Gender, Family and Academic Careers in Turkey

Abstract

Turkey has a remarkably high proportion of female full professors in its universities and in scientific fields (STEM) that are traditionally dominated by men in other countries. This could reflect a great deal of occupational gender equality but there has been a debate whether this equality came at the expense of family life. With the expansion of academia in the late 1990s and the erosion of childcare availability, whether institutional or familial, more recent cohorts of female academics may be paying a greater family penalty than their predecessors. We investigate these conjectures using the Turkish Academic Career Survey (TAC) - an original retrospective life-history study conducted in 2007 with a representative sample of around 4500 academics. We focus on the relationship between career progression and the family transitions of academics and analyze whether this relationship varies by scientific field and if professors advanced in rank during different stages of higher education's expansion in Turkey. We find a considerable gender gap in family formation outcomes of Turkish academics in all fields. Furthermore, we find that female academics that completed their PhDs after 1999 were not considerably at a higher risk of postponing parenthood compared to those who obtained their PhD's before the higher education expansion occurred.

I. Introduction

We study the family formation processes of male and female academics in Turkey and analyze whether their progression up the academic ranks is associated with their family formation outcomes, namely partnership formation, transition to parenthood, and second-births. Using a retrospective life-history dataset that is a large and representative sample of academics, we analyze whether these relationships vary by scientific field and when the academics experienced promotion with respect to the different stages of higher education expansion in Turkey.

Our study is motivated by three observations of the literature. First, while there is a long tradition of multi-disciplinary research that examines whether family processes affect career advancement and the productivity of academic women (see the literature reviewed earlier in Long and Fox, 1995; and more recently in Hermanowicz, 2012), few researchers have turned their attention to the reverse relationship and investigated whether the career progression of female academics and scientists shapes their family formation processes and outcomes (e.g. see Long, 2001 Mason, Wolfinger and Goulden, 2013; Buber, Berghammer, Prskawtez, 2011). These few studies indicate that even in fields where relative equality is achieved in terms of female-to-male ratios across academic ranks, female academics are more likely to pay a family penalty and are disadvantaged in terms of family formation outcomes. Leaving out the inequality in family outcomes from the analysis of sex-segregation in scientific and academic careers yields an incomplete picture of the gender inequality experienced in these careers (Mason, Wolfinger and Goulden, 2013).

Second, the vast majority of quantitative evidence for family processes of academic women concerns the USA, where the level of horizontal (i.e. across fields) and vertical (i.e. across ranks) sex-segregation is lower than in other OECD countries (OECD 2006). While there are very few studies with large samples from other advanced economies (e.g. Buber, Berghammer, Prskawtez, 2011 for Austria; and Probert, 2005 for Australia), we know of no studies focusing on family formation patterns of academic women and women in scientific careers in industrializing countries or emerging market economies.

This is regrettable because these countries differ dramatically from the US and other advanced economies on a number of dimensions which limits the generalizability of the previous studies. For example, in these countries, family formation processes and their

determinants are very different (Coale, 1984: Caldwell 1976; van de Kaa 1994, Cáceres-Delpiano 2012); female labor force participation is often at lower levels; higher education expansion is in its initial stages (Schoefer and Mayer, 2005). As a result, often a smaller portion of women have access to higher education and academic careers compared to women in advanced countries.

A number of sociologists have investigated cross-national differences in sex segregation in higher education (and in academic careers particularly) (*inter alia* Bradley 2000; Charles and Bradley 2002; Wolfinger, Mason and Goulden 2006; Mason, Wolfinger and Goulden 2013; Charles and Bradley 2009). These studies suggest that developing and transition countries may exhibit lower levels of sex-segregation and higher female representation in higher education and scientific careers compared to advanced economies due to a set of macro-structural factors, such as post-industrialism, size of the higher education system, and access to higher education, etc. (e.g. Chang 2004,.Charles and Bradley, 2009). It is argued that a combination of these factors may have contributed to selecting certain types of women into higher education and professional occupations (Chang 2000; and 2004; Charles 2011). Yet, the questions of whether these women pay a penalty in terms of family outcomes, and if their family processes differ from their counterparts in advanced economies have been neglected in this literature.

Third, some of these studies (e.g. Bradley 2000; Charles, 2011) and the reports published by the European Commission (She Figures, 2003, 2006 and 2009) regard Turkey as an "outlier" or a "paradoxical" case with respect to sex-segregation in the sciences. Although Turkish female labor force participation has largely declined or stagnated over the last three decades, making it the lowest in Europe and also among the OECD countries, Turkey has long enjoyed the highest proportion of women in top academic positions such as full professorships. Furthermore, Turkey also enjoys a higher representation of female professors than the majority of EU countries in scientific fields that are traditionally male-dominated, such as science, technology, engineering and mathematics (STEM).[1] The explanations of the Turkish case were principally based on anecdotal evidence and occasionally on quantitative studies that relied upon small and unrepresentative samples (Acar, 1983, 1990 and 1991; Healy et al 2005; Ozbilgin and Healy 2004; Kusku et al

[1] In fact, the peculiarity of Turkey was picked up as early as in 1994 by a report in *Science* Magazine that compared Turkey with the US (Kahn, 1994) and found that Turkey had higher rates of female engineers and computer scientists than the USA (Bradley, 2000).

2007). Earlier qualitative studies argued that academic women in Turkey during the 1980s and early 1990s had more resources and so were able to combine work and family life (e.g. Acar 1991); the implication was that these women did not pay a family penalty. Yet, this picture may have changed with the expansion of the higher education sector. To our knowledge, no quantitative analysis of academic women and their family environment has been conducted to test these predictions using large-scale representative data.

We aim to fill this gap and make contributions to two specific literatures. First, we contribute to the general literature on gender inequality in academic and scientific careers by providing evidence on another dimension of gender inequality: the gender-gap in family outcomes in a relatively egalitarian academic market. Second, we contribute to the literature on the role of education expansion, women's human capital investments (i.e. schooling), and career progression in family formation (e.g. Blossfeld and Huinink, 1991; Blossfeld 1995; and Budig, 2003). We do this by focusing on a highly-educated sample of women (and men) to explore how variations in their career progression are associated with variation in family outcomes. To this end, we compare women whose family transitions and career progressions took place during different periods of higher education expansion. We also compare academic women in departments with traditionally lower female representation rates (e.g. STEM) versus female-dominated fields.

We use a unique life-history dataset that we collected in 2007 that has rich information on the background and family outcomes of approximately 4500 academics in Turkey. We combine this dataset with the administrative records of the departments in which they work. We then use these data to construct weights for our sample and obtain characteristics of the workplaces. We describe our data sample and how we ensure representativeness of the whole academic population in section 3.

Turkey is an interesting case also for other reasons: First, family processes in Turkey are very different than those in many Western societies. For example, both in the general population and in our sample of academics, the frequency of cohabitations is negligibly small. Consequently, childbearing almost always follows marriage. Second, Turkey has a centralized higher education system. Academic salaries as well as all promotions are regulated by the Higher Education Authority (HEA) for all academics in the public universities which constitute an overwhelming share of the university sector. This leaves

little variation in basic salaries and may also provide a degree of transparency in promotion decisions. Finally, considerably fewer Turkish PhD holders work outside academia or stay inactive, something that we verify from the nationally representative Survey of Doctorate Earners conducted by the Turkish Statistics Institute. All of these have favorable methodological implications for the generalizability of our results, the representativeness of our sample, and the number of factors we need to control for. We discuss these issues in depth in section 3.

II. Background literature

A. Academic Career Progress and Family Formation

The relationship between academic careers and family formation is complex. A large set of American studies have focused on the reverse relationship, i.e. whether family processes affect rank advancement and the productivity of women in scientific careers as this was believed to be an important driver of sex-segregation in science and academia (e.g. see literatures reviewed in Long and Fox, 1995; Xie and Shauman, 2003 and particularly Morrison, Rudd and Nerad, 2011). These studies find a mixed picture for the role of family formation in academic career advancement. For example, Xie and Shauman (2003) found that marriage does not matter for women's scientific career outcomes but having children explains a large amount of the variation in these outcomes. Furthermore, the authors found that women with children are less likely to pursue careers in science and engineering after the completion of science or engineering education. They are less likely to be in the labour force or employed, to be promoted once they are in scientific career, and to be geographically mobile. On the contrary, Long (2001) argues that having children has no effect on career progression.

If family processes affect the career advancement of academic women, particularly those in STEM fields, then, it is plausible that women of higher academic ranks have already paid a family penalty and those that were not promoted are more likely to have had their children earlier. In this case, we would observe a rank gradient in family formation. Mason, Wolfinger and Goulden in a series of studies throughout the 2000s (compiled in a book in 2013) looked at gender and rank differences in family formation of American academics. They have nuanced findings: women who had children in the first five years after finishing their PhDs are less likely than men in similar conditions to get a tenured professorship.

Women in tenure track careers are also more likely to forego their desire for children than men across all fields (Mason and Goulden, 2002). However, once they are tenured, having young children may not necessarily have a negative effect on their further career progression compared to men in similar conditions (Wolfinger, Mason, Goulden, 2008).

