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Evidence from a Large-Scale Expansion Policy

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Higher Education and Female Labor Supply: Evidence from a Large Scale Expansion Policy

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Abstract

This paper investigates the causal impact of higher education on female employment by leveraging the expansion of higher education in Turkey as a natural experiment. Our results demonstrate that increased educational attainment significantly boosts women's paid employment; however, the gains in high-skilled employment are limited. To understand the channels driving these high returns to employment despite modest high-skilled gains, we find strong evidence that higher education leads to substantial improvements in job quality, including access to secure and stable employment. These findings align with existing literature, which highlights women's preference for job security and favorable working conditions as key factors influencing their labor market participation. Additionally, we provide suggestive evidence of non-pecuniary benefits of education, such as delaying marriage and increasing bargaining power within the household. These gains enhance women's autonomy and reduce social and cultural barriers to employment, underscoring the broader role of education in empowering women both economically and socially.

JEL Codes: J16, J21, J24

Keywords: higher education expansion, causal effect of education, female labor force participation

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1 Introduction

Women constitute roughly half of the global population, yet their economic contribution and growth potential remain significantly underutilized. The latter half of the 20th century witnessed a substantial rise in female labor force participation in early-industrialized countries. For instance, in the United States, female labor force participation among those aged 16 and above increased from 34 percent in 1950 to 60 percent in 2001 (US. Dept.of Labor, 2024). This increase is attributed to various supply-side factors, including changes in preferences, gender roles, and household production technologies (Greenwood et al., 2005), alongside a growing demand for female labor (Goldin, 2006; Acemoglu et al., 2014; Ngai and Petrongolo, 2017).[1]

Concurrently, there was a significant rise in college-educated women in early-industrialized countries. In the US, the proportion of women aged 25 and above with a four-year college degree increased from 5 percent to 25 percent during this period. This alone is likely to increase demand for women's services with higher wage offers and better employment prospects. Indeed, cross-sectional studies across various countries indicate a positive link between college education and female employment (Backhaus and Loichinger, 2022; Bawazir et al., 2022; Psacharopoulos and Patrinos*, 2004). However, the observed association between female labor supply and education may not necessarily reflect a causal relationship due to the presence of both spurious positive and negative confounding factors. On the one hand, unobserved traits such as intelligence, ambition, or better physical or mental health may simultaneously increase both educational attainment and labor force participation, leading to an upward bias in observed estimates (Bowen and Finegan, 2015). On the other hand, women from more socioeconomically advantaged households may have higher reservation wages and prioritize non-wage job characteristics, resulting in selective employment choices and potentially introducing a downward bias in estimates. Additionally, societal attitudes and cultural norms can act as barriers to women's educational attainment and employment, further complicating the relationship between the two (Goldin, 1989; Caner et al., 2016).

College education may influence women's labor market participation through several channels. First, higher education increases potential wages, raising the opportunity cost of staying out of the labor force and incentivizing labor market entry (Card, 2001; Goldin and Katz, 2009). Research consistently documents a significant wage premium for individuals with higher education, which may enable their market wages to exceed their reservation wages, particularly for women facing barriers to employment (Acemoglu, 2003; Walker and Zhu, 2008). Second, college education provides access to more stable and secure jobs, which women often prioritize over wage increases due to their preference for predictability and better working conditions (Wiswall and Zafar, 2016; Sloane et al., 2020). Third, education enhances job quality, enabling women to engage in less repetitive and more cognitively stimulating roles, which are associated with greater job satisfaction and sustained labor market attachment (Acemoglu, 2011; Martin, 2020). Finally, higher education may help women overcome societal and cultural barriers to employment by increasing their autonomy and bargaining power within households and broader society, particularly in regions with restrictive gender norms (Akyol and Ökten, 2022). Due to the presence of confounding factors and the various causal mechanisms through which education might influence labor supply decisions, an empirical investigation that isolates the

[1]The *quiet revolution* in the form of women's increased labor market expectations, extended horizons, altered identities, has been mostly interpreted as a consequence of long-run trends in technological change (Goldin, 2006).

causal relationship while investigating the potential channels is essential to inform effective policy design.

Utilizing the recent higher education expansion in Turkey as an instrument for higher education, this study estimates the causal impact of college education on women's labor supply decisions. The reform, which led to a substantial increase in the supply of college graduates over a short period, provides an exogenous source of variation that addresses biases from unobserved differences among women, such as individual characteristics (e.g., ability, motivation), family background (e.g., socioeconomic status, parental education), and regional factors (e.g., cultural norms, local labor market conditions). To our knowledge, this is the first study to establish the causal effect of college education on female labor supply.

Between 2005 and 2009, the number of universities in Turkey increased from 77 to 138, and available university slots grew by 60%. By 2012, the country had 158 universities, with the number of slots doubling compared to 2005. The timing and regional distribution of this expansion were largely driven by political considerations, including requests from parliament members seeking re-election in the 2007 general elections (Arap, 2010). The reform occurred over a relatively short period, independent of labor demand patterns, and was unanticipated by university applicants. Before the expansion, the demand for higher education significantly exceeded available slots, with a centralized competitive examination used to ration access (COHE, 2004, 2007). As such, the policy's first-order effects were primarily on the supply side of the education market. The gradual and regional nature of the expansion enables the estimation of employment returns to education for women exposed to varying degrees of higher education expansion.

Our findings demonstrate that higher education significantly increases women's labor market participation. Using the higher education expansion in Turkey as an instrument, we estimate that college education raises the likelihood of being employed by 29 percentage points and increases paid employment by 36 percentage points. These results highlight the substantial economic benefits of higher education for women, particularly in securing paid employment. However, the gains in high-skilled employment are more modest, with an increase of only 19 percentage points, suggesting a limited alignment between educational attainment and high-skill job opportunities. This imbalance indicates a mismatch in the labor market, where the supply of college-educated workers has outpaced the demand for high-skilled jobs. Despite this, the large returns to paid employment suggest that education facilitates women's entry into the labor market, even if their roles do not fully align with their qualifications.

Our analysis further explores the mechanisms driving the observed labor market attachment of women who attained college education as a result of increased access to higher education. The wage premium associated with education remains persistent in high-skilled positions but has recently diminished for low-skilled positions, suggesting that financial incentives alone may not fully explain the strong labor market attachment observed despite limited gains in high-skilled employment. However, we find that higher education leads to substantial improvements in securing better working conditions for women. College-educated women are significantly more likely to be employed in formal (40 percentage points), full-time (40 percentage points), and permanent positions (35 percentage points), highlighting the importance of better employment conditions as a key driver of labor supply decisions. Additionally, we explore non-pecuniary benefits of higher education, particularly its role in empowering women. College attainment delays marriage and increases women's likelihood of being household heads or living independently, reflecting enhanced autonomy in life decisions and greater bargaining power. These findings provide suggestive evidence that education helps

lower social and cultural barriers to female employment.

We contribute to three strands of the literature. First, this is the first study to identify the causal impact of higher education on female labor supply in a developing country where gender gap in both education and labor market is more prevalent. Previous research has primarily identify the causal effects of education on female labor force participation by leveraging compulsory schooling policies, providing insights limited to lower levels of education (Aydemir and Kirdar, 2017; Liwiński, 2018; De New et al., 2021; Spohr, 2003). Studies exploiting exogenous variation in college-related policies to assess the impact of higher education on female employment are scarce, as college education is often driven by choice, making selection into education a more significant concern. Few existing studies for Russia (Kyui, 2016), Chile (Didier, 2021), and Germany (Westphal et al., 2022) find positive causal effects of higher education on employment. Our study complements this literature by documenting larger employment returns to higher education in Turkey. These findings likely reflect the country's unique context as a developing nation with a predominantly Islamic population and traditional values that historically limit women's access to both education and the labor market. For instance, in 2006, prior to the reform, only 12% of 25–34-year-old women in Turkey had completed tertiary education, compared to the OECD average of 33% (OECD, 2020). Similarly, as of 2019, women's labor force participation in Turkey was 38.7%, well below the OECD average of 65% (Akyol and Yılmaz, 2024).

This paper further contributes to the literature examining women's preferences in the workplace. Wiswall and Zafar (2016) provide evidence that women demonstrate a strong preference for job stability, while Wiswall and Zafar (2021) emphasize the importance of family-friendly environments in shaping women's employment choices. In the context of developing countries, Verick (2014) highlights that addressing gender disparities in labor force participation requires not only greater access to higher education but also the creation of employment opportunities that align with women's needs. Contrary to this discussion, our findings suggest that women in Turkey exhibit a pronounced preference for secure and permanent employment, underscoring the role of job characteristics in shaping labor supply decisions. These results align with Majbouri (2023), which documents a substantial willingness to pay for full-time employment among women in the MENA region, further illustrating the importance of stability and security in women's employment preferences.

Finally, our findings contribute to the broader literature examining the relationship between education, labor force participation, and women's empowerment, particularly in developing countries where female labor force participation remains among the lowest globally (Anderson and Eswaran, 2009; Jensen, 2012; Field and Ambrus, 2008; Osili and Long, 2008; Chicoine, 2012). We provide causal evidence of the impact of education on women's empowerment indicators, including delaying marriage and fertility, consistent with prior research (Field and Ambrus, 2008; Osili and Long, 2008; Chicoine, 2012). Moreover, our results highlight that higher education significantly enhances women's autonomy and bargaining power within the household. College-educated women are more likely to delay marriage, live independently, and achieve educational attainment levels equal to or higher than those of male household members. These shifts not only facilitate greater labor force participation but also enable women to make decisions that align with their personal and professional objectives, emphasizing the far-reaching societal implications of expanding access to higher education.

The paper is structured as follows: Section 2 offers an overview of Turkey's educational system and the evolution of higher education. Section 3 lays out the conceptual framework guiding our analysis. Section 4

describes the data employed, while Section 5 explains the empirical strategy. Sections 6 and 7 present the main results and the mechanisms driving these findings, respectively. Finally, Section 8 concludes the paper.

2 Background

This section introduces the education system in Turkey and the changes in higher education policy in the years that are relevant to our study.

2.1 Overview of educational system in Turkey

In Turkey, the Ministry of National Education (MONE) is in charge of all structural reforms and education policies for primary and secondary education. Since 1981, all universities have been affiliated with the Council of Higher Education (COHE), which is an independent entity of the central government, and COHE regulates tertiary (higher) education.

