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**EDUCATION AND THE ALLOCATION
OF TIME OF MARRIED WOMEN IN IRAN**

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Abstract

In the past two decades Iranian women have become much better educated and reduced their childbearing by more than two thirds, but their participation in market work has hardly increased. Economic theory and historical experience suggest that women's education increases their market work because it increases the value of their time in the market relative to leisure or home production. In Iran, the low level of labor force participation of educated women has become a serious policy issue putting pressure on the government to limit women's attendance at subsidized public universities, on grounds that women do not use their education productively. In this paper we examine new data from a time-use survey of urban households in 2009 to show how education affects the time use of married women in urban Iran. Our results indicate that in Iran productivity of women's education is realized in the market as well as at home, in investment in children. Educated women spend more time in the market and in educating their children, two activities that are considered productive and good for economic growth. The time saved appears to be mainly at the expense of domestic work.

JEL Classifications: D1, J2, J16

Keywords: Time use, women's education, labor force participation, child education.

ملخص

في العقدين الماضيين، أصبحت النساء الإيرانيات أفضل تعليماً وقل من إنجابهن بأكثر من الثلثين، إلا أن مشاركتهن في العمل في السوق لم تزد. وتشير النظرية الاقتصادية والخبرة التاريخية إلى أن تعليم المرأة يزيد من عملها في السوق لأنه يزيد من قيمة وقتها في السوق بالنسبة إلى الترفيه أو الإنتاج المنزلي. وفي إيران، أصبح انخفاض مستوى مشاركة النساء المتعلّمات في قوة العمل مسألة سياسية خطيرة تضع ضغوطاً على الحكومة للحد من حضور النساء في الجامعات الحكومية المدعومة، على أساس أن النساء لا يستخدمن تعليمهن بشكل منتج. في هذه الورقة ندرس بيانات جديدة من مسح استخدام الوقت للأسر الحضرية في عام 2009 لإظهار تأثير التعليم على استخدام الوقت للمرأة المتزوجة في إيران الحضرية. وتشير نتائجنا إلى أن إنتاجية تعليم المرأة في إيران تتحقق في السوق وكذلك في المنزل، وفي الاستثمار في الأطفال. وتقضي النساء المتعلّمات وقتاً أطول في السوق وفي تعليم أطفالهن، وهما نشاطان يعتبران منتجين وجيدين للنمو الاقتصادي. ويبدو أن الوقت الذي تم توفيره هو أساساً على حساب العمل المنزلي.

1. Introduction

Recent decades have brought significant change to the lives of Iranian women, especially in education and childbearing (Salehi-Isfahani 2016b). Their average years of schooling has increased by two thirds in one generation, and younger urban cohorts of women are more educated than their male counterparts (see Figure 2). As expected, rising education has paralleled a significant decline in fertility, from about 7 to 2 births per woman (Figure 1). But these changes have not led to greater participation of women in the labor force; the share of adult women in market work has remained below 20 percent, less than one-fourth of the rate for men (Figure 3). The unresponsiveness of labor force participation of women to rising education and falling fertility is all the more surprising since labor saving appliances, which reduce women's time in domestic work (Ramey 2009), have also become much more common (Salehi-Isfahani 2016b). Although at odds with the historical trend (Goldin 1995; Angrist and Evans 1998), this is a common pattern in the Middle East and North Africa (Verme 2015), prompting explanations ranging from the availability of oil rent (Ross 2008) to culture and Islam (Moghadam 2003; Robinson 2005). A World Bank (2004) report refers to it as the "MENA gender paradox." In Iran, low market participation of educated women is a subject of intense political and social debate. Conservatives commentators and parliamentarians have called for limiting women's access to subsidized public higher education on grounds that women displace men who are more likely to work. Clearly, without a good understanding of how educated women allocate their time, public education policy can go seriously wrong.

The Iran gender paradox is essentially a puzzle about the time use of married women. Unmarried women are twice as likely to work in the market as married women. Economic development generally reduces the burden of domestic work on married women as families decide to have fewer children and purchase time-saving household appliances. At the same time, as women acquire more education and the productivity of their time in market work increases they may well decide to spend more time in the market. The lack of a perceptible increase in the participation rates of married women in Iran in response to these changes begs the question of where has all the released time gone. If not to market work, has it been allocated to other productive activities, such as investment in child health and education, or simply gone to more domestic work and leisure?

A good place to look for answers is in the time use of married women and how it relates to their level of education. To adequately answer questions about the "missing time" of women, ideally we need time-use data at two points in time, before and after changes in fertility and increase in time-saving household appliances. But, in Iran the earliest time-use survey conducted is for 2009, limiting our ambition to examining the relationship between women's education and their time allocation and have to eschew causal identification. We are particularly interested in how education affects the time use of married women between two types of activities: those that education can enhance in terms of their contribution to national output and economic growth – call them "productive" activities (market work and child education at home) – and the rest (basic child care, domestic work, and leisure), which education does not affect in any particular way. Certain child care activities can be in the first category depending on their impact on child health and education. Analysis of time-use data in this way can shed light on the question of the social value of subsidizing women's higher education in Iran.