These studies often relied upon Beckerian theory of human capital accumulation as a main theoretical framework and its role in fertility and family formation (Becker, 1991) as well as its sociological criticisms (e.g. Blossfeld and Huinink 1991, Blossfeld 1995, Liefbroer, 1999; Budig 2003). These theories distinguish between education and labor market experience as two forms of human capital accumulation with different mechanisms affecting family formation. However, these mechanisms may be overlapping in an academic career since the PhD years are often crucial for family formation; they can conceptually be thought of as part of the extended higher education years. Individuals postpone their family formation until they complete their higher education and expansion in higher education may affect family formation outcomes at the country level (e.g. Blossfeld, 1995; Blossfeld and Huinink 1991; Liefbroer, 1999). This implies that enrolling in a PhD program might have an independent delaying effect on family formation due to this normative behavior. Yet, one can easily treat doctoral studies as the first step in the labor market and, hence, the first step in the accumulation of job-specific human capital, which may well have an independent effect on family formation. Conceptualizing the PhD years as part of labor market experience may imply that family formation during these years is associated with the opportunity costs of career interruptions. Both of these perspectives suggest that academic career progression and expansion in higher education may have negative effect on family formation outcomes albeit through different mechanisms.

Higher education expansion has also been regarded traditionally as a key factor that explains sex-segregation in labour markets and in fields of study (e.g. Bradley 2000; Chang 2000; Charles and Grusky, 2004). However, scholars often criticized the evolutionary perspective and modernization theories, both of which predicted that as more women entered the labour market and higher education, eventually sex segregation would decline over time across occupations and scientific fields (e.g. Chang 2000, see Ch5 of Charles and Grusky, 2004 by Weeden (2004), p.136; Charles, 2011). They argue that a more complex mechanism could be associated with expansion in the service sector and higher education since the occupations and fields being created may be more ‘female-typed’. In fact, the

most salient feature of academic careers in OECD countries has been the absence of women from these fields rather than the absence of women in higher ranks overall.

In addition to key sociological studies (e.g. Xie and Shauman, 2003; Long and Fox 1995) that look at STEM fields overall, a large set of field-specific literature has investigated the careers of women in a given field inside and outside of STEM, such as female engineers (e.g. McIlwee, & Robinson, 1992), women in physics (Ivie, & Tesfaye, 2012), female social scientists (Morrison, Rudd and Nerad, 2011), and female economists (Ginther and Kahn, 2004). The general conclusion is that for women in STEM fields, family processes may matter more for career outcomes than for women in other fields. This may be due to many factors. For example, in male-dominated fields there may be less sympathy for a work- family life balance and for women committing their time to family obligations. It is also possible that the nature of research tasks and the environment in which these careers are carried out may be perceived as less family friendly (i.e. working in labs, hospitals, engineering labs and sites), compared to other fields. As a result, it is documented that more women than men may face a conflict between a STEM career and family life (Xie and Shauman, 2003, Blau 1998). It is possible that in addition to these factors, the presence of a gendered division of labor in the household may discourage some academic women in STEM fields from forming a family.

For space and scope reasons, we do not discuss any further the findings of this large literature that predominantly made use of American data. However, we aim to focus on three questions in the Turkish context that are derived from the discussions briefly explained above: First, whether academic women pay a higher family penalty than men. Second, whether higher education expansion changes the relationship between career progress and family formation outcomes. Third, whether such relationships vary across scientific fields.

B. Turkish Academic Structure over Three Decades.

It is well documented that since early 1980s, Turkish higher education has enjoyed relatively low levels of vertical and horizontal sex segregation compared to other OECD

countries (e.g. Acar, 1983, 1990 and 1991)[2]. Figure 1, obtained from Eurostat's publication "She Figures" in 2009, illustrates this phenomenon well. As seen, Turkey has the lowest Glass Ceiling Index (CGI) scores[3] (1.2) in 2007 – an indicator of vertical segregation that measures the relative chance for women as compared with men, of reaching a top position in Higher Education" (p.68). Furthermore, Table A1 (in the appendix) shows that although the number of male and female researchers (shown as per thousand) in the labor force is lower in Turkey than other countries; Turkey is *the only country* with more women than men in research-related occupations. In other words, the gender gap among researchers in the labor force is *negative* in Turkey[4]. In terms of horizontal segregation, women constitute more than 30% of all academics in STEM fields in Turkey - a score considerably higher than the majority of the EU countries (She Figures, 2009).

[Figure 1 about here]

Various explanations have been suggested for the relatively gender-egalitarian picture[5] of the Turkish research and academic environment: One line of argument stresses the importance of modernization and state ideology after the formation of the Republic in the early 1920s which encouraged secular ideals and promoted female role models (e.g. Acar, 1983, 1990 and 1991, Khan 1994). An institutional argument postulated that favorable practices and policies imposed on all universities by the centralized Higher Education Authority (HEA) created an equal-footing system which then reduced the chance that women would be discriminated against in academic hiring and promotion (Healy et al 2005, Ozbilgin and Healy 2004). An economic argument referred to the relatively low salaries in academic employment compared to better-paid jobs in the private sector for tertiary education graduates (Ozguc 1998). The processes of relative wages and "gender queues" resulted in men choosing better-paid jobs in the private sector and women taking the lower-paid academic jobs which were left unoccupied by their male counterparts

[2] Research has been done overwhelmingly in the university sector in Turkey. Turkey has one of the lowest private R&D activity rates among OECD countries (OECD, 2006 and She Figures 2006). See Table A1 in Appendix further on this point.

[3] As GCI approaches to 1 difference between women and men being promoted is reduced. When GCI increases, it implies a thickening glass ceiling, and when it falls below 1, it implies women are overrepresented in the top positions.

[4] Turkey also differs from all other EU countries, including Southern European countries, with its considerably, low female labor force participation. According to OECD Statistics in 2007 (i.e. our survey year) Turkish female labor force participation rate was around 49%, whereas in other Southern European countries were dramatically higher, such as in Italy, 62.6%, in Spain 66.8%, Greece 61.4% and Portugal 67.6%.

[5] "Relatively" egalitarian because even Turkey is still far from reaching parity, as only around 35% of all employed PhD holders are women (See Appendix).

(Reskin and Roos 1990). Finally, some sociologists argued that being an academic in Turkey was regarded as a female-typed profession, which was 'safe', 'secure' and 'esteemed' or like "being a teacher but with more prestige", allowing women to combine career and family life (Zeytinoglu, 1999 and Kandiyoti, 1997).

It may also be that a combination of these factors operated together. For example, Acar (1993) attributes low sex segregation to the "Republican ideology of post-1923 Turkey" and to the "opportunities which were opened to elite women by the correspondence of the latter with the developmental needs of the country, the availability of domestic service provided by non-elite women, and the existence of family solidarity networks" (1993; p.65). Although not tested empirically with appropriate datasets, these conjectures imply that Turkish academic women, at least in earlier cohorts, did not pay a significant family formation penalty because they were from privileged backgrounds and had the resources needed in order to combine family life and academic career. It is our aim in this paper to provide the first empirical test of whether this has been the case.

Acar (1993) goes on to argue that higher education expansion may have changed this picture:

> "In recent years, however, with the expansion of the higher education system, competition between men and women for posts has greatly increased, and economic change and urbanization have dried up the supply of inexpensive domestic help and have stymied family solidarity networks. Thus academic women are increasingly beset by conflicts between their professional and their family roles." (p. 65).

These claims are in line with the predictions of scholars in the cross-national sex-segregation literature about the role of service sector expansion in labor market segregation, although the mechanisms are slightly different. For example, Charles and Grusky (2004), Chang (2004), Charles (2003) and Charles and Bradley (2009) argue that the expansion of the service sector and the process of post-industrialization may increase both horizontal and vertical sex-segregation in labor markets in general. They claim that, initially, in less economically developed countries, only a highly selected and privileged group of women and men enter the small segment of higher education and consequently occupy professions that require high levels of skills. Furthermore, participation in higher education in those countries is characterized by more materialistic (i.e. status attainment, income) values than in countries where higher education is more widespread (Charles and Bradley, 2009). In the latter group of countries, individualistic values and self-expression

may be more important than gaining high status, and hence, women may choose fields of studies and careers that are more gender-typical. This is considered to be an important mechanism especially in explaining greater horizontal sex-segregation in higher education and in labor markets in advanced economies compared to less economically developing countries. However, it is predicted that as the service sector and higher education begins to expand in less economically developed countries due to post-industrialism, it is possible that both vertical and horizontal sex-segregation increases (Seymonov and Jones, 1999; Chang 2004). Women with more heterogeneous backgrounds and varying levels of career attachment may enter new occupations in the service industry and scientific fields in higher education that are considered more female-typed and/or lower-ranked, thus increasing both horizontal and vertical sex-segregation, overall.

Turkey's higher education sector has expanded rapidly over the last three decades. Figure 2 shows the trends of academic employment by gender and the number of universities in Turkey[6]. The first milestone in this expansion was the change in legislation that paved the way for the opening of private (not-for-profit) universities in Turkey, passed in 1991. From then on, the number of universities and employed academic men and women increased significantly. When new universities open, they usually "borrow" from the human capital of the existing universities, thus, the number of academics in the higher education sector shows a much smoother upward trend than the number of universities. Using this figure, we identify three major periods where university sector expansion was: *i.)* slow (pre 1991), *ii.)* accelerating albeit with fluctuations (1991-1998), and *iii.)* steadily increasing (1999-2007). Note that there was another jump in the university opening rate in 2005; however, due to the otherwise small sample size, we included it in the third period of steady increase rather than treating it as a fourth period. We argue that these three periods with different paces of university expansion may present different opportunity structures for women entering academic careers and at the same time may affect the type of women who self-selected into academic careers.