Prior to 1997, formal education consisted of five years of primary school, three years of lower secondary education (four years if a preparatory year was required), three years of upper secondary education (four years if a preparatory year was required), and higher education. Primary education was compulsory for all citizens. In 1997, the government increased mandatory schooling from five to eight years by merging primary and lower secondary education under the umbrella of primary school. According to the law, students who had not yet graduated from the 5th grade in the summer of 1997 were supposed to finish eight years of compulsory schooling. Upper secondary education is provided in general, vocational, or technical high schools and takes three or four years. Since 2005, all students starting high school must study for four years. All levels of education up to higher education are free in public schools.

Higher education is offered by two types of universities in Turkey, namely public and private (non-profit foundation) universities. Since 1981, all universities have been affiliated with the Council of Higher Education (COHE), an independent entity of the central government, and COHE is responsible for the strategic planning of higher education, in addition to establishing and maintaining quality assurance mechanisms. Public and private universities offer three forms of training: regular education, evening education, and open (distance) education. Students who study in regular or evening education receive education at the university, whereas those who attain an open education program are only obliged to pass centralized exams. Regular and evening education programs have limited quotas determined by the COHE, but many open education programs do not have quota restrictions.

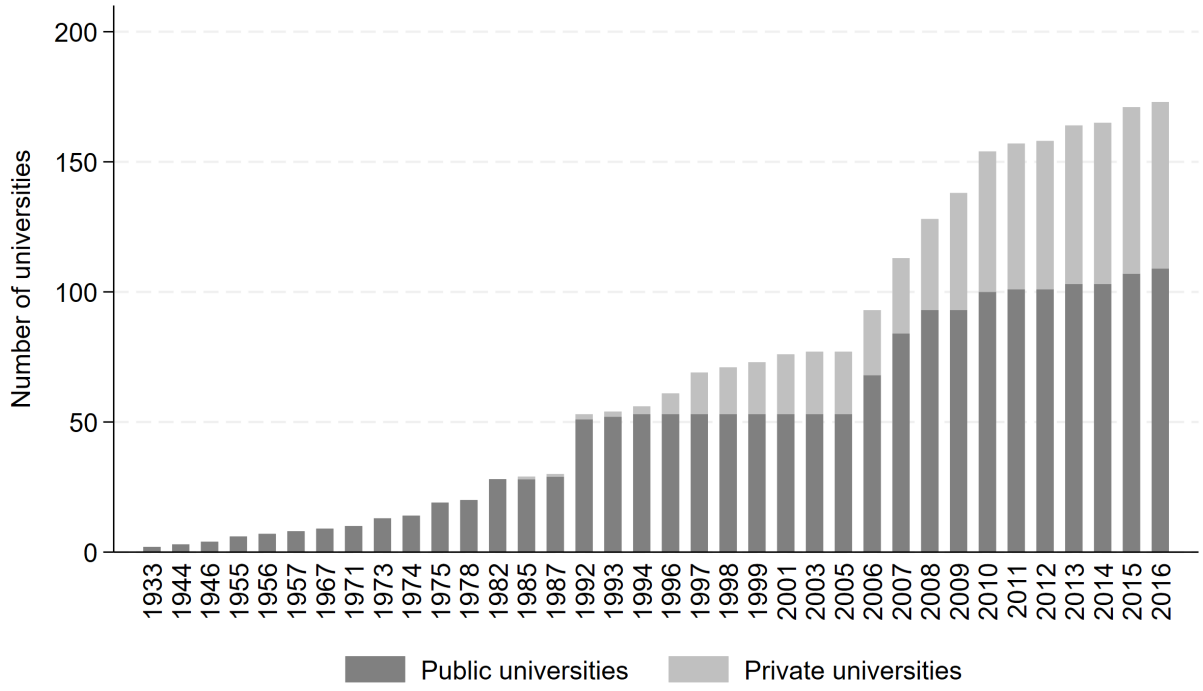
Higher education in Turkey includes vocational colleges and undergraduate programs[2], in addition to post-graduate level education. In this study, we are primarily interested in completing an undergraduate program. Demand for undergraduate education has exceeded supply in Turkey (COHE, 2004, 2007). Therefore, a centralized competitive examination has been applied to ration excess demand since 1974. The

[2]Vocational colleges generally take two years, while the overwhelming majority of undergraduate programs take four years. There are only a few exceptions that take longer: Schools of Dentistry, Pharmacy, and Veterinary take 5 years; School of Medicine takes 6 years of education. These are also classified as undergraduate programs.

Measurement, Selection, and Placement Center of Turkey (known as OSYM in Turkey) administers the exams. Although the university exam structure may change over time, it is mainly composed of the four main subjects students study during their high school education: mathematics, Turkish, science, and social sciences.

2.2 The Evolution of Higher Education in Turkey

Figure 1: The number of universities across years.



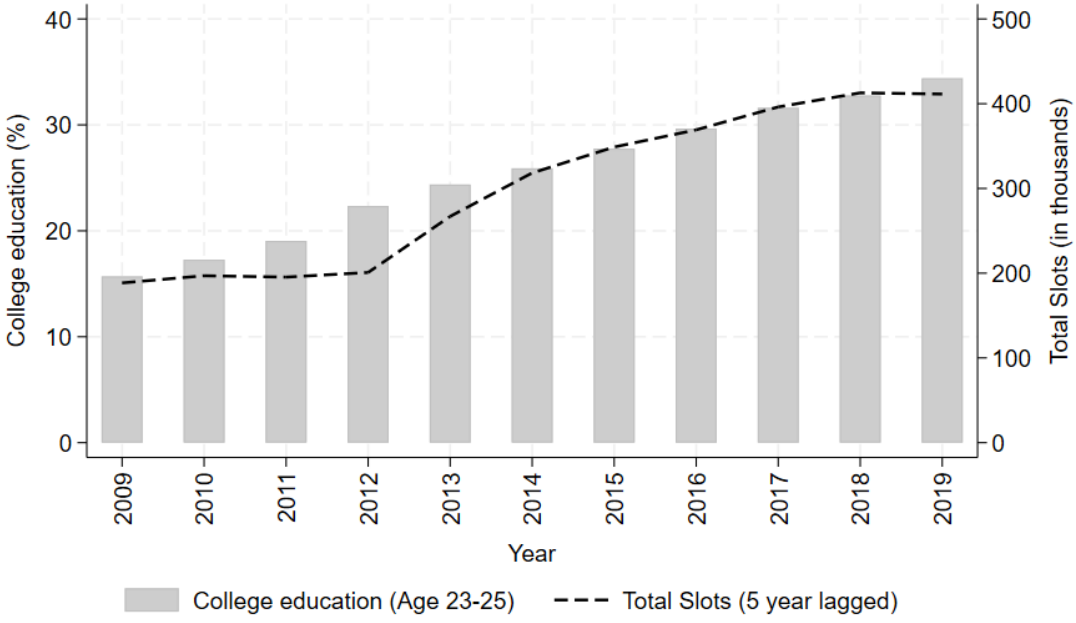
The first university in the country was founded in 1933, followed by a slow, gradual rise in the count of public universities over time until 1987 (Figure 1). The initial surge in the expansion of higher education occurred during 1992-1994. In these years, public universities were founded in 21 cities that previously lacked a university. As depicted in Figure A.1, this initial phase of Turkey's higher education expansion was concentrated in the more developed Western areas. Between 1992 and 2005, the number of public universities remained relatively constant, and the number of private universities slightly increased, as shown in Figure 1. In the second and stronger phase of higher education expansion, 41 new public universities were established between 2006 and 2008. This time, the expansion policy mostly focused on the less developed Eastern provinces that had no university prior to that date (see Figure A.1). As a result of this phase of expansion, the number of universities increased from 97 in 2005 to 138 by 2009 and 168 by 2012, while the number of available slots increased by around 60% by 2009 and doubled by 2013 compared to the slots in 2005. This second phase of higher education expansion is the focus of our study.

According to education statistics derived from Turkish Household Labor Force Surveys, presented in Figure 2, the rise in higher education attainment among 23–25-year-olds aligns closely with the increase in

total slots, lagged by five years. This reflects the typical duration of higher education (Valero and Van Reenen, 2019). The college education rates for individuals aged 23–25 saw a moderate increase from 16% in 2009 to 19% in 2011, a period during which the total slots for higher education remained relatively stable. Starting in 2012, as total slots began to increase steadily, college education rates experienced a sharp rise, reaching 34% by 2019, reflecting the significant impact of the higher education expansion during this period.

About the expansion in higher education, it is important to also note that it was politically motivated and driven by requests from members of the parliament to establish universities in their cities (Arap, 2010). According to the plans as of 2005, 25 new public universities were to be established, with the stated purpose of providing economic benefits to the regions of these new public universities. However, the Turkish general election to elect 550 members of the parliament was to be held in 2007. Due to pressures from members of the parliament who represented different cities and sought reelection, 16 more public universities were opened by 2008 than initially planned.

Figure 2: College education rates across years



3 Conceptual Framework

In this section, we consider the relevant conceptual perspectives that explain the underlying factors driving the observed association between higher education attainment and women's labor supply decisions, identify the causal mechanisms, and review the related empirical literature.

The observed correlation between female employment and education may not necessarily reflect a causal relationship due to the presence of both spurious positive and spurious negative associations. Bowen and Finegan (2015) highlight these complexities, acknowledging that such associations, alongside human capital

effects, contribute to the relationship between educational attainment and labor force participation.

Spurious positive associations arise when unobserved factors such as intelligence, ambition, or physical and mental health influence both educational attainment and labor force participation in the same direction. For instance, women with higher innate ability or stronger career motivation may be more likely to pursue higher education and participate in the labor market, creating an upward bias in ordinary least squares (OLS) estimates. This bias inflates the observed impact of education on employment outcomes, making it difficult to disentangle the true effect of education from the influence of these confounding factors.

Conversely, spurious negative associations may also distort the relationship between education and labor supply. Women from higher-income or more socioeconomically advantaged households may exhibit higher reservation wages and demand more favorable non-wage job characteristics, such as flexibility or job satisfaction, before choosing to enter the labor force. This selectivity could lead to an underrepresentation of highly educated women in the labor market, introducing a downward bias in OLS estimates. Such bias could obscure the true effect of education on labor force participation by conflating the impact of education with the preferences and constraints of more privileged individuals.

Societal attitudes and cultural norms surrounding gender roles can significantly influence women's educational attainment and labor market participation, often acting as formidable barriers to both. In societies with traditional gender norms, women may face restricted access to higher education due to expectations that prioritize domestic responsibilities or caregiving roles over personal development and professional aspirations (Goldin, 1989; Caner et al., 2016). For instance, families may be less inclined to invest in the education of daughters compared to sons, perceiving education as less valuable for women whose primary societal role is seen as caretakers or homemakers.