The literature on family economics guides our thinking on this issue. One is the quality-quantity theory of fertility pioneered by Becker and Lewis (1973), which emphasizes the tradeoff between the number and quality of children. As income increases and preferences for child quality increase relative to quantity of children, families reallocate resources, in this case women's time, from raising several children to educating a few. The total time mothers spend on children may not change, or may increase, but the type of activities involving children may

shift from basic childcare to child education, especially for educated mothers who are more productive in investing in child education. A related model, pioneered by Gronau (1977), integrates women's labor supply with their home production activities, which may be interpreted to include investment in child human capital. According to this model, women decide on market work by comparing its returns to the returns from child education at home. As a result, more educated women who are more effective in investing in their children's health and education, would increase their time allocated to both activities. Gronau's model essentially adds more structure to home production of child quality without changing the tradeoff between quantity and quality of children. A variety of evidence from advanced economies shows that more educated women spend more time in raising their children compared to less educated women (Hill and Staord 1980; Bryant and Zick 1996; Hoerth 2001; Bianchi, Cohen, Raley, and Nomaguchi 2004; Sayer, Gauthier, and Furstenberg 2004; Kalenkoski, Ribar, and Stratton 2005; Craig 2006; Kimmel and Connelly 2007; Guryan, Hurst, and Kearney 2008). Whether or not this tradeoff will induce more educated women to reduce their market work depends on the institutional features of the markets in labor and human education, but remains a theoretical possibility. Access to market work for Iranian women is restricted by patriarchal cultural norms that require gender separation in public spaces, at work, and in transportation. In most MENA countries, including Iran, women need permission from their husbands or fathers to work outside the home. These restrictions raise the cost of entry of educated women into the labor market and may tilt the balance in their time allocation in favor of home production. There are some institutional features of the education systems in Iran and MENA that also play into the relative costs and benefits of market relative to home production of human capital. MENA education systems are highly competitive with a narrow emphasis on rote memorization and widespread private tutoring (Elbadawy et al. 2009; Tansel 2013). Potentially, educated women may want to spend more time at home to invest in a broader array of skills (such as sports and the arts) or, alternatively, to push harder in the same direction as schools by supervising homework and private tutors (Salehi-Isfahani 2016a). Mother's education is empirically the most important determinant of child education, in MENA and world wide (Carneiro et al. 2013; Salehi-Isfahani 2001). So the value of women's education in raising the human capital of the next generation may not be any less than participation in market work. The relative value of home teaching is particularly high in MENA where schools emphasize test taking and rote memorization to an unusual degree and where parents can complement formal education by teaching soft skills and good citizenship (Salehi-Isfahani 2016a). Until the quality of public education in MENA is raised, and barriers to women's participation in the labor force are lowered, the contribution of educated women to teaching their children may well compete with their contribution through market work.

Explaining the "missing time" of MENA women is also important for understanding how economic development of MENA countries may have enhanced female empowerment without increasing their market work. The reallocation of women's time from childbearing to market work is associated with greater female empowerment (Anderson and Eswaran 2009). Women who work outside the home and earn independent incomes can influence the intra-household allocation of resources to the benefit of women and children (Mammen and Paxson 2000; Rosenzweig and Schultz 1982). Education can empower women for reasons other than income generation. The positive effect of women's education on time and resources allocated to children have been well documented (Duflo 2011). As with market work, which increases women's share in total household income, a greater role in the production of child quality, arguably the most important public good produced within the family, may increase women's say in how resources are allocated and how women are treated at home. If in this way education can empower women, then low levels of women's participation in the labor force does not necessarily constitute a failure of economic development to transform women's position in Middle Eastern societies.

Our findings suggest that more educated women spend more time in both types of productive and empowering activities, market work and child education, and less on domestic work. The actual time spent in child education measured is not large enough to explain low participation in market work or account for MENA women's "missing time," but it is possible that a commitment to child education interferes with women's ability to take up full time work outside the home. The biggest impact of education on time use is observed in market work, though it only shows up beyond high school. Compared to women with less than a primary education, college educated married women with at least one child under 18 years of age on average spend two hours more on market work, about 20 minutes more with their children, and 1.4 hours less on domestic work.

The rest of the paper proceeds as follows. The next section provides more context to women's allocation of time in Iran. Section 3 presents our conceptual framework for the main ideas that underpin our empirical investigation. It highlights the factors that we believe affect the allocation of women's time to market and child human capital, and helps us interpret our empirical results. Section 4 describes the survey data and how we construct our time use variables. Section 5 is a preliminary view of the main patterns of time use observed in the data, showing the difference in time use between men and women and by education. Section 6 presents our estimation results, and Section 7 offers conclusions based on our results.

2. Iranian Context

The MENA gender paradox is nowhere more remarkable than in Iran, where the pace of social transformation, especially rural areas, has been very rapid. Rural fertility fell from about 8 births per woman in the 1980s to replacement level in little over a decade (see Figure 1). During the same period, urban fertility fell from about 6 to 2. The Economist called Iran's fertility transition "about as fast as social change can happen."¹ Initially, after the Islamic revolution of 1979, the government banned family planning and fertility actually increased. But as much larger cohorts of children reached elementary school age, forcing many schools to go to two and sometimes three shifts, the government reversed itself in 1989 and supported family planning (Salehi-Isfahani et al. 2010).