[Figure 2 about here]

As a result, the theories of higher education sector expansion may predict two seemingly opposite effects on family formation outcomes of academics. First, in line with Acar (1993), women experiencing career progression post-1991 are more likely to pay a higher

[6] The figure shows the trend until the 2007-2008 academic year since that is the year we collected the micro data we use in this paper; however, the increase in the number of universities has continued since then.

family formation penalty as they may have limited resources to combine work and family. Second, as these women are also more likely to come from heterogeneous backgrounds in terms of labor market attachment and values, they are less likely to be promoted, and consequently more likely to form families. We aim to test which of these conjectures dominates in practice.

III. Data and Methods

A. Data

This study relies on two data sources: Our main dataset is the Turkish Academic Career Survey (TAC Survey), a nationally representative retrospective life-history dataset of approximately 4,500 academics (i.e. PhD holders: assistant, associate and full professors) in Turkey that we collected in 2007. This survey covers academics' educational, professional, marital, and socioeconomic backgrounds, the facilities provided by the institutions for which they work, the distribution of household-related tasks, decision-making on domestic matters, and attitudes toward work, academia and the Turkish academic system. The survey was conducted as an on-line questionnaire taking approximately 55 minutes to complete. The questionnaire was sent to all faculty staff serving at Turkish universities whose contact information was publicly available. We were able to reach 25,800 academics (out of a total registered population of 34,100) teaching at 89 universities. This gave us a coverage rate of around 75% of the whole academic population. The 4,500 academics who completed the survey gave us a response rate of 18%. This is within the benchmark of online surveys (see review in Sheehan, 2001). The sample used in this paper is set up as person-years starting from age 18 for everyone until each family transition occurs. We only retain respondents that have non-missing information on all of our variables, leaving 4,261 individuals for the analysis.

To ensure the representativeness of this sample, we constructed individual weights that we calculated using a separate dataset: Harmonised Academic Employment Data (HAED), a time series that we compiled using the yearly complete academic registers from the archives of the Student Selection and Placement Center (OSYM). This second dataset gives us the total number of academics by gender, academic field, academic rank, and type of university (i.e. public versus private) in each higher education institution in Turkey annually since 1983. Based on these parameters of the academic population, we constructed individual weights for the respondents of the Turkish Academic Survey. We use these

individual weights in our analyses in order to address, at least partially, potential biases that may occur due to survey non-response. Thus, we believe that our results are generalizable to the academic population resident in Turkey in 2007. We discuss, next, the potential threats to the generalizability of our findings and representativeness of our sample, selection into our dataset and the study sample, as well as our attempts to deal with these issues.

B. Data Quality, Representativeness and Selection Issues

Email or online surveys have been criticized for four main sources of errors: *coverage, sampling, non-response and measurement error* (Couper 2000:p.466). Coverage usually refers to selecting out people with little computer literacy and access, when samples include the general population (Couper 2000:p.466). This is less relevant for our specific population, where computer and internet access was available for all academics in 2007. Yet, coverage may still be a concern as we could not obtain email addresses of approximately 25% of all the academic population in the country in that year. A smaller proportion of these academics were employed in seven very small or newly opened universities that did not share their faculty contact information. It is possible that the academics without publicly available email addresses could be different from the rest of the academic population in many ways (for example, they could be older). If this is the case, our weighting strategy will not help since we can only adjust for a few observable characteristics, which do not include age, using constructed weights. Therefore, in that scenario, our results that compare academic cohorts could be biased although it is not possible to anticipate the direction of this potential bias.

This described problem is in fact related to *sampling error,* which is caused by observing a sample of the whole population. It is important to note here that we did not adopt any sampling strategy (random, stratified, etc.). Instead, we sent out our questionnaire to email addresses of the whole population, whose contact details were publicly available. Thus, we eliminated at least, one source of sampling error, which we believe is one of the strengths of the TAC Survey. However, the final sample might still have considerable differences from the original population.

For example, *non-response* is another important reason why our final sample might be different than the original population. We think, even though 18% is a reasonable response rate for web surveys; it is possible that non-response may be non-random (with respect to

observed and unobserved characteristics), generating sampling bias in our estimates. For example, it is plausible that academic women with children, perhaps, did not fill out our survey as they may have less time due to family obligations. Alternatively, there may be some other unobserved characteristics that may make certain academics more (or less) likely to form a family and at the same time make them less (more) likely to fill in our questionnaire. If this is the case, then, our findings on the gender gap in family formation might be overestimated. Unfortunately, our weighting strategy is not able to correct for potential sampling bias generated by unobservable characteristics.

Finally, *measurement error* may also generate biases in our estimates of the gender gap in family formation outcomes. An important source of measurement error may arise due to the nature of retrospective surveys. Recall errors in the timing of family and career events are common in retrospective surveys. However, it is less likely for this specific population to recall the years of their career stages and promotions with errors than individuals in other professions, as most academics have regularly updated CVs. Previous literature has pointed to recall errors by men regarding family transitions (e.g. Joyner et al 2012); yet, it is more prevalent for non-marital births and low educated men, which is not the case for male academics in Turkey. Moreover, the dates of birth of children are collected in years, so it is unlikely that men will misreport the year their children were born. However, it is still possible that our data may suffer from a certain degree of recall bias on the timing of career stages and family formation dates, perhaps, among the older cohorts of academics.

Further Selection Issues

One may argue that our initial population - PhD holder academics employed in a higher education or a research institute - is already a select group with respect to family formation processes. Put differently, it is plausible that certain women that may leak from the academic pipeline because family formation may have interfered with their progress. Two issues may occur: First, since the average marital age is low in Turkey, many women may drop out before obtaining their PhD due to marriage and children. We believe that this is a very realistic scenario and in our dataset, we observe that academic women are a very select group compared to academic men. As expected, they come from more privileged backgrounds (see Table A3). However, we believe this sort of selection is not a serious concern for the purpose of this study as we aim to generalize our findings to the population of (*PhD holding) academic women in 2007 living in Turkey*. To a large degree in this study, we compare these women with each other using variations in their academic cohort and

scientific field. After all, academic women are more select than men everywhere in the world. This sort of selection may still have implications, though, when we compare men and women in section 4A. We will revisit this issue when we discuss our empirical strategy in the next section and in section 4A.

However, a more serious issue for our descriptive associations would be if women drop out after they obtain their PhD or after they enter the academic market due to their family obligations. To check this possibility, we relied on the published statistics from the Survey of Doctorate Holders conducted in 2009, by the Turkish Statistics Institute[7]. Tables A1 and A2 in the appendix give us some information about how likely this scenario is. First, we note that in Table A2, around 6% of all male PhDs and 4% of all female PhDs are unemployed or inactive in Turkey in the year 2009, which is 2 years after our data were collected. The number in the inactive population includes retired PhD holders as well. This gives us confidence that women do not drop out as much after they enter the academic job market.

However, one may argue that they may chose to leave academia to work in other industries. Table A1 shows that the university sector is the largest employer of PhD holders in Turkey by far, employing more than 70% of all PhD's in the country (Turkish Statistics Institute, 2009). Furthermore, almost equal numbers of male and female doctorate holders work outside the higher education sector, and less than 5% of female PhDs were inactive or unemployed, which is lower than the share of male PhDs that were unemployed (7%). These figures give us confidence that the selection problem that could have arisen due to women's dropping out as a result of family obligations or more attractive career options elsewhere may not be too problematic in our sample.

Finally, one may still argue that part of "the leaked sample" might have left Turkey, thus were not included the Survey of Doctorate Holders by Turkish Statistics Institute or our TAC survey. Thus, we call for caution especially regarding our descriptive comparison of men and women, as explained in the next section.

C. Empirical Strategy

Our empirical strategy is twofold. First, in order to establish whether academic women are more likely to pay a family penalty, we start with basic summary statistics and unadjusted

[7] Unfortunately, micro-data from this survey are not available to researchers. However, a series of cross-tabulations can be obtained from the Turkish Statistics Institute.

Kaplan–Meier curves that describe the gender gap in transition rates in family outcomes. We then adjust these with a set of covariates and report simple models where we include parental background, if the university in 2007 was a private university[8], and if it is located in one of the three largest Metropolitan areas (e.g. Istanbul, Ankara and Izmir) as baseline controls to net out differences in family formation opportunities and costs associated with these characteristics. Our coefficient of interest here is the one for "female", which indicates whether gender differences persist after we adjust for these factors.

It is important to note here that although the aim of this analysis is to see whether gender differences in family formation probabilities persist once we control for a set of potentially confounding factors, it is possible that there are a large set of unobserved gender differences that may cause them to experience different family formation patterns. As discussed previously, women with PhDs, as well as men, are very select population groups and subject to different selection processes. Thus, we are cautious when interpreting the coefficient of our "female" indicator. We report the results of these initial descriptive figures and models in the first part (part A) of the results section (4).

Second, we turn to the question of whether career progress is associated with academic women's family formation, and focus on two additional questions: 1) Whether the family formation process of academic women that experience career advancement during higher education expansion periods is *slower* or f*aster* compared to earlier academic cohorts, and 2) Whether women in male-dominated academic fields are more likely to pay a family penalty. In this section, our aim is to see whether time-varying academic rank, as a measure of career progress, matters for family formation by academic women in different academic cohorts and fields. By making this comparison, we aim to alleviate the problem of differential selection that we have to face when we compare men and women.

