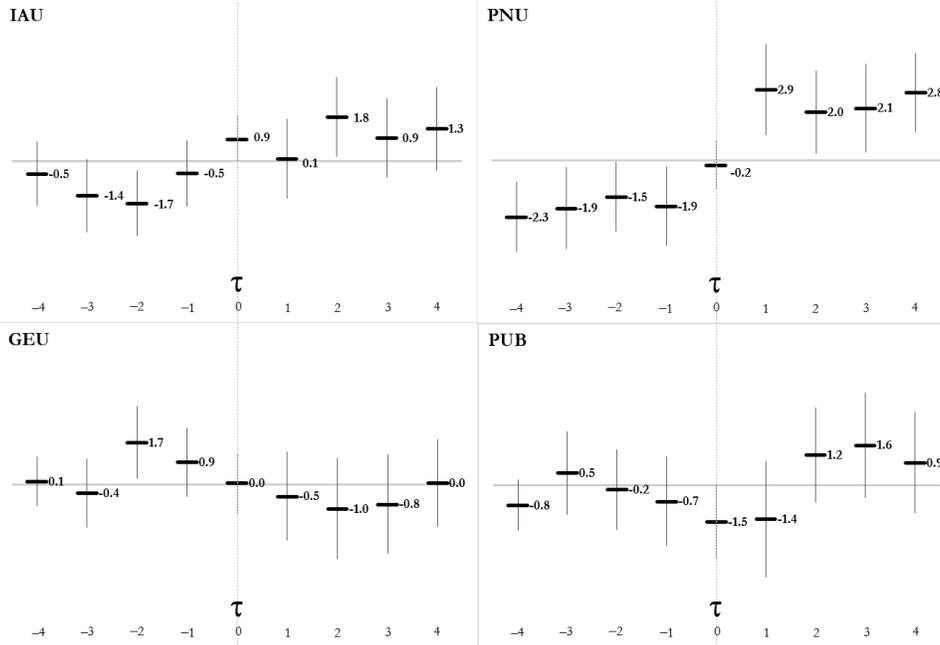
Figure 3: Female-to-male ratio of total IAU and new PNU, GEU, and PUB enrollments by genders



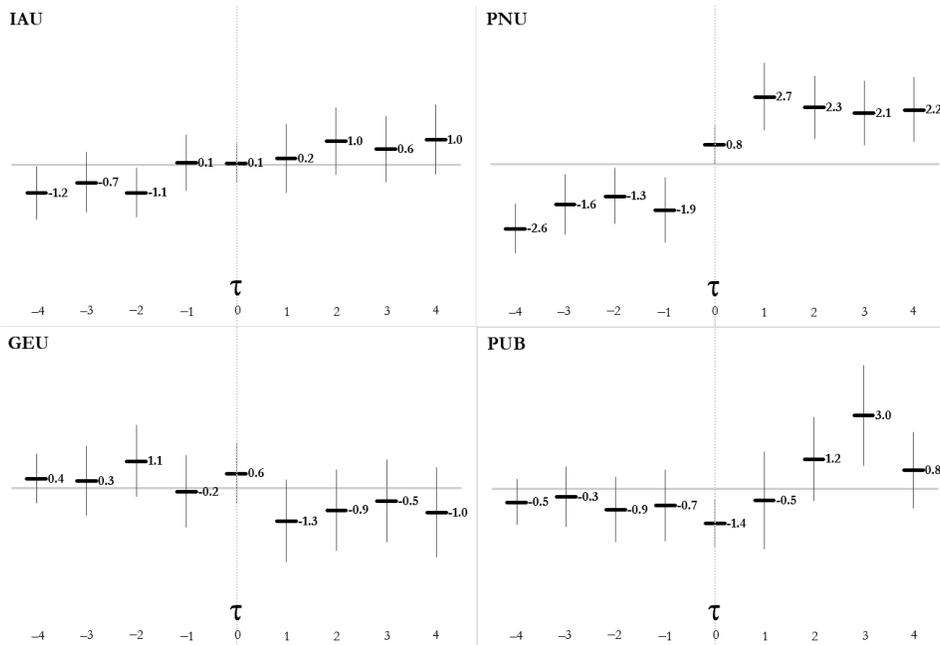
Sources Authors calculations from the Universities' enrollment data from the IRPHE and the IAU.

Figure 4: Event study estimates of the effect of university opening on the chance of marriage

Women:



Men:



Notes: The reported values are the estimated π 's in Model (2), multiplied by 100, shown by the bold horizontal lines. The corresponding vertical lines show the 95 percent confidence intervals.

Sources: Universities' enrollment data from the IRPHE and the IAU. Census 1996 and HEIS data from the SCI.