Similarly, these societal norms extend to the labor market, where traditional expectations regarding caregiving and domestic duties often discourage women from seeking or maintaining employment. Cultural expectations may pressure women to prioritize family responsibilities, leading to lower labor force participation, even among those who have attained higher education (Goldin, 1989). These societal and cultural factors act as confounding influences, shaping both women's educational attainment and their labor supply decisions.

However, there are also reasons to think that education changes individuals in ways that will affect their propensity to seek employment, which we refer to as the human capital effect. The most obvious point is that education increases a person's expected market earnings and thus increases the differential return between market and non-market activity; that is, the opportunity cost of staying out of the labor market is greater for a person with considerable education than for a person with relatively little education (Card, 2001). Specifically, the literature documents that individuals with higher education earn more relative to those with lower educational degrees, with numerous studies highlighting the persistence of this wage premium in developed economies (Goldin and Katz, 2009; Card and DiNardo, 2002; Acemoglu, 2003; Walker and Zhu, 2008; Crivellaro, 2014; Blundell et al., 2022). The additional wages earned by those with considerably higher levels of education may enable their market wage to exceed their reservation wage, facilitating labor market entry for women who might otherwise face barriers.

Beyond wages, the quality of employment gained through higher levels of education plays a pivotal role in shaping women's labor supply decisions. Women often value job stability and security more than men, prioritizing roles that offer contracts with lower dismissal potential over temporary ones (Wiswall and Zafar, 2016). College education may provide access to such favorable working conditions, which can act as an additional driver for labor market entry. Indeed, women's preference for stability and benefits often surpasses their sensitivity to wage increases, reflecting a strong demand for jobs that provide predictability and long-term security (Sloane et al., 2020). These considerations underscore the importance of better employment conditions as a key channel through which higher education may influence female labor supply.

In addition, higher education may enhance women's taste and aptitude for work by increasing their likelihood of accessing jobs that are less repetitive, involve more cognitive tasks, and offer greater autonomy. Research shows that recent advancements in information and communication technology have increased demand and wages for jobs requiring higher cognitive skills (Acemoglu, 2011; Minardi et al., 2023). These qualitative improvements in job characteristics are strongly associated with higher levels of job satisfaction (Martin, 2020; Martin and Omrani, 2015), making market work more appealing and encouraging sustained labor market participation. This highlights the broader impact of education, as it not only offers economic incentives but also improves job quality, granting individuals with higher levels of education greater access to such roles.

Finally, higher levels of education and prolonged exposure to a school environment may help mitigate the negative impacts of societal attitudes and cultural norms on female labor supply. With greater educational attainment, women are often better equipped to negotiate their roles within the family and broader society, enabling them to overcome cultural and normative barriers to labor market participation. These shifts are particularly significant in regions with low female labor force participation, where traditional norms have historically constrained women's access to both education and employment opportunities (Akyol and Ökten, 2022).

Predicting the overall impact of college education on women's labor supply is challenging due to potential biases in the observed relationship between education and employment. Higher education is associated with increased labor market participation, but unobserved factors such as ability, ambition, or socioeconomic background may influence both educational attainment and labor supply decisions. Furthermore, reverse causality may occur if women more inclined to participate in the labor market are also more likely to pursue higher education. These complexities highlight the need for empirical investigation to isolate the causal impact of college education on women's labor market outcomes, providing valuable insights for policies aimed at increasing women's labor force participation.

4 Data

Our primary dataset is the Turkish Household Labor Force Surveys (HLFS), conducted annually by Turkstat, Turkey's national statistics agency. The HLFS is a cross-sectional household survey, covering approximately 400,000 individuals from 150,000 households each year. It provides detailed information representative of the NUTS-2 level (26 regions of Turkey), including key demographic characteristics such as age, gender,

marital status, and household composition. The survey also collects comprehensive educational data, including school enrollment and the highest degree completed, as well as rich labor market information. These labor market variables encompass employment status, type of employment (e.g., paid employment, self-employment, unpaid family work), occupation, earnings, working hours, and industry of employment. This extensive dataset forms the foundation for analyzing the relationship between college education and female labor supply.

We aim to investigate early labor market outcomes for women shortly after completing college, specifically in the first five years after completing their higher education. While HLFS provides detailed data on educational attainment and labor market outcomes in the survey year, it does not include information on the timing of labor market entry or the year of graduation. To address this limitation, we base our timeline on typical educational milestones, assuming that individuals make higher education decisions at age 18—the typical age for high school graduation. To capture the educational opportunities available to women when making these decisions, we define a cohort variable indicating the year each observed individual turns 18. Following Valero and Van Reenen (2019), we further assume that individuals graduate and begin making labor market participation decisions approximately five years after enrollment, at around age 23. Based on these assumptions, we focus on the age range of 23–27, which captures women in their early career stages and minimizes the influence of major life events such as marriage and childbearing, which are known to significantly affect women's employment decisions (Goldin, 1989).

The expansion of higher education in Turkey, initiated in 2006 with the establishment of new universities, resulted in a gradual increase in university slots and enrollments rather than an immediate surge. To capture the effects of this expansion, our study focuses on cohorts from 2000 to 2013, where a cohort is defined as the year a woman makes her higher education decision (assumed to be at age 18, as explained above). To compare employment outcomes for cohorts exposed to the expansion policy with those who were not, we pool HLFS data from survey years 2005 to 2022 and construct a sample of women aged 23–27. This pooled design allows us to analyze labor market outcomes at similar life stages for both exposed and non-exposed cohorts, mitigating age-related effects and enabling robust comparisons. Additional details on sample composition by cohort definitions and survey year are provided in Table A.2 in the Appendix.

Given that our sample integrates multiple waves of the HLFS, the analysis is constrained by the variables consistently available across all survey years. The educational attainment information is drawn from the highest level of education completed, classified in the HLFS into five main categories across all waves of HLFS: no education, primary education, secondary education, vocational secondary education, and higher education or above. Based on this classification, we construct our primary educational variable of interest: a binary indicator, referred to as *education*, which takes the value of 1 if an individual has attained a university degree (corresponding to higher education or above) and 0 otherwise. This binary measure of educational attainment enables us to focus on the impact of completing a university degree, distinguishing it from other levels of educational attainment.

Our interest in the labor market outcomes of young women focuses primarily on their employment outcomes. HLFS provides multiple definitions of employment. The broadest category includes all forms of employment, such as paid employment, self-employment, employer status, and unpaid family work. Our first outcome variable *employment* is a binary indicator, taking the value of 1 if a woman is employed (excluding

unpaid family work) and 0 otherwise. While self-employment is technically considered a form of employment, it often lacks long-term stability and benefits like health insurance or retirement. Additionally, the share of women employers in the age group we study is very small. Therefore, we focus primarily on assessing whether college education increases the likelihood of securing paid employment among young women. To capture this specific type of employment, our second and primary outcome variable *paid employment* is defined as an indicator of being in paid employment.

Though our aim is to identify the impact of college education on female labor market outcomes, which primarily affects the supply side of the labor market, our analysis focuses on female employment rather than labor force participation for three key reasons. First, we focus on paid employment to examine whether college attainment increases the likelihood of women securing wage-earning jobs, as opposed to other types of employment such as unpaid family work or own-account workers. Tunalı et al. (2021) documents that in 2018, among employed women, 65.3% were wage earners, while 23.7% were unpaid family workers (predominantly in agriculture), and the remainder were own-account workers. The latter two employment types, though included in employment and labor force statistics, often lack continuity and access to social security, making them less stable and desirable forms of work (Bagir et al., 2023). Second, the labor force, in the short run, has a sizeable cyclical component. During periods of economic growth and rising wages, labor force participation tends to increase, particularly among young women and women aged 25–54, as more individuals enter or delay exiting the labor force. However, many of these entrants may temporarily remain unemployed, contributing to the unemployed component of the labor force. Given that our analysis spans multiple years, these cyclical variations in female labor supply present a notable concern. By focusing on employment rather than labor force participation, we mitigate the risk of such short-term fluctuations affecting our results, as the employment variable is less sensitive to cyclical trends. Finally, it is important to note that the definition of unemployment —and, by extension, labor force participation, which includes both employed and unemployed individuals— underwent changes in the Household Labor Force Surveys. Until 2013, unemployment was defined as not being employed and actively looking for a job within the last three months, whereas starting in 2014, the definition was revised to a narrower search window of one month.

In addition to paid employment, we examine high-skilled employment as a specific category of paid employment, using the ISCO-08 classification available in the HLFS. According to ILO (2012), educational requirements for occupations are classified by the 1-digit ISCO-08 codes. In this system, occupations coded as 1, 2, and 3 (including managers, professionals, technicians, and associate professionals) generally require higher education, while codes 4 to 9 (such as clerical support workers, service and sales workers, skilled agricultural and forestry workers, craft and trade workers, plant and machine operators, assemblers, and elementary occupations) typically require lower levels of education. Based on this classification, we define our third outcome variable, *high-skilled employment*, as a binary indicator that takes the value of 1 if a woman is employed in a high-skilled occupation and 0 otherwise. By analyzing high-skilled employment, we aim to assess the extent to which college education enables women to access roles that are aligned with their qualifications and offer greater earning potential.

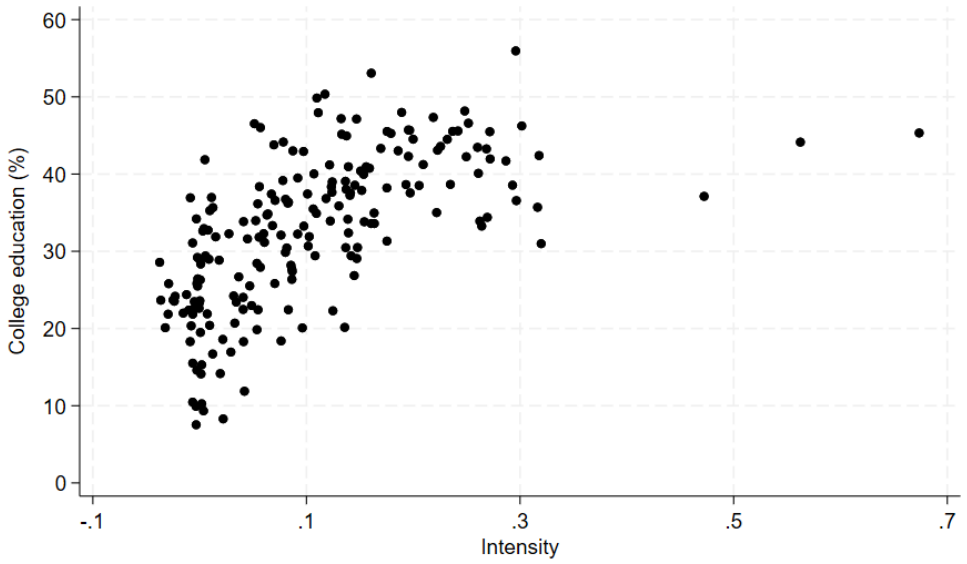
Our goal is to establish the causal effect of college education on female employment. Due to issues of omitted variable bias and reverse causality, as discussed conceptually in the previous section, OLS estimates cannot provide a reliable causal link between educational attainment and employment outcomes. To address

these challenges, we employ an instrumental variable strategy, leveraging the recent expansion of access to higher education in Turkey. As a first step, it is essential to establish the relationship between the expansionary policy and college education to validate the instrument and ensure its relevance.