We estimate our models using discrete-time event history methods. We use logit link to estimate our discrete time models[9]. In discrete-time logit models, the response variable is a binary indicator of the event. In our case, the person-years with no event are recorded as '0'

[8] In Turkey, the law prohibits for profit universities. Thus, private universities are those that are founded and owned by non-profit organizations backed up by private companies and businesses. These universities charge tuition fees at the market price and salaries of their faculty are not centrally regulated as in the case of those in public universities. Other functions remain subject to HEA regulations.

[9] We also estimated our models using "complementary log-log" link and our results are virtually the same (available upon request.)

and the ones when the respective family transition occurs as '1'. The hazard function in logit models can be written as:

$$h_j(t) = \Pr\big(y_j(t) = 1 \,\big|\, y_j(t-1) = 0\big) \qquad (1)$$

where $h_j(t)$ is the probability of the event occurring during the interval *t*, on the condition that it did not occur beforehand, y_j represents the binary response corresponding to the occurrence of the event (transition into marriage, birth of first child, and birth of second child) in each (t) where *t* is the value of the year for each individual, indicated with j. The formal discrete-time models can be written as follows:

$$logit\big[h_j(t)\big] = log\left[\frac{h_j(t)}{1-h_j(t)}\right] = \alpha(t) + \beta(x_j) \qquad (2)$$

Here, $\left[\frac{h_j(t)}{1-h_j(t)}\right]$ refers to the conditional probability of the event occurring in period *t* for individual *j*. The hazard of 'success' of an event for individual *j* in period *t* is denoted by $h_j(t)$, and the 'failure' by 1-$h_j(t)$.

In the models above, the logit of the baseline hazard function is represented by $\alpha(t)$. We specify the baseline hazard function in a flexible form by grouping years and using the piece-wise constant hazard function below:

$$\alpha(t) = \alpha_0 D_0 + \alpha_1 D_1 + \ldots + \alpha_k D_k \qquad (3)$$

where the time axis is divided into several intervals that we identified, for each outcome variable and gender, based on hazard rates. Time intervals for 1st marriage are measured as age 18-23, 24, 25, 26, 27, 28, 29-33, 34-47 and 48+ for women; 18-24, 25, 26, 27, 28, 29, 30, 31, 32-36, 37-54, 55+ for men. Time intervals for 1st births are measured as number of years after marriage: 0-1, 2, 3, 4, 5, 6, 7, 8-11, 12+ for women and 0-1, 2, 3, 4, 5, 6, 7-10, 11+ for men. Time intervals for 2nd births are measured as number of years after the 1st birth: 0-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11+ for women; 0-1, 2, 3, 4, 5, 6, 7, 8, 9, 10+ for men.

Outcome Variables

We have three dependent variables that measure family formation: transition into marriage, transition into having the first child, and the likelihood of having a second child. Note that we use transition into marriage but not transition into cohabitation as a measure of

partnership formation. Even though we have information in our survey about cohabitation, in Turkey it is extremely rare to cohabit before marriage. In our survey, only 15 academics self-reported as cohabiting at the time of the survey. Furthermore, having children outside marriage is also extremely rare in Turkey and in our academic sample. The implication is that our dependent variables are sequentially constructed. In other words, while the risk set for transition to marriage includes everyone from age 18, the clock for the transition to parenthood starts from the time of marriage. Subsequently, the risk set for the transition to having a second child includes only parents and starts from the timing of the first birth.

Control variables:

As our academic sample is a highly selected group, it is homogeneous with respect to many socio-economic factors: All respondents hold a PhD, are employed full-time, and reside in urban settings. Furthermore, the variation in academic salaries for academics of the same rank is relatively small as salaries are centrally regulated by the state. Consequently, these factors can, in a way, be treated as controlled for in our sample. However, there is still variation with respect to the timing of marriage and family formation that can be accounted for by other factors unrelated to academic careers. One of these factors is socio-economic background. Parental education and income could influence individuals' attitudes and preferences towards family formation. The analyses then control for the respondent's father's education as a proxy of parental social class. Similarly, being born and raised in an urban setting versus a small town implies different opportunities and values in upbringing and could also influence preferences towards work and family. The models control for place of birth which was recoded as: "Large town", "Small town and "Abroad." We also control for the university type, public versus private, and its location being in one of the three large metropolitan urban areas (e.g. Istanbul, Ankara, and Izmir, all with a population greater than 3 million) as opposed to other medium or smaller size cities in Turkey. Finally, we control for partner characteristics, such as employment status and education, which could matter for first and second births. All of these factors are expected to affect both the attitudes and the opportunities for family formation.

Table A3 in the appendix shows basic frequency distributions of these control variables. The Table shows that fewer than 10% of all academics work in private universities where hiring and promotion processes are not controlled by the centralized Higher Education Authority (HEA). Finally, Table A4 in the appendix provides us with the mean age at a

given academic rank in our sample while Table A5 provides the distribution of major academic fields by gender.

IV. Results

A. Descriptive Analyses of Gender Differences

In this section, we first provide a basic description of the gender gap in each of our three dependent variables: marriage, transition into parenthood and birth of a second child in our stock sample. There are clear differences between the family compositions of male and female academics in Turkey. Male academics are more likely to be married, have a child, and have a larger number of children (Table 1).

[Table 1 about here]

These differences point to the difficulty of combining a family life and a career for academic women. We look into this further with Kaplan-Meier estimates which show differences in men and women's timing of family transitions in Turkish academia (Figure 3). Recall that the risk set varies for each outcome in this figure and they are constructed, sequentially. In other words, transition to parenthood and having a second child are modelled as conditional on having experienced the previous family transition. With respect to transition into marriage, women marry at a slightly faster rate than men between the ages 22 and 27. Survivor curves converge between ages 27 and 30 after which men increasingly marry at a higher rate than women academics (Figure 3 top panel). While only 2% of male academics have not completed the transition into marriage by age 45, the proportion of never married women at the same age is 22%. In terms of the transition into parenthood, we follow the married sample and plot the transition to first birth against the number of years since marriage (Figure 3 middle panel). Both men and women increasingly enter into parenthood after the 5^{th} year in their marriage but around 10 years into the marriage, gender differences start to show up. Part of this might be driven by women's reproductive age limit. Yet, gender differences in childlessness among the married sample are striking. Nearly 40% of all married academic women remain childless, while only 20% of married academic men do so. Finally, for second order births, among the parent sample, only around 30% of academic women end up having the second child as opposed to 60% of academic fathers having the second child.

[Figure 3 about here]

Can these gender differences in family transitions be explained by parental background, spousal characteristics or workplace environment? Table 2 presents results from discrete-time logistic regression models for each of the family outcomes controlling for these factors discussed above.

Once these factors are controlled for, coefficients for females are negative and statistically significant, indicating a family penalty for female Turkish academics that is unexplained by socio-demographic and workplace factors. All the coefficients of our control variables have the expected signs and many of them are statistically significant. The most interesting finding is that academics in the STEM fields are on average less likely to marry, but once married, academics in these fields are not less likely to become parents and have a second child. Additionally, we estimated other specifications, where we included more controls, such as, the academic rank and the period in which the respondent started as an assistant professor (not reported). In our models where the dependent variables are the birth of the first or the second child, we also run additional specifications with controls related to partner characteristics, such as partner's education and employment status. After including these additional controls, our coefficient of interest (female) remained largely the same, still we report in table 2 for each outcome variable two models, with and without these control variables, although our preferred specifications are without these control variables (Models 1a,2a and 3a), which are potentially endogenous.

[Table 2 around here]

One way of illustrating the differences between academic women in periods with higher education is to construct academic cohorts of PhD students by the decade in which they obtained their PhD and plotting their family transition hazard curves. Figure A2 in the appendix does this. Disaggregated by PhD cohort (i.e. completion year of PhD), there is no visible difference across male cohorts. However, the youngest female cohort has a flatter survival curve than older cohorts, indicating a remarkable delay in partnership formation. The gender differences in parenthood timing are also wider. Once married, male academics have their first child sooner than their female counterparts. Ten years after marrying, 87% of male academics have had their first child, whereas childlessness is around 20% among

female academics. However we should keep in mind that, although informative, this figure only shows us the differences between PhD cohorts. One should ideally describe cohorts entering into all ranks of academic positions, (that is, "assistant professorship cohorts" or "commencing the PhD cohorts") and compare whether they have differences in family formation outcomes. This approach would be more in line with the life-course perspective we aim to adopt. Thus, we essentially do this in the next sub-section where we interact all academic ranks (including PhD study years) in a time varying fashion with the three specific period dummies in the multivariate models.

B. Results from Models on Women Sample

Although a very small group of female PhD holders are inactive or unemployed in Turkey (i.e. less than 4%), and the vast majority of PhD holders are employed in the higher education sector (see section 2), it is still possible that our sample of women in 2007 is a select sample of survivors, as discussed previously. Furthermore, there may be other unobserved variables that drive gender differences in family formation outcomes that our set of control variables in Table 2 would not have captured. Thus, rather than comparing women with men, we compare women with other women that experience key academic transitions at different periods of higher education expansion in the last 30 years. Additionally, we compare women in traditionally male-dominated fields, such as STEM fields, with women in fields where the female-to-male ratio is close to parity or where women outnumber men such as the humanities, social and administrative sciences, etc.