During the same period the average years of schooling of women increased significantly. Comparing cohorts of women born in 1960s and 1980s, the average years of schooling in rural areas increased from 5.5 to 9.5, and in urban areas from 9.0 to 12.2 (Figure 2). The rise of female education is partly credited to the gender segregation of schools, which may have allowed girls from more conservative families to attend school. The rise of girl education in rural areas was actually faster than urban areas. Despite these developments, women's participation in market work is low (Figure 3), remaining at one-third of the women's participation rate in, for example, Malaysia, also a predominantly Muslim country with similar fertility and female education profiles.

Marriage is an important determinant of women's labor force participation. In 2015, unmarried (single and divorced) women participated at a much higher rate than married women, 28.4% vs. 10.0% (Figure 3). The wide disparity in participation of married and unmarried women appears to have widened in recent years. Studies in MENA countries have shown that married women are less likely to participate in market work. In Egypt, most women in private sector leave their jobs at marriage (Assaad 2015). The much lower participation of married women in MENA is often attributed to male patriarchy (Diwan and Vartanova 2016), but the evidence is not conclusive. Given Iran's patriarchal culture, the time allocation of married women has a lot to do with whom they marry. There is a fair amount of assortative mating in Iran. Educated women tend to marry educated men; the correlation coefficient in years of schooling of couples

¹ "Falling Fertility," print edition, October 30, 2009, <http://www.economist.com/node/14744915>.

is about 0.7. Because educated men may influence the time allocation of their wives, with assortative mating, a part of the impact of women's education on time use is indirect and through the education of their husbands. Without good identifying instruments, it is not possible to separate the direct and indirect effects.

3. Conceptual Framework

The literature on the economics of households has moved beyond the traditional unitary model in which the household head makes all the important decisions, such as who works where and how much, introducing different versions of collective decision making model (Chiappori and Donni 2009), with implications on the labor supply of women (Blundell et al. 2007). But the new collective models do not yet offer practical guidelines for empirical research on married women's time use, so the basic unitary model continues to supply plausible predictions and has intuitive appeal. In the unitary framework, without loss of generality we can represent the household by a single woman decision maker who, given her education and other household characteristics (husband education, the number of children, etc.), decides on how to allocate her time to market work, child care and child education, domestic work, and leisure. We attempt to capture these choices with a simple model of time use that illustrates the effect of education on married women's time allocation. For simplicity, we assume that the woman's education and marriage decisions are predetermined. Marital sorting is a fact of life, in Iran and elsewhere, so to the extent that the husband's education affects the time allocation, the fact that educated women marry educated men, with the data at hand, we cannot isolate the effect of the woman's education on her time allocation from that of her husband. Our model closely resembles the representation of the household with home production proposed by Gronau (1977) Our model differs from Gronau's in the type of home produced good. In his model, the home produced and market purchased goods are perfect substitutes, whereas in our model the home produced good is child human capital, which market purchased education is not a perfect substitute. We assume that human capital is produced at home using the woman's own time as well as schooling purchased from the outside.

We assume that the household (in this case the woman) maximizes a one-period utility $U = U(X_m, X_d, h, l)$, where X_m is the consumption of market goods, X_d is the consumption of a domestically produced good, h is child human capital, and l is leisure. Utility is maximized subject to the budget and time constraints. The budget constraint is:

$$X_m + pE = w(H)L_m + v, \quad (1)$$

where p and E are the price and quantity of education purchased in the market, $w(H)$ is the market wage, H is the human capital of the mother, L_m is her time in the labor market, and v is non-wage income. The price of X_m is normalized to one. We assume that the wage is an increasing and concave function of the mother's human capital, which is the common assumption about declining returns to education in the labor market: $w'(H) > 0$ and $w''(H) < 0$. The household, which is represented by the mother buys market goods as well as education. Expenditures on market goods and education (pE) are paid for by the woman's income from market work $w(H)L_m$ plus other income v (for example, unearned income and income of the husband). The time constraint is:

$$T = L_m + L_d + L_h + l,$$

where L_h is the time spent at home on educating children, L_d is domestic work, and T is the total time available.

Production of child education is a function of the effective time the mother spends at home teaching her children, HL_h , and market-purchased schooling:

$$h = g(HL_h, E), \quad (2)$$

with diminishing returns to both inputs. This formulation of home production, which is different from Gronau (1977), is closer to Graham and Green (1984) and Kerkhof and Koorman (2003), who allow home production to use market and home inputs while maintaining the assumption of perfect substitutability between market and home goods in consumption as in Gronau (1977). In our formulation, because child education is not a perfect substitute for the market produced good and needs a home input to produce, results in a different interaction between market wage and labor supply. Although our model is too general to generate precise predictions regarding the effect of H on the allocation of mother's time, it helps in clarifying the circumstances under which we should expect a rising supply of labor to the market and child education.