To construct the instrument capturing variations in exposure to the expansion policy across cohorts and regions (as identified in the HLFS), we use data from the online almanacs of OSYM, which publish annual information on the number of available slots in all programs and universities. We collect and digitize data for the 2005–2013 period, including location identifiers at the province (NUTS-3) and regional (NUTS-2) levels. The available slots are aggregated at the NUTS-2 level to align with the HLFS microdata. Additionally, population figures from Turkstat are obtained to account for regional differences in the number of available slots in higher education.

Our instrument, referred to as *intensity*, measures exposure to higher education expansion for a given cohort in a given region. It is calculated as the increase in available university slots relative to the 2005 baseline (pre-expansion), divided by the number of 18-year-olds in that region. The numerator captures the supply shock in higher education, while the denominator captures the demand-side variations and accounts for scale differences across regions and cohorts. For example, for an individual in the 2010 cohort (age 18 in 2010) residing in the Konya region, intensity is calculated as the increase in public university slots in Konya from 2005 to 2010, divided by the number of 18-year-olds in Konya in 2010. Consistent with prior studies (Duflo, 2001; Berlinski et al., 2009), intensity is set to zero for cohorts from the pre-expansion period.

Figure 3: The correlation of female college education with intensity



Our measure of exposure to the expansion policy assumes that individuals observed in the HLFS benefited from higher education opportunities in their current region, as the survey does not provide information on migration history. However, migration for labor market opportunities poses a potential measurement issue, particularly in Istanbul, Türkiye's most populous city. According to Turkstat, 2–3% of Istanbul's population consists of annual in-migrants, with half citing better labor market opportunities as their primary motivation,

and an additional 15% migrating as tied movers for household-related job opportunities. To address this potential bias, we exclude Istanbul from all estimations.

Figure A.2 in the Appendix illustrates the spatial and temporal variations of our instrument, *intensity*, across Turkish regions in post-expansion years. The figure reveals significant changes in intensity both over time and across regions. Initially, higher education opportunities were few in many regions, but they generally increased along with the expansion policy.

Figure 3 displays the correlation between women's education and intensity at the region and cohort level. On the vertical axis, we show the average educational attainment of women in a specific cohort and region, while the horizontal axis represents the intensity for that cohort and region. The figure indicates a positive correlation between female educational attainment and intensity.

We additionally obtained economic data, gross domestic product (GDP) per capita, from Turkstat for Turkey's 26 NUTS-2 regions. These data are used to control for spatial and temporal variations in regional economic conditions across regions and years in our estimations.

5 The empirical methodology

We investigate the role of college education on female labor supply by the following model:

$$y_{irst} = \alpha_0 + \alpha_1 \text{Educ}_{irst} + \beta X_{irt} + \gamma_r + \gamma_s + \gamma_t + \epsilon_{irt} \tag{1}$$

where y_{irst} is the labor market outcome and $Educ_{irst}$ is the binary higher education attainment of individual i, belonging to cohort s, living in region r and observed in survey year t. The control variables include individual-specific control variables denoted by X_{irt}, region fixed effects γ_r, and cohort fixed effects γ_s and wave fixed effects γ_t.

In equation (1), we estimate the causal impact of college education on women's employment outcomes using an instrumental variables (IV) approach, leveraging the recent higher education expansion policy. This method addresses potential biases arising from unobserved differences among women, such as individual characteristics (e.g., ability, motivation), family background (e.g., socioeconomic status, parental education), and region-specific factors (e.g., cultural norms, local labor market conditions). Favorable characteristics, such as higher ability, motivation, and socioeconomic status, may simultaneously increase a woman's likelihood of both entering the labor market and pursuing higher education, creating a positive bias in an ordinary least squares (OLS) model. Conversely, the same favorable characteristics may raise a woman's reservation wage and her demand for better employment conditions, potentially leading to a negative bias in estimating the effect of university education on employment. As a result, the overall direction of this bias remains ambiguous.

In our setting, university exam takers cannot precisely anticipate the supply of available slots for their cohort or the geographic distribution of these slots before they apply to take the exam. Consequently, the changes in slot availability due to the expansion policy serve as exogenous shocks to university applicants. We use the exposure of different cohorts to varying educational opportunities—specifically, the variation

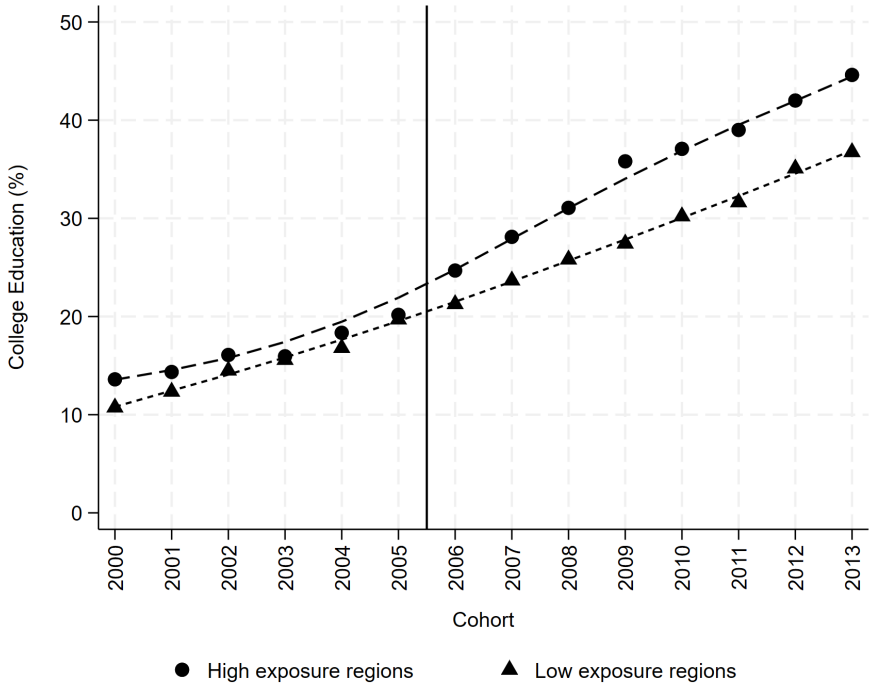
in the number of additional slots in universities relative to each cohort of young people—as an instrument for educational attainment. The underlying assumption for identification is that the reform created an unexpected, exogenous incentive that significantly influenced individuals' higher education attainment, with minimal direct impact on their labor market outcomes.

The validity of this instrument depends on its strong association with higher education attainment (Caner et al., 2024) and its limited impact on general employment factors, such as labor market conditions, job opportunities, and wages (the exclusion restriction). As previously discussed, the timing of the higher education expansion was exogenous to university exam applicants, and the scale of the expansion was substantial. These factors support the plausibility of the instrument, reinforcing that the expansion policy impacted educational attainment without directly influencing employment outcomes.

To address potential autocorrelation across cohorts (Bertrand et al., 2004) and dependence at the regional level (Abadie et al., 2017), we cluster standard errors at the cohort-by-region level. This adjustment ensures robust inference by accounting for correlated errors within each cohort and region, thus providing more reliable estimates of the causal impact of higher education on women's employment outcomes.

Our first-stage estimation examines the impact of an expansionary higher education policy on the educational attainment of the affected population. A common challenge in program evaluation is isolating the effects of compensatory interventions (Rosenzweig and Wolpin, 1986), as such interventions may be correlated with pre-existing trends in education. To address this concern, we assess the correlation between our intensity measure and variables reflecting education demand or labor market conditions in the years prior to the policy implementation.

Figure 4: College education across cohorts: High versus low intensity regions



First, we calculate the number of university exam takers per 18-year-old and higher education graduation rates for different age groups (25-34 to capture young adults, and 25-44 and 25-64 to provide a broader view of the working-age population) using the 2005 HLFS data, before the expansion. Next, we evaluate the number of higher education institutions and their capacities, focusing on the number of universities and available slots per 18-year-old in 2005, to determine whether the distribution of new educational opportunities is related to initial conditions.

Next, we incorporate data on gross domestic product (GDP per capita), overall labor productivity, and labor productivity in the manufacturing sector (including mining, quarrying, and utilities) to examine the relationship between the expansion and initial economic and labor market conditions across regions.[3] Our analysis finds no statistically significant relationship between the predictors and the intensity of the expansion in the late years of the expansion, suggesting that the initial (pre-reform) conditions do not violate our exogeneity assumption (see Table A.1 in the Appendix).

In our first-stage estimations, we identify the causal effect of the exposure to expansion by exploiting the spatial and temporal variations in the exposure to the expansion policy, with a difference in differences estimation (also known as two-way fixed effect model), similar to Card (1992), Duflo (2001), Berlinski et al. (2009), and Müller and Wrohlich (2020). One crucial identifying assumption embedded in these models is that the trends in enrollment among higher-intensity regions would have been the same as the trends in the comparison group of lower-intensity regions in the absence of the reform. In order to test the validity of this assumption, we check whether the high intensity and low intensity regions had parallel time-trends in educational attainment prior to the reform. We divide the regions into three groups based on their exposure intensity (use the increase in slots from 2005 to 2013) and call the regions that are in the bottom and top group as low and high intensity regions, respectively. We provide graphical evidence in Figure 4, to show that attainment rates in the pre-reform years (before 2006) were indeed moving together in the high and low-intensity regions. After 2006 a gap emerged between the two groups, in favor of high-intensity regions.