These within-group comparisons of women allow us to test whether those experiencing career progress in different environments of competition (i.e. whether in expansion periods or in STEM) are more likely to form families.

Period Specific Career Transitions

Table 3 shows two sets of estimates for each outcome variable for the female sample. The first set constitutes our baseline models, which are reported in the first three columns. In these models we are interested in associations with career-progression. Hence, in addition to our standard set of controls (e.g., parental background, spousal characteristics, place of birth, university type, and location) we include three period dummies capturing different periods of university expansion. Since our data were collected in 2007, introducing these

period dummies to our baseline hazard that is measured by flexible age and time intervals is effectively equivalent to exploiting variation in cohort differences in models where the dependent variable is transition to marriage. Whereas, in models where dependent variables are transitions to parenthood and having a second child, we additionally include polynomial age indicators since our baseline hazard is defined as the time since marriage and time since first birth.

These results show that after the higher education expansion in 1991 academic women on average are less likely to experience transition to first birth, and transition to second birth when demographic clocks are controlled for. In other words, older cohorts, on average, paid a smaller family formation penalty, in terms of childbearing. This confirms the hypothesis suggested by earlier qualitative studies. Therefore, these findings are in line with the predictions of the sector expansion hypothesis of Charles and Grusky (2004) and Charles (2003): Recent cohorts might have different preferences for children and weaker labor market attachment. These are also in line with the prediction of earlier studies in Turkey. Recent cohorts might have fewer resources to combine work and family life and, thus, are more likely to pay a family formation penalty.

[Table 3 about here]

The last three columns report the estimates for models that allow us to see whether time-varying career ranks in particular had a stronger association with academic women's family formation for those that experienced career progression after the Turkish higher education expansion started and accelerated. We interact the time-varying academic ranks with our three period dummies. In a way, these models compare academic cohorts' career progression: i.e. those that were in a given academic rank at a given period net of age.

These models with interactions show that career progress during university sector expansion does not have a differentiated effect for any of the outcome variables once we control for age flexibly and the time since marriage and first birth, which govern these demographic events. Women who moved up in the academic career ladder after the sector expansion pretty much behaved in a similar way to their predecessors with respect to family formation.

Field Differences

We now compare women in fields with higher female-to-male ratio to fields where women are traditionally less represented, i.e. STEM. Recall that, although horizontal segregation is far from eliminated, in Turkey women constitute more than 30% of all academics in STEM fields, which is considerably higher than majority of the EU countries (She Figures, 2009). The results of these models for women are presented in Table 4.

Table 4 reports the models in the same way that we reported the period differences (Table 3). The first three columns show average differences between family formation outcomes of women in STEM and non-STEM fields across career ranks controlling for period and age in the baseline (as usual). We also apply our standard set of controls. These estimates indicate that on average being in a STEM field does not really matter for women since in none of the three models are the coefficients for the STEM indicator statistically significant. However, once we interact the STEM dummy with academic rank, we find that *overall effect* of being an assistant professor or an associate professor in a STEM field on having a second child is positive, relative to being in a PhD program in other fields. This may be due to the fact that PhD training years are less flexible and more demanding. The interaction models for the other family outcomes produce results showing differences in academic ranks across these fields that are not statistically significant. This implies that although the STEM fields employ fewer women than men in Turkey, family outcomes on average are not particularly affected by being in a male-dominated field. This is an interesting finding in the context of Turkey: the variation in family formation may be driven by factors other than scientific field. Put differently, the explanations for horizontal sex segregation in Turkey should not consider family formation processes as a potential factor.

[Table 4 about here]

V. Conclusion and Discussion

In this paper, we have three important questions about the family formation of Turkish academics. First, do academic women pay a higher penalty in family formation outcomes versus academic men? Second, do expansion periods in the higher education sector alter family formation processes among academic women? Third, do academic women in

STEM fields pay a higher penalty in terms of family formation outcomes than academics in other fields? We answer these questions in the context of the relatively gender-egalitarian and centralized Turkish academic environment. We focus on transition into marriage, into parenthood, and having a second child.

Regarding the first question, our answer is yes: we find significant gender differences in all family formation outcomes even after we control for a number of characteristics relevant to family transitions. For the second question, we specify three periods where higher education expanded at different speeds. The period before 1991 is our reference category since expansion in higher education started then after a change in legislation regarding private universities. We find that there was a delay in family transitions when the higher education sector started to expand. When specific career stages are interacted with these expansion periods, we find no difference for being at different academic ranks during these periods. Our descriptive results already hinted that a large number of marriages and first births occur during PhD years and somewhat in assistant professorships. But, we find that rank differences do not vary across expansion periods. For the third question, we find that academic field does not matter for women and that academic women in STEM fields are not very different from those in other fields, which contrasts with previous findings from the USA.

Since the early 1990s a vast literature in sociology and economics has attempted to disentangle how career progress and human capital accumulation affect marriage and fertility (e.g. Blossfeld and Huinink, 1991). The causality in this relationship has not been established and the direction of influence may go both ways (Budig, 2003). Our results thus contribute to the literature that seeks to understand *all* dimensions of gender inequality in scientific and academic careers. Even in a relatively egalitarian context, considerable gender differences in family formation outcomes can be found. These differences point to another dimension of inequality between men and women that is related to the family domain. Furthermore, we show that these differences may evolve in more nuanced directions when a country experiences an expansion in the higher education sector, as in the case of Turkey. Higher education in Turkey has continued to expand more rapidly than ever in the last eight years, the period since our survey was conducted. We conclude by noting that, if left unaddressed as the higher education expansion continues, inequalities in family formation outcomes might lead to changes in the current relatively egalitarian

female-to-male ratios. Last but not least, it is not our aim to make causal claims since one limitation of our study is that it relies on retrospective information provided by academics employed in 2007. There may be several sources of selection into and out of our academic sample that we are unable to adjust for. However, we believe that our within-gender comparisons do not suffer greatly from selection problems and provide rich information about the sources of variation in family formation outcomes.

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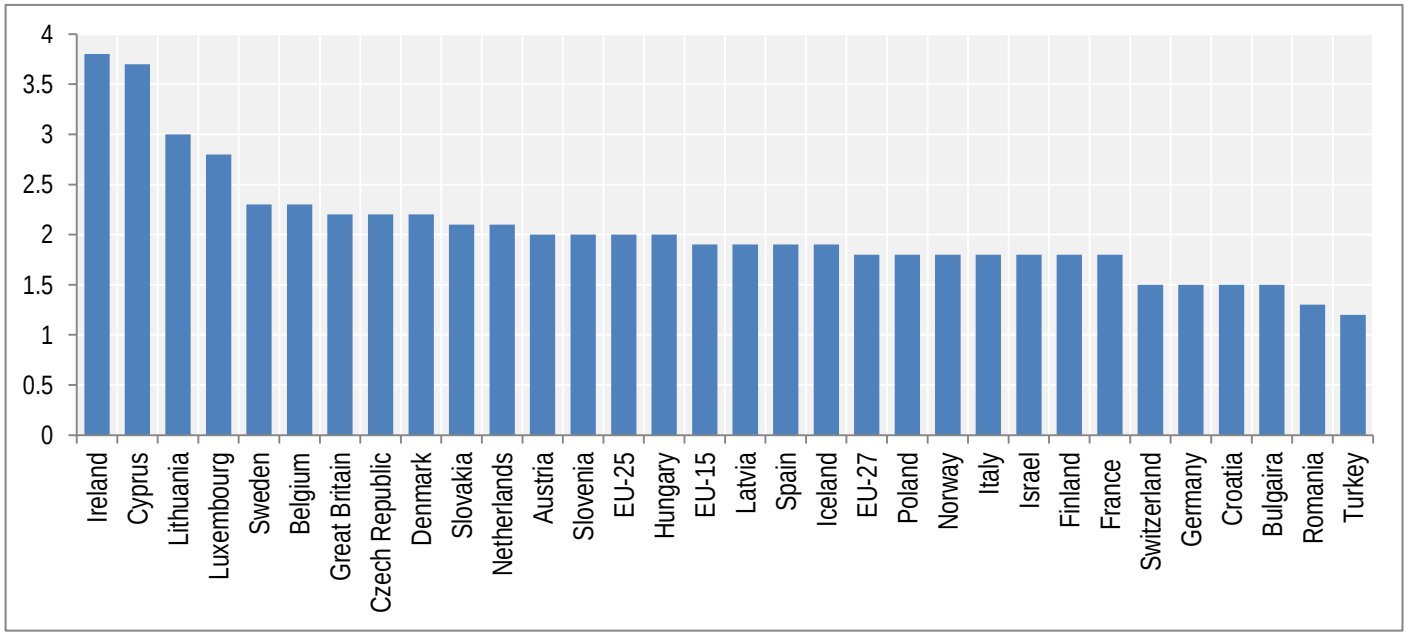
Figures and Tables