The woman's decision problem can be written as:

$$\max U = U(X_m, X_d, h, l) \quad (3)$$

$$s.t. \quad X_m + pE = w(H)L_m + v \quad (4)$$

$$h = g(HL_h, E) \quad (5)$$

$$T = L_m + L_d + L_h + l \quad (6)$$

Substituting for X_m , L_m , and h from the above constraints, the maximization problem reduces to:

$$\max_{L_h, E, l} U(w(H)(T - L_d - L_h - l) + v - pE, X_d, g(HL_h, E), l) \quad (7)$$

The first order conditions are:

$$\frac{\partial U}{\partial L_d} = -w(H)U_1 + U_2 = 0 \quad (8)$$

$$\frac{\partial U}{\partial L_h} = -w(H)U_1 + HU_3g_1 = 0 \quad (9)$$

$$\frac{\partial U}{\partial l} = -U_1w(H) + U_4 = 0 \quad (10)$$

$$\frac{\partial U}{\partial E} = -pU_1 + U_3g_2 = 0 \quad (11)$$

The first three conditions require that the marginal value of time in the market, $w(H)U_1$, equal its marginal value in domestic work, U_2 , in teaching, Hg_1U_2 , in leisure, U_4 . The last condition guarantees the efficient allocation of expenditures between the market good and schooling, and combined with the second condition expresses a key equilibrium condition:

$$\frac{g_1}{g_2} = \frac{w(H)/H}{p} \quad (12)$$

Equation 12 requires that the marginal rate of transformation between home and purchased schooling equal the ratio of the price of home teaching (which is forgone wage per unit of H)

to price of schooling. Thus, in equilibrium, the amount of child human capital produced per dollar at home or at school are equal.

How does more education affects mother's time allocation? As is well known, household models of this type do not generate precise predictions. For example, the effect of an increase in mother's education on the allocation of time between leisure and what we might call "productive" activities – market work and child education – depends on the relative strengths of price and income effects, which cannot be determined in the general formulation. An increase in the woman's education increases her wage, which increases her income as well as the price of her leisure. Since leisure is a normal good, the positive income effect from the higher wage may dominate the negative price effect, raise the consumption of leisure and reduce the time allocated to market and home teaching. In most cases women's labor supply is increasing in education, suggesting that the price effect may dominate the income effect, so that, as the wage increase, leisure is reduced and time is released for market work – in our case to market as well as home teaching. The same is more likely to be true of domestic work, if the market and domestic goods are close substitutes, such as restaurant meals and food at home, so we may plausibly assume that rising education releases time for "productive" activities in the market and at home. Our empirical results show that female education reduces time in domestic work.

The key to determining which activities will thrive as a result of rising education, is the relative marginal valuations of time in the market, $w(H)U_1$, and in child education, Hg_1U_2 . As H increases both values increase but at different rates depending on the shape of the returns functions for women's education in the labor market and in home teaching. The wage function, $w(H)$, is normally assumed to be concave ($w''(H) < 0$), so that market returns to education diminish as education increases. This opens up the possibility for the returns to home teaching to exceed the returns to market work beyond a certain level of education. However, this may not be the case in Iran. Returns to education in Iran (and more generally in MENA) appears to be convex, that is, marginal returns decline as education increases. Salehi-Isfahani et al. (2009) find evidence to this effect for male workers in the three largest MENA countries, Egypt, Iran, and Turkey. In Iran and for women the premium on higher education is very high since the type of jobs that MENA societies find appropriate for women are office and clerical jobs that often require tertiary education.² If the returns to education rise at the university level, we should observe that women with higher education spend less time in home teaching relative to those with tertiary, but less than university education. Our estimates below seem consistent with this conjecture.

The effect of education on the productivity of home teaching depends on the tradeoff between home teaching and schooling. At the outset we can safely assume that demand for child human capital, h , increases with income, so the question is whether this increase will be met by increased home production or by more schooling. From equation 12 we know that the effect of education on the price of home teaching, $w(H)/H$, also depends on the shape of the wage function. If the wage function is concave, $w(H)/H$ will fall as H increases and home teaching becomes cheaper relative to schooling, and the time allocated to home teaching increases. But, this relative price effect may be outweighed by the income effect, which increases the ability of the woman to buy schooling with her increased income. This effect may be particularly large if, at high values of H , $w''(H) > 0$ and buying more schooling become the more attractive option. A contrary scenario can also be constructed. If the price of schooling is high enough

² A Mincer regression of log of monthly earnings on years of schooling and experience (without correction for selection) produces a convex returns equation, as indicated by the positive coefficient of the square of years of schooling ($yeduc^2$):

$$\ln wage = 0.091 yeduc + 0.031 yeduc^2 + 0.070 exp - 0.001 exp^2 \quad R^2 = 0.37, N = 2138$$

(0.017) (0.003) (0.007) (0.000)

(or schools are of low quality) so that the mother's time in teaching is relatively more effective than schooling (high g_1/g_2), then she may decide to spend more time in home teaching and reduce her time in the market. Naturally, the in-between case where both L_m and L_h increase is the most likely. Without further restrictions on the functional forms of U and $g(\cdot)$ it is difficult to predict the net effect.