To refine our investigation on the pre-expansion parallel trends, we define a binary and time-invariant treatment group variable that takes the value 1 if the individual is residing in high intensity region, and 0 if in low intensity region.[4] This variable allows us to rely on the differential increase in educational attainment in treated versus untreated regions by considering the education supply increases over time for both treatment and control groups. We estimate the dynamic treatment effects by an event study model that includes the complete set of interactions of cohort dummies with the binary treatment variable, as well as controls for region and survey-year fixed effects.

Figure 5 presents the coefficient estimates for the interaction of treatment dummy with cohort dummies, capturing the differential increase in attainment for each cohort living in treated regions compared to the

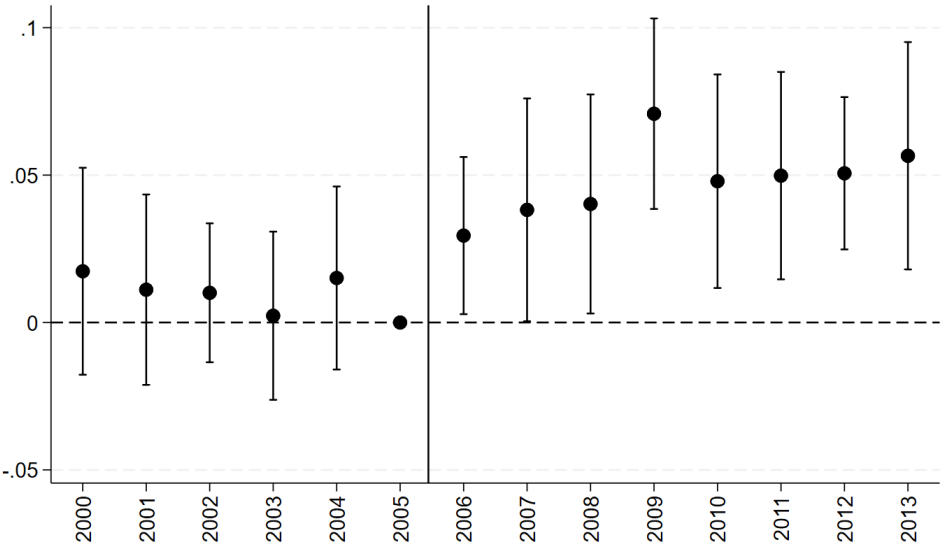
[3]Data on the 18-year-old population is available only from 2007 onward, so we estimate the population of 18-year-olds in 2005 by assuming the population growth rate among 18-year-olds from 2005 to 2007 was equivalent to the growth rate for the total population:

$$Pop18_{2005} = Pop18_{2007}\left(\frac{Pop_{2005}}{Pop_{2007}}\right)$$

where Pop_t and $Pop18_t$ represent the total population and the population of 18-year-olds in year t, respectively.

[4]Note that the ranking of regions by their intensities in different years is quite stable over time due to the staggered nature of the expansion policy.

Figure 5: The effect of higher education expansion: Event study analysis



same cohorts in control regions. The estimates for the pre-expansion cohorts are statistically zero for all cohorts, confirming the parallel trend assumption. The estimates for the post-expansion cohorts are positive and statistically significant with larger estimates for later cohorts. In other words, the rising differences over time between high and low intensity regions lead to significantly higher educational attainment for women in treated versus untreated regions.

6 Results

We estimate equation (1) for each labor market outcome, with the results for women aged 23-27 presented in Table 1. Columns (1) and (3) show the ordinary least squares (OLS) estimation results, where the outcome variables are employment and paid employment, respectively. The findings indicate a significant positive association between completing a college degree and being employed (both overall and in paid employment). The effect size is approximately 33 percentage points for both outcomes.

As discussed earlier in Section 3, the OLS results may be biased due to endogeneity and reverse causality. To address these issues and to get the causal effect of completing a higher education degree on employment, we instrument the college degree with the available higher education opportunities. As presented in Panel B of Table 1, the increased opportunities are a strong predictor of college education. The F-statistic from the first-stage analysis is 41.154, well above the threshold recommended by Staiger and Stock (1997), confirming that our instrument is strongly related to the endogenous education variable. While our first stage F-statistic exceeds the threshold recommended by Staiger and Stock (1997), recent work by Lee et al. (2022) and Keane and Neal (2023) suggests that caution should be exercised when interpreting the significance and inference of the endogenous variable. Specifically, Lee et al. (2022) recommends a first-stage F-statistic threshold of 104.7, which is not met for our instrument. To address this concern, we conduct additional checks on the

Table 1: The effect of college education on female labor supply

	Dependent variables					
	Employment		*Paid employment*		*High skill employment*	
	(OLS)	(IV)	(OLS)	(IV)	(OLS)	(IV)
Education	0.326***	0.291***	0.331***	0.360***	0.305***	0.188**
	(0.005)	(0.107)	(0.005)	(0.100)	(0.004)	(0.077)
AR conf. set (95%)		[.067, .499]		[.150, .554]		[.021, .337]
tF conf. set (95%)		[.055, .528]		[.139, .581]		[.018, .358]
Mean dependent variable		0.239		0.220		0.096
First stage:	*Dependent variable: Education*					
Exposure		0.277***		0.277***		0.277***
F-statistic		41.154		41.154		41.154
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
GDP per capita	Yes	Yes	Yes	Yes	Yes	Yes
Observations	225,140					

Notes: The sample includes cohorts from 2000-2013 when they were aged 23-27. The standard errors clustered at cohort by region level are given in round parentheses with the patterns of p-values denoted by * for p<0.1, ** for p<0.05, and *** for p<0.01.

sensitivity of the second-stage results using the Anderson–Rubin (AR) test Keane and Neal (2023) and the tF-procedure described in Lee et al. (2022). These tests are conducted in a just-identified setting with one endogenous regressor.

The IV results are presented in columns (2) and (4). These findings indicate that higher education has a positive and significant causal effect on female labor supply. Women who gained access to higher education through expanded opportunities are 29 percentage points more likely to be employed and 36 percentage points more likely to be in paid employment. This highlights the substantial causal impact of higher education on increasing women's participation in the labor market.

The results indicate that OLS slightly overestimates the impact of a college degree on overall employment while underestimating its effect on paid employment. The larger gains in paid employment suggest a shift away from less stable forms of work, such as self-employment, due to college education. The compliers of the expansion policy —women who faced greater financial or psychological barriers to attending college— are likely to experience different outcomes. Women constrained by financial costs are more likely to enter the labor market, while those with higher psychic costs may be less inclined. The fact that the IV estimate for paid employment exceeds the OLS estimate suggests that financial barriers may play a larger role or that longer exposure to education reduces the psychic costs associated with entering paid employment.

Next, we examine the alignment between the type of employment and educational attainment by focusing exclusively on paid employment. To evaluate the quality of this match, we use the occupation codes from the ISCO-08 classification assigned to individuals identified as paid workers and introduce a binary high-skill employment variable.

Drawing on the ILO's classification of occupations based on required education[5], we define *high-skill* employment as a binary variable. It takes the value 1 if an individual is employed in an occupation that necessitates a university degree and 0 if the occupation does not require higher education or if the individual is not in paid employment.

According to the OLS estimates reported in Table 1, higher education is positively and significantly associated with high-skilled employment. The effect size is slightly smaller than overall paid employment, with 31 ppt. However, the IV estimates, which capture the causal impact of college education on high-skilled employment, are notably smaller, at 19 ppt. These findings suggest that the OLS estimates are upwardly biased in this case, in contrast to our earlier findings on overall paid employment.

Our findings indicate that expanding educational opportunities has successfully increased workforce participation among women, with many taking on paid employment and contributing actively to the labor market. This shift represents a substantial gain in labor market attachment, especially in contexts where women face barriers to employment. However, while more educated women are entering the workforce, many may not fully utilize their education in high-skilled positions. One possible explanation for the limited growth in high-skilled employment is a mismatch between the supply of college graduates and the demand for high-skilled jobs. As more people (not only limited to women) attain higher education, the labor market might struggle to keep pace in the short run, leading to an oversupply of educated workers relative to the available high-skilled roles. This imbalance suggests that educational expansion may have outpaced the labor market's capacity to provide corresponding high-skill employment opportunities, leaving some graduates in roles below their skill level.

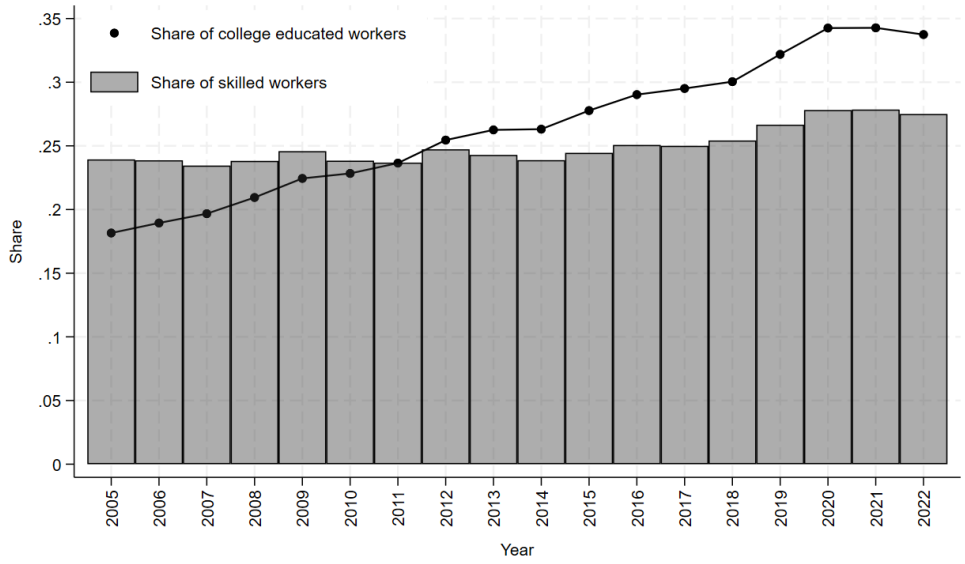
To investigate whether this mismatch contributes to the observed lower returns to completing a university degree in terms of high-skilled employment, we examine key summary statistics. First, we compare the evolution of the share of skilled workers among all paid employees to the evolution of college-educated workers among paid employees (see Figure 6 (a)). Second, we narrowed the focus to the age range of our sample (23-27-year-olds) to assess whether the trend differs for younger workers (Figure 6 (b)).