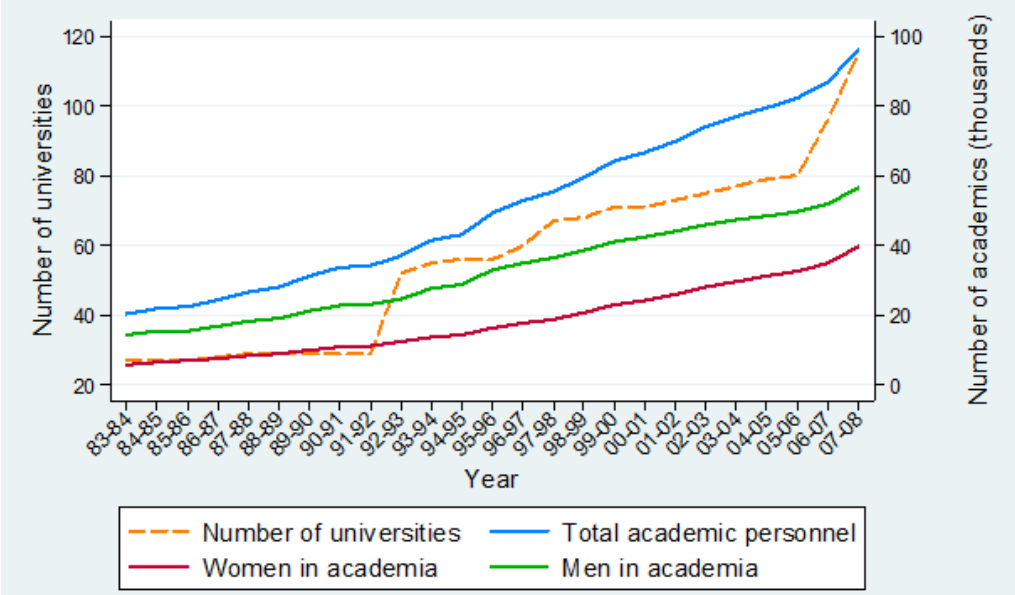
Figure 1.Cross National Glass Ceiling Index (GCI) Scores for 2007.



Source: She Figures 2009.

Notes: Glass Ceiling Index (GCI) measures the vertical sex-segregation in Women in Science and Academic Careers and "it compares the proportion of women in grade A positions (equivalent to Full Professors in most countries) to the proportion of women in academia (grade A, B, and C), indicating the opportunity, or lack of it, for women to move up the hierarchical ladder in their profession." A GCI of 1 indicates that there is no difference between women and men being promoted. A score of less than 1 means that women are over-represented at grade A level and a GCI score of more than 1 points towards a Glass Ceiling Effect, meaning that women are underrepresented in grade A positions.

Figure 2. Expansion of the Higher Education Sector in Turkey (1983-2008)



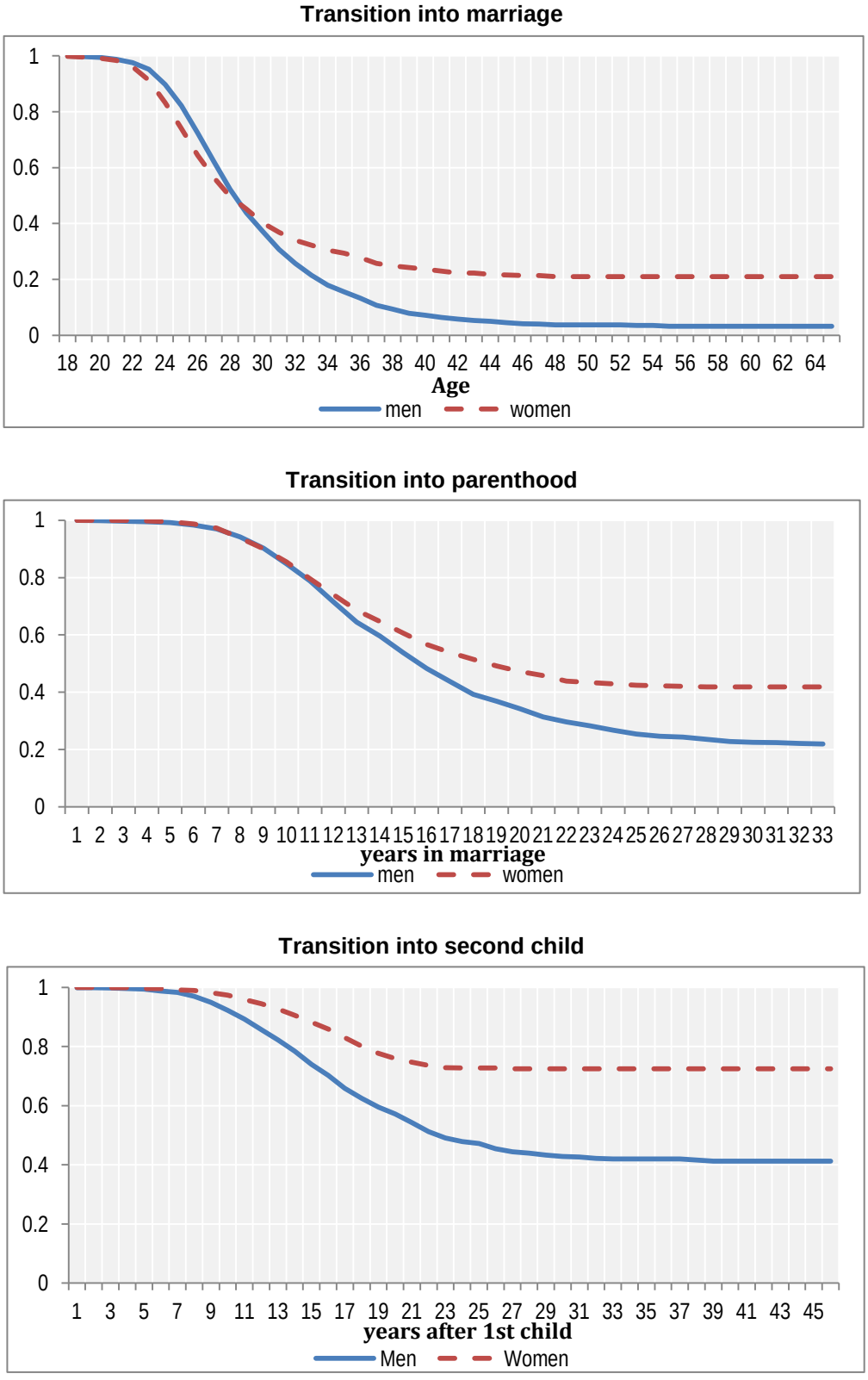
Source: Authors' calculations using data from Student Selection and Placement Center (OSYM), Yearly Statistics

Table 1. Gender gap in family outcomes among Turkish academics in 2007

	Married (%)			Has a child (%)			Number of children		
	Women	Men	Gap	Women	Men	Gap	Women	Men	Gap
Assistant professor	64.8	85.8	21.0	56.3	74.9	18.7	0.8	1.3	0.5
Associate professor	65.3	90.5	25.2	61.0	84.8	23.8	0.9	1.7	0.8
Full Professor	63.6	94.1	30.5	70.8	93.8	23.0	1.1	1.9	0.8

Source: Turkish Academic Career Survey, 2007. Number of children reports averages.

Figure 3. Gender differences in Family Formation Outcomes: Kaplan-Meier Curves



Note: Sample size includes overall 4288 academics. First panel on the left shows gender differences in the transition rate into marriage. The middle panel shows the same for the rate of experiencing the first birth and the third (the right) for the transition to second order birth. The gender differences are significant in all three figures.

Table 2. Family transitions and Gender: Discrete time logit regressions

	1st marriage		1st birth		2nd birth	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Female	-0.434***	-0.402***	-0.155***	-0.101**	-0.620***	-0.368***
	(0.055)	(0.055)	(0.054)	(0.057)	(0.085)	(0.089)
STEM fields	-0.097**	-0.105**	-0.020	-0.026	0.054	0.042
	(0.041)	(0.041)	(0.047)	(0.048)	(0.063)	(0.070)
Father's education (Ref. Cat: No formal education						
Primary	-0.041	-0.049	-0.022	0.020	-0.276***	-0.208**
	(0.064)	(0.065)	(0.079)	(0.082)	(0.089)	(0.096)
Lower secondary	-0.147	-0.155*	0.017	0.034	-0.534***	-0.517***
	(0.090)	(0.089)	(0.102)	(0.105)	(0.159)	(0.176)
Upper secondary	-0.111	-0.123	-0.107	-0.068	-0.522***	-0.357***
	(0.077)	(0.077)	(0.092)	(0.096)	(0.116)	(0.118)
Tertiary	-0.205***	-0.214***	-0.307***	-0.240***	-0.746***	-0.582***
	(0.071)	(0.072)	(0.081)	(0.085)	(0.104)	(0.109)
Birthplace (Ref. Cat: Urban area)						
Countryside	0.049	0.050	0.075	0.062	0.012	-0.040
	(0.043)	(0.043)	(0.049)	(0.050)	(0.067)	(0.071)
Abroad	-0.008	-0.014	-0.026	-0.048	0.069	0.041
	(0.106)	(0.104)	(0.130)	(0.131)	(0.229)	(0.214)
Metropolitan university	-0.151***	-0.171***	-0.184***	-0.197***	-0.458***	-0.412***
	(0.046)	(0.047)	(0.053)	(0.057)	(0.073)	(0.079)
Private university	0.189*	0.175*	0.135	0.148*	-0.010	-0.041
	(0.101)	(0.102)	(0.087)	(0.087)	(0.213)	(0.237)
Other Controls	No	Academic Rank + Year become assistant professor + Spouse Employment + Spouse Education	Age at marriage	Academic Rank + Year become assistant prof. + Spouse Employment + Spouse Education + Age at marriage	Age at parenthood	Academic Rank + Year become assistant prof + Spouse Employment + Spouse Education + Age at parenthood
Baseline hazard: Time varying time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-5.208***	-5.073***	-2.523***	-3.589***	-1.602	-2.473**
	(0.082)	(0.090)	(0.847)	(1.104)	(1.129)	(1.176)
N (person years)	128482	128482	21999	20742	23014	21747
n (persons)	4,249	4,249	3,640	3,637	2826	2,804
Number of events	3,679	3,679	2,776	2,776	1,573	1,573
Log-likelihood	-17513.1	-17454.9	-10682.071	-10504.746	-7177.8037	-6877.2151