4. Data

The data for this study come from a household survey of time use conducted by the Statistical Center of Iran (SCI) for four rounds (seasons) between fall 2008 and summer 2009 (September 21, 2008 to September 20, 2009). The survey is nationally representative consisting of 12,880 urban households (3220 households in each round and a total of 33,757 individuals). The survey has a stratified, two-stage sampling design. In each round, 1,610 primary sampling units (PSU) were chosen at random using the census 2006 frame and two households were selected from each PSU. Throughout we report cluster-robust standard errors using the cluster information provided. The survey is weighted to adjust for the probability of selection and nonresponse. We use these weights in our tabulations. This survey exhibits a high level of consistency with other household data. The distribution of age and education presented in this survey compare well with census and the more standard Household Expenditure and Income Surveys also collected by SCI. The survey has been used by Ghazie-Tabatabai, Mehri, and Messkoub (2013) to estimate the value of women's time at home, and by Torabi and Abbasi-Shavazi (2016) to study the marriage market.

The survey collected time use data for all household members 15 years and older living in the household at the time of the first visit by the interviewer. Each individual recorded his or her activities in 15-minute intervals on 24-hour diary sheets. Individuals chose the day to report their activities as long as it was between the 10th and 16th of the last month of each season (it could be a weekday, a weekend day, or a special holiday). The activities recorded include market work, eating, sleeping, childcare, domestic work, and leisure activities. The participants were also asked to distinguish between their main and secondary activities, which they performed in parallel with the main activity. The context in which each main activity took place was also recorded –location, whether other people were present, the person or institution for which the activity was carried out, and whether it was paid or unpaid work.

The survey includes the standard demographic information as well as information on assets owned by the household, such as car and appliances, but not household income or consumption expenditures. We use the method of Principal Component Analysis described in Filmer and Pritchett (2001) to aggregate the binary asset ownership variables into a single household wealth index. The assets we use are car, motorcycle, phone, computer, gas stove, refrigerator, freezer, vacuum, washing machine, dishwasher, microwave, TV, video, and sewing machine. Information on access to basic services such as electricity, gas, and water are not provided. The resulting asset index is correlated with other indicators of household socio-economic status, such as women's education.

We divide education groups into five levels: less than primary, less than high school, high school diploma, associate degree (a two year training after high school), and college and above. The distribution of these categories is provided in Table 1. The largest group (45 percent) have completed primary education but not high school. Adding the 15 percent with less than a primary education, about 60 percent of our sample of married women have only a basic education. About 23 percent have high school diplomas, 9 percent associate degrees, and 8 percent college education or above.

We limit our sample to married women between the ages of 15 and 59 living with their husbands and with at least one child under age 18. Table 1 presents the summary statistics for

this sample. There are 6,370 observations in our primary sample. The average age of women is about 36 and have two children. Their husbands are 5 years older and slightly more educated. There are some women who are more educated than their husbands. Approximately 1/4 of the time use diaries are recorded in the summer and 16 percent in the weekends and holidays. The ratio of summer observations indicates that the data is collected evenly during the year.

Researchers categorize their time-use data according to their needs. For example, Aguiar et al. (2013) distinguish between wage and other income generating work because they are interested in the impact of the Great Recession on the allocation of time at the margin between market work and home production. We follow Aguiar and Hurst (2006), Kimmel and Connelly (2007), and Hendy (2010) and combine all income generating activities into one group, which we call market work, and categorize work done at home for consumption within the household as domestic work. The coding of activities in Iran's time-use survey follows the "International Classification of Activities for Statistics" (ICATUS), developed by the United Nations (2005). The ICATUS classifies activities into 15 main categories:

1. Formal sector work: corporations/quasi-corporations, non-profit institutions and government
2. Work for household in primary production activities
3. Work for household in non-primary production activities
4. Work for household in construction activities
5. Work for household providing services for income
6. Providing unpaid domestic services for final use within household
7. Providing unpaid care-giving services to household members
8. Providing community services and help to other households
9. Learning
10. Socializing and community participation
11. Attending/visiting cultural, entertainment and sports events/venues
12. Hobbies, games and other pastime activities
13. Indoor and outdoor sports participation and related courses
14. Mass media
15. Personal care and maintenance

We divide daily time into five categories: market work, domestic work, child care, child education, and leisure. We measure market work as the sum of the first five categories above, which includes market work performed at home and outside the home. Domestic activities are defined as unpaid domestic services for final use within the household (category 6). This includes care of other household members except children. Childcare is reported under category 7 and comprises only the items specific for the basic needs of the household's own children. Child education is also reported under item 7, but it is designated as the time spent developing children's cognitive skills (reading to children, teaching and helping them with homework) as well as playing games and outdoor activities. We measure leisure as the residual (equal to 24 hours minus the time accounted for the above activities).

The survey asks for time spent in each categories as primary or secondary activity. For example, a woman may report domestic work as a primary activity for a particular time slot while she also minds her children, which she would report as a secondary activity. Primary activities correspond more closely to the notion of purposeful time spent with children for child development. We include only primary activities in our time use measures. Specifically, childcare and child education reported as secondary activities are not included in our measures of time spent with children. Some activities, like domestic work and basic childcare are more easily combined with others as secondary activities, so by focusing on primary activities only

we may underestimate them. This is a less of a problem for market work and child education, which are the focus of our study. The distinctions between childcare and leisure is also not straightforward. Most parents derive pleasure from spending time with their children and often report the time spent with their children as being among their most enjoyable time, particularly in comparison with domestic work (Juster 1985; Krueger, Kahneman, Schkade, Schwarz, and Stone 2009; Robinson and Godbey 2010).. But there is also evidence that women treat childcare differently than domestic work or leisure.³ Regardless of whether it is a chore (like changing diapers) or a pleasure (playing ball), in the survey time spent with children is not reported as leisure.