For the entire workforce, the share of skilled workers increased from 24% to 27% over the period of our analysis, while the proportion of college-educated workers rose substantially from 18% to 33%. Examining the details, we observe that the share of college-educated workers in the entire labor force first exceeds the share of skilled jobs in 2011 (the year when the first exposed cohort, 2006, is expected to enter the labor market after five years), and continues to increase in later years, while the share of skilled jobs remains relatively stable. When focusing on younger workers, the disparity is even more pronounced: the share of skilled workers grew from 24% to 32%, while the share of college graduates jumped from 21% to 42%, with most of this increase occurring among post-expansion cohorts.

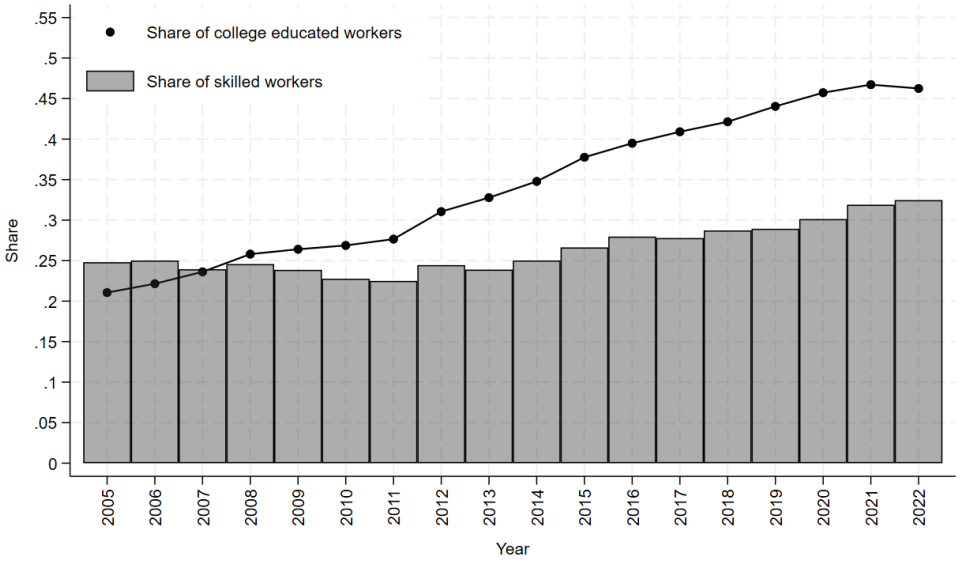
These findings suggest that the labor market has not generated enough high-skill jobs to match the recent surge in college-educated workers, particularly among young workers entering the labor force. As a result,

[5]ILO (2012) identifies the required educational attainment for occupations by the 1-digit ISCO-08 classification. In this system, occupations coded as 1, 2, and 3 (managers, professionals, technicians, and associate professionals) typically require higher education, while codes 4 to 9 (clerical support workers, service and sales workers, skilled agricultural, forestry, and fishery workers, craft and related trades workers, plant and machine operators, assemblers, and elementary occupations) require lower levels of education.

Figure 6: The comparison of demand and supply of skilled jobs in the labor market



(a) Entire labor force



(b) Young workers (Aged 23-27)

the labor market is experiencing a growing skill mismatch, where the increase in educational attainment is not fully translating into high-skill employment, especially for recent graduates. This lower return to education in terms of high-skilled employment raises an important question: if complier women are unable to secure high-skilled jobs, why are they still entering the labor market? This question becomes particularly relevant given our finding that the returns to education in paid employment are almost twice as large as the returns for high-skilled employment.

7 Mechanisms

The substantial gains in paid employment for women who accessed higher education through policy reform highlight the need to explore the mechanisms driving these outcomes. This section examines several potential factors that may have contributed to the observed increase in workforce participation, even if many of these jobs are not high-skilled positions. First, women with college education may benefit from the *sheepskin effect*, where a diploma itself, regardless of job type, enhances their earning potential and allows them to secure wages above their reservation wage. Second, higher education can open doors to more favorable job characteristics, such as formal, full-time, and permanent positions, which provide greater stability and benefits. Finally, education may enhance women's bargaining power within the household, allowing for greater autonomy in employment decisions and encouraging workforce participation. Each of these mechanisms will be discussed in detail in this section to better understand the factors driving the observed paid employment gains.

7.1 The wage premium of education: The role of increased earnings in labor market entry

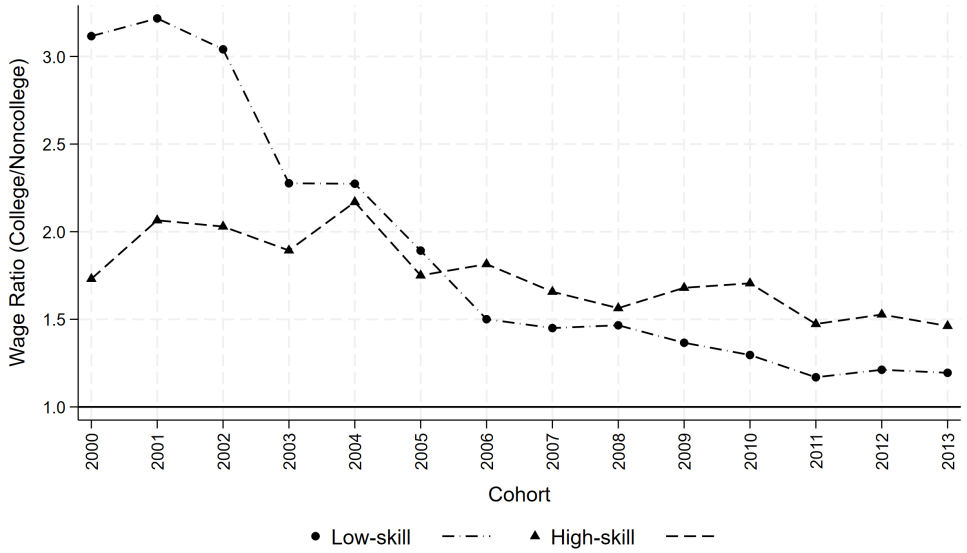
It is well documented that individuals with higher education earn more relative to those with lower educational degrees, with numerous studies highlighting the persistence of this wage premium in developed economies (Goldin and Katz, 2009; Acemoglu, 2003; Card and DiNardo, 2002; Blundell et al., 2022; Walker and Zhu, 2008; Crivellaro, 2014). The additional wages earned by college graduates may enable their market wage to exceed their reservation wage, facilitating labor market entry for women who might otherwise face barriers. However, recent studies also reveal that many college graduates are employed in positions that neither require a degree nor fully utilize the skills gained through higher education (Sloane et al., 2020). As a result of these growing labor mismatches, overeducated individuals tend to receive lower wages and report less job satisfaction compared to their well-matched peers (Hartog, 2000; McGuinness, 2006).

To investigate wage differentials by educational attainment across low- and high-skilled employment, we present the mean hourly wage ratios of college graduates to non-college graduates for these two employment types in our sample. Figure 7 illustrates these wage ratios, comparing college graduates and non-college graduates employed in high- and low-skilled jobs over various cohorts.

The graph reveals that for pre-expansion cohorts, college graduates in high-skilled jobs earned nearly twice as much as their peers without a college degree in similar roles, indicating a substantial college wage premium. However, this premium shows a gradual decline with the educational expansion, as evidenced by the falling wage ratio beginning with the 2007 cohort. By the latest cohorts, college graduates in high-skilled employment earn only about 50% more than their non-college-educated counterparts.

In low-skilled employment, a similar trend is observed but with an initially larger wage premium. For pre-expansion cohorts, college graduates earned approximately three times as much as their peers without a degree in low-skilled roles, reflecting a significant wage advantage for higher education. This premium steadily declines over time, with an accelerated reduction among post-expansion cohorts. For the most recent cohorts, the wage premium for college graduates in low-skilled jobs has nearly vanished, as indicated

Figure 7: The evolution of wage differentials: High vs. low skilled employment



by the wage ratio converging to 1. This suggests that for low-skilled employment, the value of a college degree in terms of wage advantage has diminished significantly in the post-expansion period.

In summary, the wage gains associated with higher education are evident in both high- and low-skilled employment, suggesting that a college degree provides a clear income advantage. This wage premium can help college-educated individuals secure earnings that exceed their reservation wage, facilitating entry into the labor market. However, the wage gains are now more pronounced in high-skilled employment, where college graduates continue to enjoy an income boost, albeit at a reduced rate compared to earlier cohorts. For those in low-skilled jobs, the wage premium has diminished significantly over time, providing only a marginal increase in earnings relative to their non-college-educated peers. These findings underscore the changing landscape of the college wage premium, which remains valuable but is increasingly concentrated in high-skilled employment.

7.2 Education and the pursuit of stable employment: formal, full-time, and permanent employment returns

Research indicates that women often prioritize stable and secure employment more than men, particularly seeking a better work-life balance when entering the labor market (Wiswall and Zafar, 2016, 2021; Verick, 2014; Majbouri, 2023). Wiswall and Zafar (2016) found that women demonstrate a higher willingness to pay for jobs that offer greater stability, whereas men tend to prioritize opportunities with higher earnings growth. Women are also more likely to work in jobs for which they are overeducated if those positions provide non-financial benefits, such as job security and predictable hours (Sloane et al., 2020). Collectively, these findings underscore the importance of job stability and quality in women's employment decisions. In this section, we examine the potential causal effects of education on the nature of paid employment, focusing on distinctions between full-time and part-time roles, formal and informal work, and permanent

versus temporary employment.

To differentiate these employment categories, we use binary variables to ensure clear distinctions. Each category divides employment status into two distinct groups. For instance, we categorize employment into formal (assigned a value of zero for informal or unemployed individuals) and informal categories (assigned a value of one for informally employed individuals). This methodology allows us to precisely measure the effects of college education on employment types, as detailed in Table 2.