Note: Discrete time logit models above report coefficients. Standard errors are shown in parentheses.
* p <0.1, ** p<0.05, *** p<0.01. Transition into marriage is estimated with the entire sample, transition into parenthood is estimated with academics who are married, and transition into 2nd child is estimated with academics who are parents. Time intervals in hazard function are derived separately for each event and gender from hazard rates obtained from Kaplan-Meier curves. Time intervals for 1st marriage are measured as age: 0-23, 24, 25, 26, 27, 28, 29-33, 34-47 and 48+ for women; 0-24, 25, 26,27, 28, 29, 30, 31, 32-36, 37-54, 55+ for men. Time intervals for 1st births are measured as number of years after marriage: 0-1, 2, 3, 4, 5, 6, 7, 8-11, 12+ for women; 0-1, 2, 3, 4,5, 6, 7-10, 11+ for men. Time intervals for 2nd births are measured as number of years after 1st birth: 0-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11+ for women; 0-1, 2, 3, 4, 5, 6, 7, 8, 9, 10+ for men.

Table 3. Period effects and family transitions of women: Discrete-time logit models

	1st marriage	1st birth	2nd birth	1st marriage	1st birth	2nd birth
				Interaction Models		
Career Stage (Ref Cat: PhD years)						
Assistant Prof	0.170	0.305**	0.577***	-0.102	0.222	0.342
	(0.156)	(0.151)	(0.210)	(0.411)	(0.385)	(0.386)
Associate Prof	-0.096	0.450*	-0.099	0.834	-0.228	-0.986
	(0.271)	(0.230)	(0.283)	(0.574)	(0.499)	(0.717)
Full Prof	-1.400**	-0.261	-1.288**	-0.030	0.993	0.051
	(0.577)	(0.557)	(0.605)	(0.987)	(0.710)	(0.888)
Period (Ref Cat: pre-1991)						
1991-1998	-0.020	-0.461***	-0.597***	-0.039	-0.428***	-0.932***
	(0.093)	(0.114)	(0.188)	(0.141)	(0.162)	(0.310)
1998-2007	0.100	-0.646***	-0.538***	0.014	-0.653***	-0.772**
	(0.114)	(0.132)	(0.183)	(0.152)	(0.177)	(0.331)
*Rank*Period (Ref. Cat.: PhD*Pre-1991)*						
Assist Prof* Period:1991-1998				-0.014	0.049	0.742
				(0.479)	(0.456)	(0.505)
Assist Prof* Period:1999-2007				0.436	0.110	0.191
				(0.435)	(0.420)	(0.468)
Assoc. Prof* Period:1991-1998				-0.757	0.717	0.690
				(0.671)	(0.621)	(0.875)
Assoc. Prof* Period:1999-2007				-1.163*	0.764	1.162
				(0.645)	(0.546)	(0.781)
Full Prof* Period:1991-1998				0.000	-2.329*	-1.481
				(.)	(1.230)	(1.316)
Full Prof* Period:1999-2007				-1.349	-1.304	-1.716
				(1.165)	(0.983)	(1.208)
N (person years)	44849	6609	7250	44,790	6,547	7,250
n (persons)	1442	1083	779	1,442	1,083	779
Number of events	1091	780	310	1,091	780	310
Log-likelihood	-4038.2727	-2220.88	-1171.77	-4029.37	-2212.98	-1166.13

Note: Discrete time logit models above report coefficients. Standard errors are shown in parentheses.
* p <0.1, ** p<0.05, *** p<0.01. Transition into marriage is estimated with the entire sample, transition into parenthood is estimated with academics who are married, and transition into 2nd child is estimated with academics who are parents. Time intervals in hazard function are derived separately for each event and gender from hazard rates obtained from Kaplan-Meier curves, as described in Table 2. Models control for father's education, place of birth, type of university, location of university. Models on marriage additionally controls for age at marriage; models on first and second births age at having, respectively, first or second child. Models also include time varying pre-PhD years and career interruption years for those that have interrupted in grouped form (and their interactions), but for parsimony these spells are not reported.

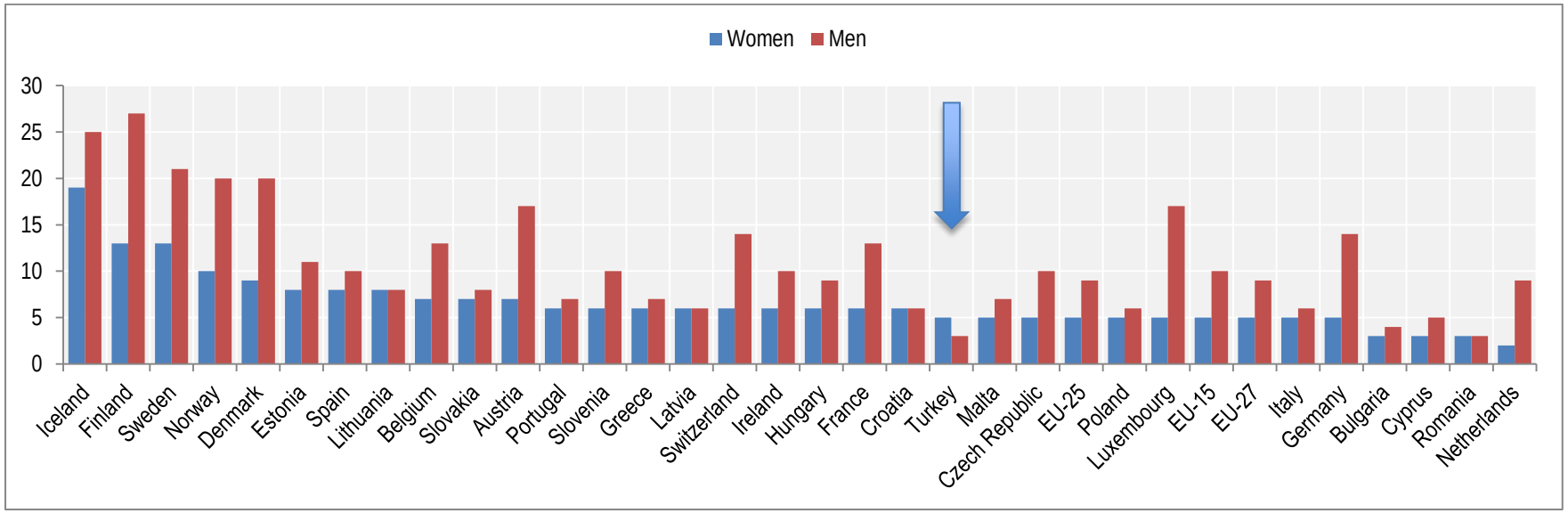
Table 4. Field differences in family transitions among women – Discrete-time logit models

	1st marriage	1st birth	2nd birth	1st marriage	1st birth	2nd birth
	b/se	b/se	b/se	b/se	b/se	b/se
					(interaction models)	
Career Stage (Ref Cat: PhD years)						
Assistant Prof	0.169	0.282*	0.547***	0.278	0.373*	0.005
	(0.157)	(0.155)	(0.212)	(0.190)	(0.194)	(0.265)
Associate Prof	-0.134	0.442*	-0.156	0.212	0.190	-0.685*
	(0.277)	(0.242)	(0.281)	(0.331)	(0.325)	(0.362)
Full Prof	-1.367**	-0.359	-1.249**	-0.309	-0.760	-0.853
	(0.575)	(0.607)	(0.619)	(0.539)	(0.810)	(0.666)
STEM fields	-0.070	-0.008	0.097	0.153	-0.009	-0.580**
	(0.074)	(0.093)	(0.139)	(0.114)	(0.136)	(0.276)
*Career Stage*STEM (Ref. Cat.: PhD*STEM)*						
Assist. Prof*STEM				-0.216	-0.188	1.155***
				(0.260)	(0.267)	(0.371)
Assoc. Prof*STEM				-0.694	0.455	1.101**
				(0.469)	(0.402)	(0.486)
Full Prof*STEM				(no event)	0.653	-0.616
					(1.055)	(1.188)
N (person years)	44554	6578	7240	44374	6578	7240
n (persons)	1,433	1,076	777	1,433	1,076	777
Number of events	1084	778	310	1084	778	310
Log-likelihood	-4010.2075	-2236.3233	-1194.3044	-4004.8939	-2211.4212	-1164.4254

Note: Discrete time logit models above report coefficients. Standard errors are shown in parentheses.
* p <0.1, ** p<0.05, *** p<0.01. Transition into marriage is estimated with the entire sample, transition into parenthood is estimated with academics who are married, and transition into 2nd child is estimated with academics who are parents. Time intervals in hazard function are derived separately for each event and gender from hazard rates obtained from Kaplan-Meier curves, as described in Table 2. Models control for father's education, place of birth, type of university, location of university. Models on marriage additionally controls for age at marriage; models on first and second births include age at having, respectively, first or second child. Models also include time varying pre-PhD years and career interruption years for those that have interrupted in grouped form (and their interactions), but for parsimony these spells are not reported.