5. Patterns of Time Use

The time use survey reveals several interesting aspects of family life in Iran. In this section we discuss a few before moving to multivariate analysis. An obvious place to start is the difference in the time allocation of adult women and men. Restricting our sample to those aged 20-59, we find, as expected, a sharp contrast in their time use, particularly for married adults, reflecting the well-known traditional household division of labor in Iran (see Table 2). Unmarried women and men spend the same lengths of time in sleeping (8.38 hours compared to 8.28), while unmarried women report slightly longer leisure time than men (11.14 hours per day compared to 10.82 hours). Neither difference is statistically significant. Married women and men spend less time in sleeping and leisure compared to their unmarried counterparts. Married women spend 2.16 fewer hours in leisure compared to unmarried women (2.09 hours difference for men). Married women spend three times as much time in domestic work as married men (3.22 and 1.05 hours, respectively). As expected, marriage adds more than three hours to women's time in domestic work (6.34 hours for married compared to 3.22 hours for unmarried women), but it does not affect men (1.05 vs. 1.31 hours). Both married and unmarried women spend less time in market work than men. The difference is 5.76 hours for married and 2.57 hours for unmarried individuals.

In Tables 3 and 4 we examine the patterns of time use of women and their husbands according to the wives' education. Assortative mating ensures that the pattern we observe for the husbands is not too different were we to use their own education instead. The advantage of doing it this way is that it keeps the focus on women and uses the same sample of married couples for both the top and bottom panels of these tables. The top panel in each table shows the time allocation of women and the bottom panel shows the time allocation of men. The first column in each panel is the average number of children less than 18 years old living in the household, which declines with mother's education. Table 3 shows the average hours spent per day in five time-use categories for couples with at least one child under 6 years old, and Table 4 shows the same for couples with at least one child aged 6-17.

There are several interesting observations to be made from these tables regarding the relationship between women's education and their own and their husbands' time allocation. For brevity we confine the discussion to couples with small children (Table 3) and note any differences between these and couples with older children as they arise. First, note that whereas women's average time allocations change appreciably with education, they do not for their husbands, though none of the differences are statistically significant. The two activities that change the most with education are market work and domestic work, followed by child education. Women with college education and above spend on average 1.90 hours per day in market work compared to half an hour for those with high school and below (again, the difference is not significant). The latter group spend about 6 hours per day doing domestic work, compared to 4.6 hours for the most educated group. It appears that much of the increased

³ Bryant and Zick (1996), Bianchi (2000), Sandberg and Hofferth (2001), Bianchi et al. (2005), Aguiar and Hurst (2006), Howie et al. (2006), Kimmel and Connelly (2007), Guryan et al. (2008).

market time is made possible by reduced time in domestic work (about half an hour comes from reduced leisure time). The two groups with post-secondary education (associate and college) spend about twice as much time in child education as the least educated, but the amounts of time involved in the latter activity are small (0.39 hours and 0.20 hours per day). There is no appreciable change in the time allocation of husbands as their wives education increases.

In Table 7 in the Appendix, we examine the pattern of time use of married women by quintiles of household assets. The top panel is for women with small children under 6 years old and the bottom panel for those with children 6-17 years old. As expected, in both categories richer households have fewer children. Wealth has a weak positive association with time spent on children for those with small children, but not for those with older children. Women in richer households spend less time on domestic work and more in the market. Leisure time does not change with wealth.

Finally, we report the time allocation of married women and men by the number of children younger than 18 years old (Appendix Table 10). For women, time spent with children and in domestic work increase with the number of children, while leisure declines. There is a similar, perhaps weaker relationship in the case of their husbands.

6. Empirical Results

We now turn to the multivariate analysis of time use. Although the decisions to spend time in different activities are interdependent, the empirical literature on the determinants of time use does not generally resort to simultaneous equations estimation. Most authors simply use ordinary least squares (OLS) or instrumental variable methods to estimate each equation separately. OLS does not account for the dependence of time allocated to different tasks, that is, the fact that time spent in one activity is not available to be spent in another. We take this dependence partially into account by allowing the error terms, ε_j , to be correlated across all four equations, and estimate them using Seemingly Unrelated Regressions (SUR), as in Kimmel and Connelly (2007).⁴ We correct for correlation inside PSU's (two married couples in each PSU) using cluster-corrected standard errors.

Our basic estimation model is a system of four linear time allocation equations as follows:

$$t_j = \beta_{0j} + \beta_{1j}X + \varepsilon_j, \quad (13)$$

where t_j is the number of hours per day a mother choose to spend in activity j . Activity j includes basic child care, child education, domestic work, and market work. Leisure is determined as a residual, subtracting all hours from 24, so it does not have a separate equation. The vector of explanatory variables, X , in equation 13 includes standard demographic characteristics of the mothers (age and education), household characteristics (age difference of couples, age and gender of children, presence of a disabled member, and household wealth index), and whether the diary day occurs in the summer. We estimate separate equations for Fridays – the sabbath – and other national holidays.