Table 2: The effect of college education on job quality

Panel A: Full-time versus part-time employment	*Dependent variables*			
	Full-time employment		*Part-time employment*	
	(OLS)	(IV)	(OLS)	(IV)
Education	0.308***	0.395***	0.023***	-0.035
	(0.005)	(0.099)	(0.001)	(0.029)
AR conf. set (95%)		[.195, .595]		[-.103, .0167]
tF conf. set (95%)		[.176, .615]		[-.099, .029]
Mean dependent variable		0.206		0.014
Panel B: Formal versus informal employment	*Dependent variables*			
	Formal employment		*Informal employment*	
	(OLS)	(IV)	(OLS)	(IV)
Education	0.344***	0.402***	-0.013***	-0.042
	(0.005)	(0.091)	(0.001)	(0.050)
AR conf. set (95%)		[.212, .579]		[-.146, .058]
tF conf. set (95%)		[.202, .603]		[-.152, .067]
Mean dependent variable		0.190		0.031
Panel C: Permanent versus temporary employment	*Dependent variables*			
	Permanent employment		*Temporary employment*	
	(OLS)	(IV)	(OLS)	(IV)
Education	0.309***	0.350***	0.022***	0.010
	(0.005)	(0.094)	(0.001)	(0.039)
AR conf. set (95%)		[.144, .533]		[-.068, .091]
tF conf. set (95%)		[.141, .5593]		[-.075, .0961]
Mean dependent variable		0.197		0.023
Region fixed effects	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes
GDP per capita	Yes	Yes	Yes	Yes
Observations		225,140		225,140

Notes: The sample includes cohorts from 2000-2013 when they were aged 23-27. The standard errors clustered at cohort by region level are given in round parentheses with the patterns of p-values denoted by * for p<0.1, ** for p<0.05, and *** for p<0.01.

Panel A of Table 2 illustrates that college education significantly increases the likelihood of full-time employment by approximately 40 percentage points. The absence of an effect on part-time employment, despite significant OLS estimates, suggests possible biases from external factors like family background or non-labor income. We argue that individuals from wealthier families, who are more likely to attain higher education, may also prefer part-time work. The IV approach corrects this bias, revealing a stronger causal impact of college education on full-time employment without affecting the probability of part-time

employment.

In Panel B, our analysis shows a notable increase in the probability of formal employment by 40 percentage points, exceeding the OLS estimate while having no effect on informal employment. Although the OLS estimates for informal employment are negatively significant, the IV estimates show no causal impact, suggesting that the OLS findings may be biased by omitted variables like family income, ability, or ambition. These unobserved factors may drive both higher educational attainment and lower likelihood of informal employment.

Panel C reveals a positive and significant effect of college education on securing permanent employment, with an increase of 35 percentage points—slightly higher than the OLS estimate. Although college education is positively associated with temporary employment in the OLS estimates, the IV regressions show no significant causal effect, indicating that external factors might be confounding this association.

Comparing these findings to our IV estimate for paid employment (36 percentage points), we see that the returns to more favorable and stable employment types, such as full-time, formal, and permanent positions, exceed the returns to paid employment overall. These effects are also well above the returns to high-skill employment, which are estimated at 18 percentage points. This comparison underscores that access to better employment conditions is one of the main contributors to women's workforce entry, as college education not only facilitates labor market participation but also improves job quality and stability. Thus, beyond income and employment gains, the prospect of securing favorable employment conditions plays a crucial role in motivating college-educated women to enter the workforce, even when their roles do not fully align with their educational qualifications.

7.3 Women empowerment: Non-pecuniary returns to education

This subsection explores the non-pecuniary returns to education, particularly those that contribute to women's empowerment. While much of the literature on education emphasizes its economic benefits, education also plays a crucial role in enhancing women's autonomy, bargaining power, and decision-making capacity within the household. Non-pecuniary gains, such as the ability to make independent life choices, exert influence within the household, and access greater autonomy, are fundamental aspects of empowerment. Here, we interpret women's empowerment as a reduction in social and cultural barriers to female employment, with education serving as a mechanism to promote agency and independence.

Using a limited set of variables from the labor force survey data, we examine indicators that capture empowerment-related outcomes, focusing on aspects such as delayed marriage, living arrangements, household composition, and women's roles within the household. These indicators provide insight into how educational attainment enables women to overcome traditional constraints and strengthens their capacity to make personal and household decisions.

To capture aspects of women's empowerment, we define a set of binary variables that reflect different dimensions of autonomy and decision-making power. The first variable, never married, is an indicator of whether an individual has not been married by the survey age. The HLFS categorizes marital status into four groups: never married, married, divorced, and widowed. Based on this categorization, we define the

never married variable to take a value of 1 if the individual is never married and 0 otherwise.

The results for this indicator are reported in the first column of Table 1, using the educational expansion as an instrument for education. Our IV estimates indicate that completing a higher education degree increases the probability of never being married at ages 23–27 by 36 percentage points for women who are compliers of the expansion policy. This impact of education on delaying marriage is statistically significant, with an effect size comparable to our estimates for paid employment outcomes and substantially larger than the estimates for high-skilled employment. These findings suggest that higher education provides women with greater autonomy, potentially enabling them to delay marriage and prioritize personal or professional goals. This delay in marriage can be seen as an empowerment effect, as it reflects an ability to make independent life choices that might otherwise be constrained by traditional expectations.

Table 3: The effect of college education on women empowerment

	Dependent variables			
	Never married	*Living with parents*	*Household head*	*More educated*
Education	0.355***	0.252*	0.142**	0.485***
	(0.128)	(0.135)	(0.064)	(0.168)
AR conf. set (95%)	[.097, .622]	[-.020, .534]	[.023, .291]	[.160, .851]
AR conf. set (90%)	[.137, .572]	[.033, .481]	[.043, .261]	[.212, .785]
tF conf. set (95%)	[.071, .637]	[-.046, .549]	[.001, .283]	[.114, .857]
Mean dependent variable	0.370	0.362	0.037	0.665
Region fixed effects	Yes	Yes	Yes	Yes
Cohort fixed effects	Yes	Yes	Yes	Yes
Wave fixed effects	Yes	Yes	Yes	Yes
GDP per capita	Yes	Yes	Yes	Yes
Observations	225,140			

Notes: The sample includes cohorts from 2000-2013 when they were aged 23-27. The standard errors clustered at cohort by region level are given in round parentheses with the patterns of p-values denoted by * for p<0.1, ** for p<0.05, and *** for p<0.01.

The next natural question pertains to fertility, as fertility is a key determinant of female labor supply, a relationship that has been well-established in both developed and developing country contexts (Angrist and Evans, 1998; Jacobsen et al., 1999; Cruces and Galiani, 2007). However, our data does not allow us to investigate fertility outcomes directly. In several waves of the HLFS (2014–2020), only working-age household members are surveyed, and even when younger individuals are surveyed, it is not always possible to identify the mother or father of the child. As a result, our dataset lacks the necessary information to explore fertility outcomes comprehensively. Nevertheless, delaying marriage logically implies a delay in fertility for women who are compliers of the expansion policy, particularly in the early years of their careers. Indeed, studies such as (Osili and Long, 2008; Chicoine, 2012) have documented similar patterns, showing that additional educational attainment often leads to delayed marriage and fertility. Thus, it is reasonable to infer that the educational gains experienced by these women contribute to a postponement of both marriage and childbearing.

After establishing that women are delaying marriage and potentially postponing childbearing in their early career years, we further investigate how their living arrangements change with the additional education they have attained. Given the shifts in marital and fertility choices, it is likely that educational attainment also impacts living arrangements. The most common living arrangement for these women is residing with

their parents, with the next most likely alternative being living independently as the head of their own household. To capture these likely alternatives, we define two binary indicator variables: living with parents and household head. The living with parents variable takes a value of 1 if the individual resides with her mother, father, or both, while the household head variable takes a value of 1 if the individual is the head of the household in which she lives. These indicators allow us to analyze how educational attainment influences the choice between co-residence with parents and independent living arrangements.

Our results on the impact of education on living with parents and household headship are presented in the second and third columns of Table 3. The IV estimates indicate that education increases the probability of living with parents by 25 percentage points, though this effect is only weakly significant. To confirm this weak significance, we also provide the Anderson-Rubin (AR) confidence set at a 90% level. The magnitude of this effect is smaller than the impact on never being married, suggesting that some women who delay marriage choose alternative living arrangements rather than remaining with their parents.

To examine these alternative arrangements, we look at the likelihood of being a household head, as shown in column three. The results indicate that education increases the probability of being a household head by 14 percentage points. Given that the mean level of household headship is particularly low in our sample (only 4 percent), this increase represents a substantial shift, highlighting that college education provides more independent living arrangements for women who attained higher education due to the expansion policy.

The empowerment gains discussed here suggest that women are likely to have higher bargaining power within their households, which may help explain the substantial paid employment gains associated with college education, even though gains in high-skilled employment are limited. To further assess their power status within the household and better understand these results, we investigate whether attaining a college education enables women to achieve a higher level of educational attainment than other males residing in the same household.

For this purpose, we determine the highest level of education among male household members and use this information to define a binary indicator variable, highest education. This variable takes a value of 1 if the woman has an educational level equal to or higher than the most educated male in the household, or if there are no male members residing in the household. This indicator can be viewed as a more direct measure of the woman's bargaining power within the household, particularly with regard to employment decisions, as it reflects her relative educational standing compared to other household members.

Our result on the impact of education on achieving a higher level of education than males in the household, presented in the fourth column, indicates that attaining higher education increases the likelihood of women having an educational level equal to or higher than that of the most educated male in their household by 49 percentage points. This substantial effect suggests a significant power shift benefiting young women who are compliers of the expansion policy. The effect size is 74% of the mean of the dependent variable and is strongly significant, supporting our argument that higher education empowers women within their households, enhancing their bargaining power and influence over decisions.

Our findings suggest that higher education contributes significantly to women's empowerment by enhancing their autonomy and bargaining power within the household. Our findings show that college-educated

women are more likely to delay marriage, live independently, and achieve an education level equal to or higher than that of male household members. These shifts not only promote female labor force participation but also enable women to make decisions aligned with their personal and professional goals, highlighting the broader social impact of educational expansion.

8 Conclusion

Despite global increases in female employment rates, significant gender disparities persist in work opportunities and income. The global labor force participation rate for women remains just over 50 percent, compared to 80 percent for men. Women are more likely to be employed in informal or insecure roles and face limited opportunities for career progression or business expansion. When women do work, they tend to earn less than their male counterparts. Addressing these disparities and understanding the factors influencing female labor supply remain critical for effective economic policy design.

This paper sheds light on the role of higher education in shaping women's labor supply decisions, utilizing Turkey's higher education expansion as an instrument. The expansion of higher education in Turkey, a rapid and politically motivated initiative, served as a unique natural experiment, allowing us to isolate the effects of increased educational opportunities on female employment. Our findings demonstrate that college education significantly increases women's labor market participation. College-educated women are more likely to be employed overall, with a 36 percentage-point increase in the likelihood of paid employment. Additionally, higher education leads to substantial gains in job quality, increasing the probability of securing formal, full-time, and permanent positions by 40, 40, and 35 percentage points, respectively. These results emphasize the role of better working conditions in driving labor market attachment among women.