Table 1: Total number of “new” enrollments in Iranian universities in selected years, males and females, both genders (%), selected years

| Academic Year | Public (No Tuition) | Public & Private (with Tuition) | | | | Total Enrollment | Country's 20-24 Years Population | Country's Population |
|---------------|---------------------|---------------------------------|---------|---------|--------|------------------|----------------------------------|----------------------|
| | | IAU | PNU | GEU | F&H | | | |
| 1998–1999 | 61,678 | 159,039 | 33,418 | 5,070 | 30,747 | 289,952 | 5,824,075 | 61,985,135 |
| 2003–2004 | 95,734 | 240,562 | 73,478 | 11,386 | 50,680 | 471,840 | 7,650,784 | 67,175,327 |
| 2008–2009 | 134,994 | 319,736 | 211,573 | 73,474 | 56,710 | 796,487 | 8,767,732 | 72,321,714 |
| 2013–2014 | 179,098 | 372,361 | 146,404 | 125,414 | 57,634 | 880,911 | 7,538,683 | 77,025,063 |

Notes IAU indicates Islamic Azad University; PNU indicates Payame Noor University; GEU indicates independent non-profit universities; F&H indicates occupational colleges. Aggregate data on the IAU “new” enrollment were made available to us only for the four selected years in the table. The corresponding population data are for 1998, 2003, 2008, and 2013. Population numbers are provided to put the enrollment numbers in perspective.

Sources Authors’ calculations from universities new enrollments data from IRPHE and IAU.

Table 2: Counties in term of university opening during 1997–2013 by university system

| | IAU | PNU | GEU | PUB |
|---|-----|-----|-----|-----|
| Number of Counties with a Unit of the Corresponding University System Before 1997 | 67 | 85 | 3 | 22 |
| Number of Counties that Received a Unit of the Corresponding University System During 1997–2013 | 116 | 104 | 56 | 66 |
| Number of Counties that Did Not Receive a Unit of the Corresponding University System During 1997–2013 | 16 | 10 | 140 | 111 |
| Total | 199 | 199 | 199 | 199 |

Sources Authors calculations from the Universities’ enrollment data from the IRPHE and the IAU.

Table 3: The effect of university opening on the chance of marriage by university system and age

| Age When University Opened | Women | | | | Men | | | |
|-------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|
| | IAU | PNU | GEU | PUB | IAU | PNU | GEU | PUB |
| 13–17 | 0.0 (0.6) | -0.1 (0.5) | 2.5* (1.3) | 1.6* (0.9) | -0.3 (0.5) | 0.9** (0.4) | 1.4* (0.8) | 1.5** (0.7) |
| 18–22 | 5.2*** (0.7) | 4.8*** (0.6) | 5.3*** (1.1) | 2.7** (1.2) | -0.5 (0.5) | -0.7 (0.5) | 1.0 (0.8) | 0.4 (0.8) |
| 23–27 | 7.5*** (0.8) | 8.0*** (0.7) | 6.4*** (1.5) | 4.6*** (1.2) | 5.0*** (0.8) | 5.6*** (0.7) | 2.3* (1.0) | 1.3 (1.3) |
| 28–32 | 5.1*** (0.6) | 7.2*** (0.7) | 4.7*** (1.2) | 3.0*** (1.1) | 9.0*** (0.7) | 10.3*** (0.7) | 5.9*** (1.3) | 2.7** (1.2) |
| 33–37 | 1.2* (0.6) | 2.6*** (0.7) | 0.4 (1.0) | 1.0 (0.9) | 3.9*** (0.6) | 6.9*** (0.6) | 2.3* (1.1) | 2.9*** (0.9) |
| Obs. | 302,372 | | | | 297,512 | | | |

Notes: The reported values are the estimated β s, in Model (1), that are multiplied by 100. The standard errors, in parentheses, are clustered on county level. ***, **, and * indicate statistical significance levels 1, 5, 10 percent, respectively.

Sources: Universities' enrollment data from the IRPHE and the IAU. Census 1996 and HEIS data from the SCI.

Table 4: The effect of university opening on the likelihood of holding a university degree or being a university student by university system and age

| Age When University Opened | Women | | | | Men | | | |
|-------------------------------|-----------------|-----------------|------------------|-----------------|-----------------|------------------|-----------------|-----------------|
| | IAU | PNU | GEU | PUB | IAU | PNU | GEU | PUB |
| 13–17 | 0.0 (0.5) | -1.1** (0.5) | -1.9* (1.1) | 0.6 (0.8) | -0.4 (0.5) | -1.8*** (0.5) | -0.3 (0.9) | -0.5 (0.8) |
| 18–22 | 5.7*** (0.6) | 3.8*** (0.5) | 9.3*** (1.6) | 2.9*** (0.9) | 5.0*** (0.6) | 3.5*** (0.5) | 8.9*** (1.3) | 2.5*** (0.8) |
| 23–27 | 5.4*** (0.5) | 4.6*** (0.5) | 4.8*** (1.1) | 2.4*** (0.8) | 4.3*** (0.6) | 3.8*** (0.5) | 3.8*** (1.1) | 2.1*** (0.8) |
| 28–32 | 0.9** (0.4) | 1.3*** (0.3) | 0.2 (0.9) | 1.6** (0.6) | 1.5*** (0.5) | 1.4*** (0.5) | 0.6 (0.9) | 0.7 (0.8) |
| 33–37 | -0.5 (0.5) | -0.3 (0.3) | -3.6*** (1.0) | 0.4 (0.9) | 0.3 (0.6) | 0.0 (0.5) | -0.5 (1.0) | -1.1 (0.8) |
| Obs. | 301,543 | | | | 293,295 | | | |

Notes: The reported values are the estimated β s, in Model (1), that are multiplied by 100. The standard errors, in parentheses, are clustered on county level. ***, **, and * indicate statistical significance levels 1, 5, 10 percent, respectively.

Sources: Universities' enrollment data from the IRPHE and the IAU. Census 1996 and HEIS data from the SCI.