We control separately for the number of school age children aged 6-11 and 12-17 years old. We do not control for the presence of younger children because it is likely to be endogenous. Other explanatory variables include the presence of a disabled member in the household, which may influence the mother's time allocation, by raising her time in domestic work or childcare and reduce her time for market work. The gender preference of parents can influence the

⁴ Kimmel and Connelly (2007) use Tobit to account for zero values of the dependent variable in three of their four equations of time allocation (except leisure), but we do not because the zeros do not represent censoring. In addition, the estimated marginal effects from Tobit may be biased (Stewart 2013).

amount of time they allocate to male and female children. To check if the allocation of time of Iranian women to children is affected by child gender we include the number of boys as a proportion of all children (less than 18). We also control for the couple's age differences (husbands minus wife) as a measure of the bargaining power of women, which affects their ability to choose how to allocate their time.⁵ A dummy variable marks if the time use data pertain to the summer season, when schools are closed and mothers with school-age children may allocate their time differently. Following Kimmel and Connelly (2007), we report the regression results separately for weekdays (Table 5) and holidays (Table 6). In these regressions we limit our sample to married women aged 15-59 with at least one child younger than 18.

We begin with the discussion of the results for weekdays, presented in Table 5. All four equations are good fits, explaining 15% of the variation in childcare, 11% in child education and market work, and 9% in domestic work. The results confirm our main hypothesis that education increases the time devoted to both market work and children and reduces time for domestic work. However, the effect of education does not kick in until high school in childcare and market work regressions. Women with basic education behave similarly to those with less than primary education (the reference category) in time spent in childcare and market while women with a high school education and above have a different pattern. The most striking difference is in market work. Women with more than a college education work nearly 2 hours more in the market than women with less than primary education and 1.40 hours less in domestic work. The estimated additional time they devote to child care and child education is relatively small, less than 15 minutes per day, but the estimates are significant. These regressions do not show a noticeable difference between the effects of the explanatory variables on child care and child education. It is possible that the distinction between the two is not that clearly recorded in the data, or that the quality of child care time – for example, care related to child health – is not the same for mothers with more and less education.

The most important finding from regressions for time allocation in weekdays is that as education increases women reallocate time away from domestic work to both market and children at home. In other words, as far as the effect of education is concerned, time spent with children and in the market are similar to each other and different than domestic work. Education appears to move the margin in the direction of time spent in activities that it makes more productive (child education and market work) and away from those that it does not make more productive (domestic work and leisure).

The estimated coefficient of age suggests that, as expected, older women spend less time in child care and more in market and on house work. Age also has a significant positive effect on child education time during week days. The age difference of husbands and wives negatively affects the time allocation of women on childcare and market work. Since we already control for the woman's age, one interpretation of the variable measuring the difference between the age of the husband and his wife is that it represents their relative bargaining power. When women are older relative to their husbands (the age difference is smaller), they spend more time on childcare and market work. If this inference is valid, inverting the association, it would suggest that, like market work, childcare is positively correlated with female empowerment. The presence of disabled members in the household has no effect on any of the components of time use.

The coefficient of the number of children aged 6 to 11 in the household is positive and significant in the child education equation but not in the childcare equation. Each additional child in this age group adds 0.08 hours per day to child education time. The number of older children ages 12 to 17 appears to reduce childcare and child education time but increases

⁵ We dropped a few observations that had age differences outside the range minus 9 and 25 years.

domestic work. The proportion of boys in the total number of children less than 18 is positive and significant in the childcare equation but not in others. Assuming that boys are not inherently more time consuming to take care of, this evidence is consistent with male preference among Iranian families, which is widely believed but for which no previous evidence exists. Wealth negatively affects domestic work, but appears to have no direct effect on other components of time use.

Unsurprisingly, the coefficient of the dummy variable indicating the summer season has a negative sign for childcare, child education, domestic work, and market work, indicating leisure takes the place of these activities during the summer months. Similarly, the data shows that time allocation on Fridays and holidays are quite different in that the coefficients of women's education in the regression for child care are no longer significant (Table 6), while their effect is larger in magnitude for child education and domestic regressions. The effects of age, summer, and number of children aged 6 to 11 are also more significant, while the effect of other controls such as the presence of disabled members and household wealth on time allocation is the same as for weekdays. An interesting contrast between child education on weekdays and holidays is worth noting. In weekdays, when some educated mothers work, the coefficient of child education peaks at associate degree and declines for women with college education and above. In fact, for weekdays, women with college education and above seem to spend less time than those with high school, which makes sense if we note that employment opportunities and wages for college educated women are substantially higher than those with less than a college education. The difference in the estimated coefficients for college and associate degrees is significant, but not with high school. In contrast, during holidays, the effect of education on time spent in child education continues to rise and is highest for college or above (though the differences are not significant). One way to interpret the difference in results between weekdays and holidays is that for the latter the opportunity cost of teaching is not market work, so returns to child education naturally is higher than in market work.