However, a notable skill mismatch emerges, as many college-educated women find employment in roles that do not require a degree. This reflects broader challenges in labor markets where the supply of educated workers exceeds the demand for high-skilled jobs, particularly in developing countries. Despite this, the strong returns to paid employment suggest that higher education remains a critical tool for improving women's economic opportunities and reducing barriers to labor market participation. Moreover, our research sheds light on the broader societal benefits of educational expansion, suggesting that increased access to higher education for women not only enhances their individual economic prospects but also strengthens their societal bargaining power.

Overall, this study underscores the transformative potential of expanding access to higher education for women, particularly in contexts where traditional norms and structural barriers have historically limited their access to both education and the labor market. By increasing access to education, policymakers can foster greater gender equity in labor markets and unlock the untapped economic potential of women's participation.

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Appendix

Figure A.1: Distribution of universities across provinces: Timeline of university establishment

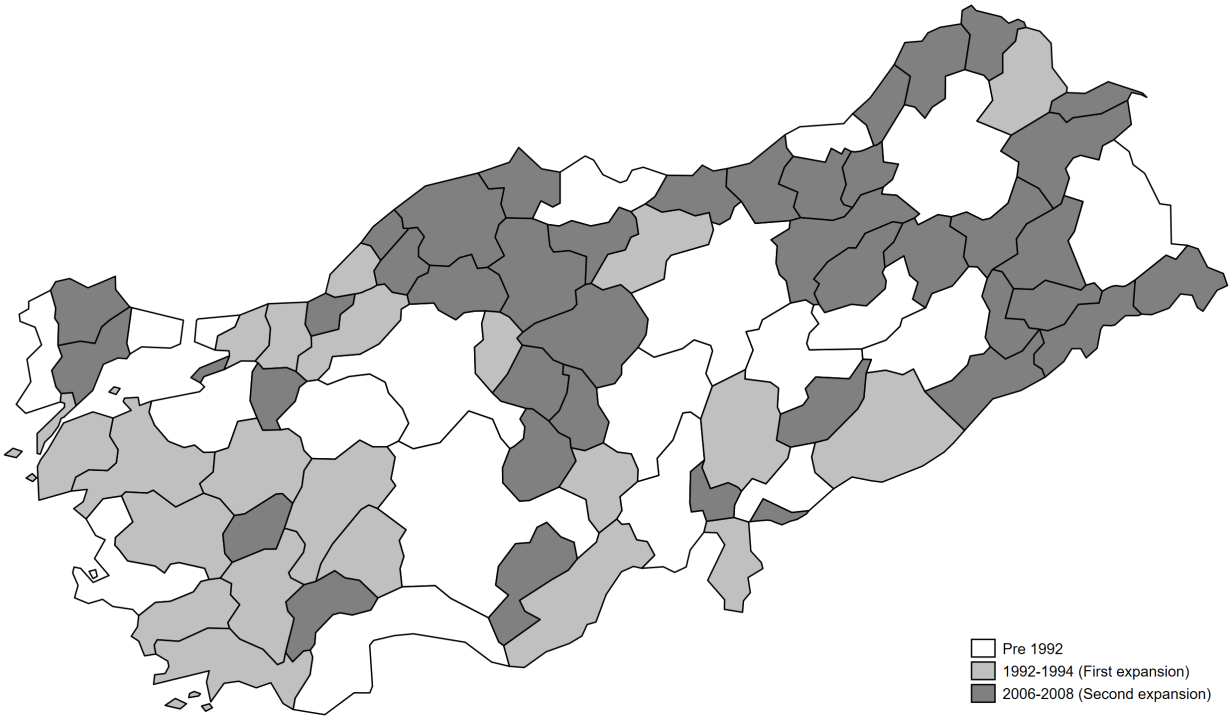

Table A.1: Exogeneity of education and labor market indicators to intensity measure

	Dependent variables:							
	College education for aged 25-34	College education for aged 25-44	College education for aged 25-64	Number of universities	Available slots per 18-year-old population	GDP per capita	Labor productivity	Industry productivity
Intensity in 2006	0.302	0.172	0.387	1.112**	0.622	0.111**	0.097	0.069
	(0.481)	(0.426)	(0.413)	(0.511)	(1.698)	(0.047)	(0.105)	(0.070)
Intensity in 2007	0.069	0.013	0.189	0.692	0.146	0.086**	0.069	0.044
	(0.412)	(0.363)	(0.355)	(0.454)	(1.447)	(0.041)	(0.089)	(0.060)
Intensity in 2008	0.416**	0.396**	0.328**	0.597***	2.095***	0.047**	0.077*	0.062**
	(0.174)	(0.150)	(0.153)	(0.187)	(0.522)	(0.019)	(0.040)	(0.025)
Intensity in 2009	0.122	0.122	0.075	0.190	0.912***	0.007	0.007	0.022
	(0.101)	(0.088)	(0.089)	(0.113)	(0.311)	(0.011)	(0.023)	(0.015)
Intensity in 2010	0.025	0.033	-0.004	0.033	0.269	-0.004	-0.008	-0.000
	(0.073)	(0.064)	(0.063)	(0.084)	(0.250)	(0.008)	(0.016)	(0.011)
Intensity in 2011	0.029	0.035	0.004	0.034	0.187	-0.001	-0.006	-0.002
	(0.061)	(0.053)	(0.053)	(0.070)	(0.211)	(0.007)	(0.013)	(0.009)
Intensity in 2012	0.038	0.042	0.019	0.031	0.151	0.000	-0.003	-0.002
	(0.053)	(0.046)	(0.046)	(0.062)	(0.186)	(0.006)	(0.012)	(0.008)
Intensity in 2013	0.025	0.029	0.011	0.016	0.106	-0.000	-0.003	-0.002
	(0.045)	(0.040)	(0.039)	(0.052)	(0.158)	(0.005)	(0.010)	(0.007)
Observations	25	25	25	25	25	25	25	25

Notes: The standard errors are given in round parentheses with the patterns of p-values denoted by * for p<0.1, ** for p<0.05, and *** for p<0.01.

Table A.2: Sample of interest: 23-27-year-old women

	Household Labor Force Survey - Waves																	
Cohorts	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2000	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-	-	-	-	-	-
2001	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-	-
2008	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-	-
2010	-	-	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**	-
2013	-	-	-	-	-	-	-	-	-	-	-	-	-	**23**	**24**	**25**	**26**	**27**

Figure A.2: Spatial and temporal variation in exposure to expansion policy (Intensity)

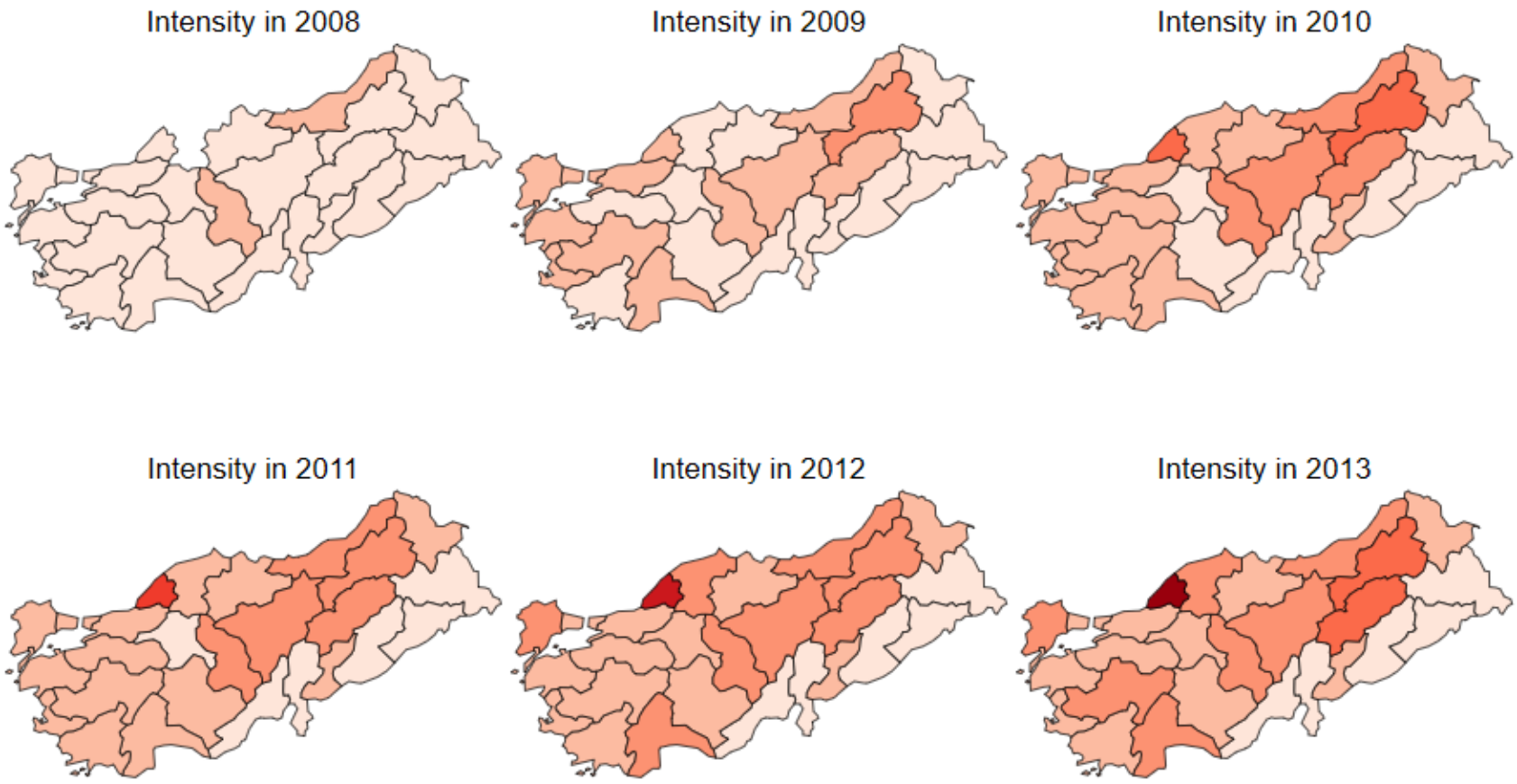

Figure A.3: The evolution of wages across cohorts: Workers with and without a college degree, in high versus low-skill jobs