Appendix

Figure A1. Researchers per thousand labor force by sex in 2006



Source: She Figures 2009, Figure 1.6, with data from Labour Force Survey, S&T Statistics (Eurostat), Norwegian Institute in Innovation, Education and Research.
Notes: Exceptions to the reference year: Slovakia, Czech Republic, Estonia 2007; Belgium, Denmark, Germany, Ireland, Greece, Luxembourg, Netherlands, Portugal, Sweden, Iceland, Norway 2005; Switzerland: 2004. The labor force is defined as the sum of employed and unemployed persons.

Table A1. Doctorate holders by sector of employed and sex, 2009

	Total		Male		Female	
Sector of employment	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**
Total employed	71,966	100	47,222	65.6	24,744	34.4
Government sector	10,715	14.9	6,986	9.7	3,728	5.2
Business enterprise sector	8,308	11.5	5,836	8.1	2,472	3.4
Higher education sector	52,309	72.7	34,064	47.3	18,245	25.4
Other education sector	403	0.6	196	0.3	207	0.3
Private non-profit sector	231	0.3	140	0.2	91	0.1

Source: Survey of Doctorate Holders, 2009 Turkish Statistics Institute.

Table A2. Doctorate holders by employment situation and sex, 2009

Employment situation	**Total**		**Male**		**Female**	
	Number	**(%)**	**Number**	**(%)**	**Number**	**(%)**
Total	77,424	100.0	49,503	63.9	27,921	36.1
Employed	71,966	93.0	47,222	61.0	24,744	32.0
Unemployed	673	0.9	266	0.3	407	0.5
Inactive	4,668	6.0	1,941	2.5	2,727	3.5
Unspecified	117	0.2	74	0.1	43	0.1

Source: Survey of Doctorate Holders, 2009 Turkish Statistics Institute.

Table A3. Summary statistics of control variables

	Men		Women	
	Freq	**%**	**Freq**	**%**
Father's level of education				
No formal education	506	17.80	39	2.70
Primary education	976	34.33	283	19.61
Lower secondary education	243	8.55	124	8.59
Upper secondary education	363	12.77	254	17.60
Tertiary education	755	26.56	753	51.49
Birth place				
Urban areas	1144	40.65	810	56.76
Countryside	1595	56.68	581	40.71
Abroad	75	2.67	36	2.52
Type of university				
Public	2611	91.78	1308	90.71
Private	234	8.22	134	9.29
Location of the university				
Small towns	1871	65.74	621	43.07
Metropolitan areas	975	34.26	821	56.93
Academic field				
STEM fields	1431	50.69	562	39.22
Academic rank				
Assistant Professor	1224	46.61	665	51.91
Associate Professor	601	22.89	290	22.64
Full Professor	801	30.50	329	25.45
Spouse's level of education				
No formal education	9	0.38	0	0
Primary education	122	5.20	0	0
Lower secondary education	80	3.41	1	0.12
Upper secondary education	311	13.25	12	1.46
Tertiary education	1825	77.76	807	98.41
Spouse's employment status				
Employed	1366	58.18	748	91.22
Unemployed	59	2.51	8	0.98
Out of labour force	923	39.31	64	7.81
	Mean	**St. Dev.**	**Mean**	**St. Dev.**
Age at marriage	29.05	4.41	27.73	4.37
Age at parenthood	31.18	4.76	30.27	4.23
Total	2850		1443	

Source: Turkish Academic Career Survey, 2007, authors' calculations.

Table A4. Distribution of academic men and women academic ranks and mean age in 2007 (cross-sectional sample, weighted distributions)

	Men				Women			
	Freq.	%	Mean age	St Dev	Freq.	%	Mean age	St Dev
PhD student	221	7.75	37.5	6.2	161	11.16	36.6	4.8
Assistant professor	1225	42.98	40.7	5.95	665	46.08	39.9	5.16
Associate professor	602	21.12	42.8	5.6	290	20.1	43.6	5.84
Full Professor	802	28.14	53	7.5	327	22.66	51.67	7.05
Overall	2850	100	44.1	8	1443	100	43.6	7.4

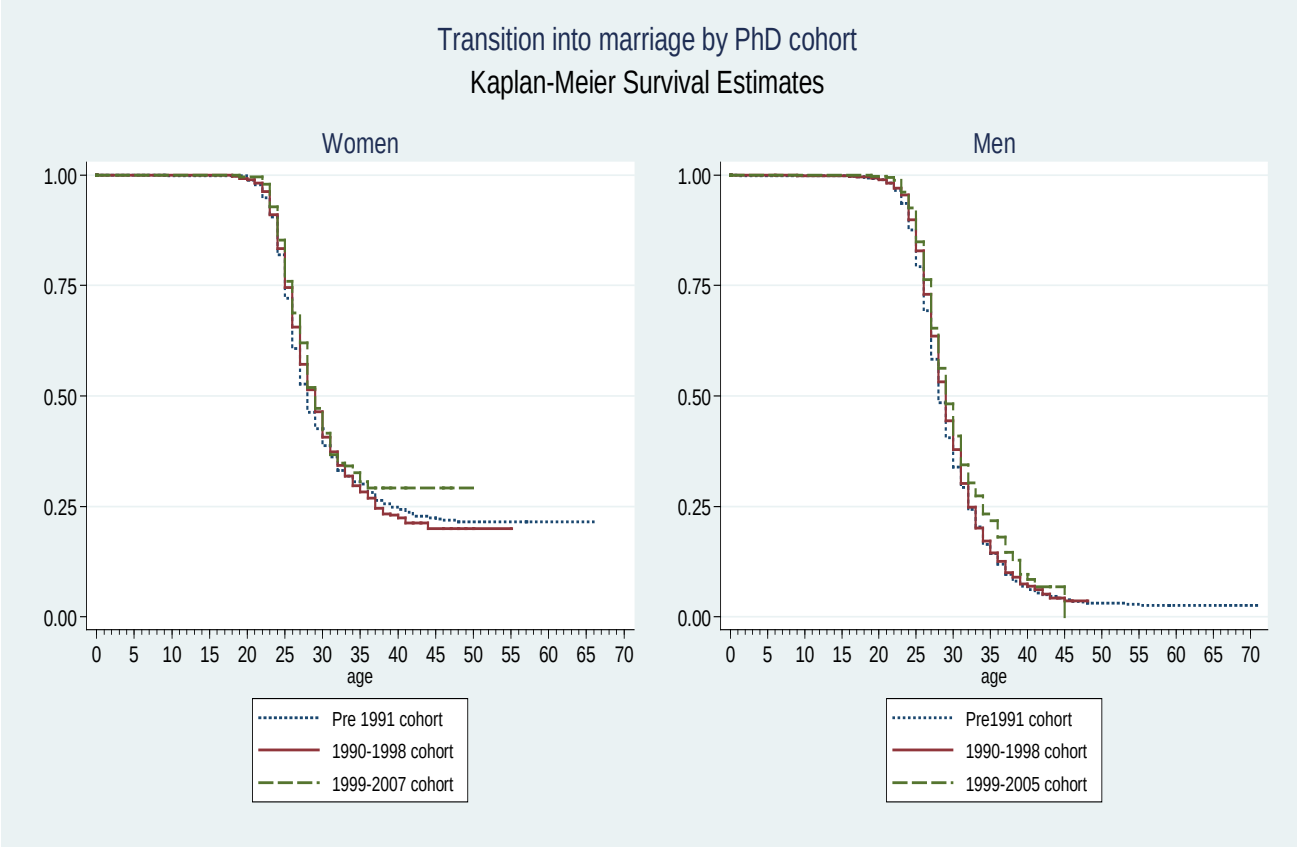
Source: Turkish Academic Career Survey, 2007, authors' calculations.

Table A5. Academics by field (cross-sectional sample, weighted distributions)

		Male	**Female**	**Total**
Education	Freq.	353	227	580
	%	60.84	39.16	100
Humanities and Art	Freq.	183	100	283
	%	64.64	35.36	100
Social sciences, business and law	Freq.	315	215	530
	%	59.43	40.57	100
Science	Freq.	966	342	1308
	%	73.88	26.12	100
Engineering, manufacturing and construction	Freq.	422	152	574
	%	73.57	26.43	100
Agriculture	Freq.	542	111	653
	%	82.94	17.06	100
Health and welfare	Freq.	132	120	252
	%	52.33	47.67	100
Services	Freq.	57	33	90
	%	63.16	36.84	100
Total	Freq.	2,963	1,298	4,261
	%	69.55	30.45	100
		Male	**Female**	**Total**
Female-typed fields	Freq.	1,037	694	1,731
	%	59.91	40.09	100
STEM fields	Freq.	1,926	604	2,530
	%	76.14	23.86	100
Total	Freq.	2,963	1,298	4,261
	%	69.55	30.45	100

Source: Turkish Academic Career Survey, 2007, authors' calculations.

Figure A2. Differences in Family Formation Outcomes by Phd Entry Cohorts



Source: Turkish Academic Career Survey, 2007, authors' calculations.