To learn more about time use when schools are closed, we ran the regressions for summer months separately instead of placing the summer dummy (Table 9 in Appendix). As with holidays during the school year, the coefficient of education for summer weekdays increases with education all the way to the college level and above. One explanation for this may be that women, especially teachers, are more likely to be on vacation during the summer, so time at home does not compete as much with market work as in other seasons. The regression for holidays during the summer (Table 9) has too few observations to offer reliable estimates, but for what they are worth, they do not offer any evidence that college educated women spend more time in child education, which seems inconsistent with the low opportunity cost argument for holidays advanced above.

Finally, it is useful to contrast these results with similar regressions for married men while conditioning on men's education. We report these results in the Appendix Table 11 for weekdays and and Table 12 for holidays. The largest contrast with women is in market work, which for men *decreases* with education. Educated men spend more time in child education but the coefficients are much smaller than for women. For example, a woman with associate degree spends 0.22 hours more per day on child education whereas for a man this is 0.04 hours. Encouragingly, educated men spend *more* time in domestic work (women spend less time), but the effect is mostly relative to those with less than a primary education. Given assortative mating, this suggests that in more educated households men take up the traditional duties of women as the latter engage in more productive activities.

7. Conclusions

We employ time use data to throw light on a perplexing issue in the allocation of time of married women in Iran. In particular, we are interested in whether more educated women

allocate their time differently to home and market, and at home to domestic work and to children. This question is motivated by secular trends in aggregate outcomes in fertility, education, and labor force participation of women, which suggest that, despite the sharp decline in fertility and rising education, women's participation in market work has not increased.

Our analysis of time use data reveal several important results. First, that education affects the time use of women but not their husbands. The traditional division of labor in which women do the domestic work and men market work is not affected by women's education. Second, more educated women spend more time in the market and on child care and child education, though the size of the impact is much smaller on the latter two categories. From the data it appears that market work and investment in children are activities that more educated women do more of and seem less in conflict with each other that they are with domestic work, which decreases as female education increases.

Our results have interesting implications for the current debate in the Iranian society regarding women's education. They dispute the claim by conservatives in Iran that public spending on women's education, especially at the university level, does not have a positive economic impact. Women with high school and university education work more hours in the market, which is by definition productive. They also spend more time with their children, which increases the human capital of the next generation as well as the efficiency of public expenditures in education. In this context, a statement from the two-time former president Ayatollah Hashemi Rafsanjani is interesting. In response to conservative members of the parliament who objected to "allocating university slots to women who when they graduate stay at home and raise children," he said, "an educated but jobless mother plays an important role in the society because she raises more educated children," (*Hamshahri* newspaper, January 9, 2000.)

Our findings have implications for the effect of education on female empowerment, even where education does not increase women's market work. Female empowerment is an important goal in its own right, but also contributes to economic development (Duflo 2011). So it is important to understand all the channels through which investments in girl education contribute to social and economic development. A large literature identifies women's empowerment with increased market work of women (eg, Hoddinott and Haddad 1995; Anderson and Eswaran 2009; Kantor 2003).. In the Middle East, where the weak link between education and female employment understood in terms of the culture of patriarchy, Islam, or oil income (Moghadam 1993; Ross 2008), focus on the employment channel for increased empowerment leads to overly pessimistic prognosis for the future of women's empowerment in the region. In this context, a better understanding of the impact of women's education on the allocation of time spent at home from domestic activities to child education is important for education policy.

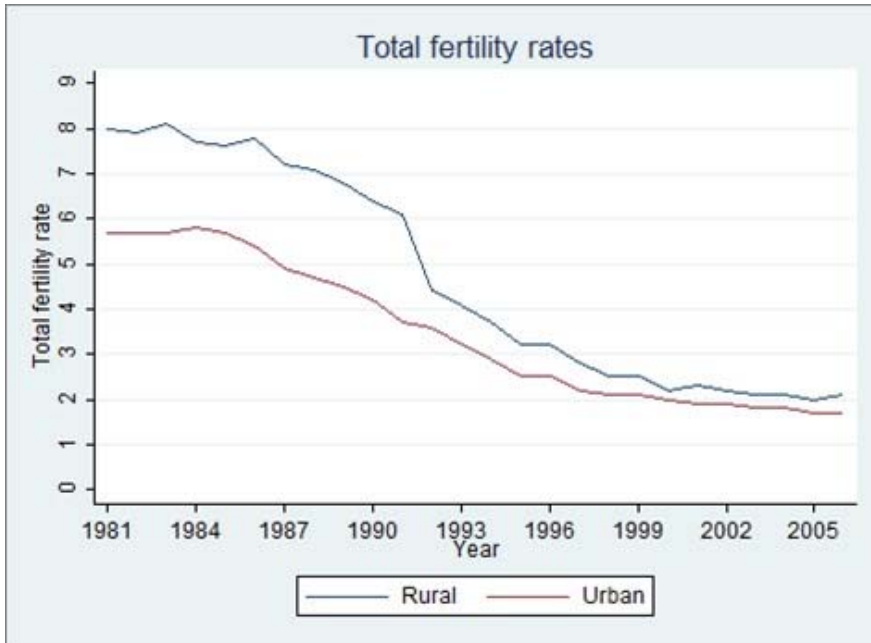
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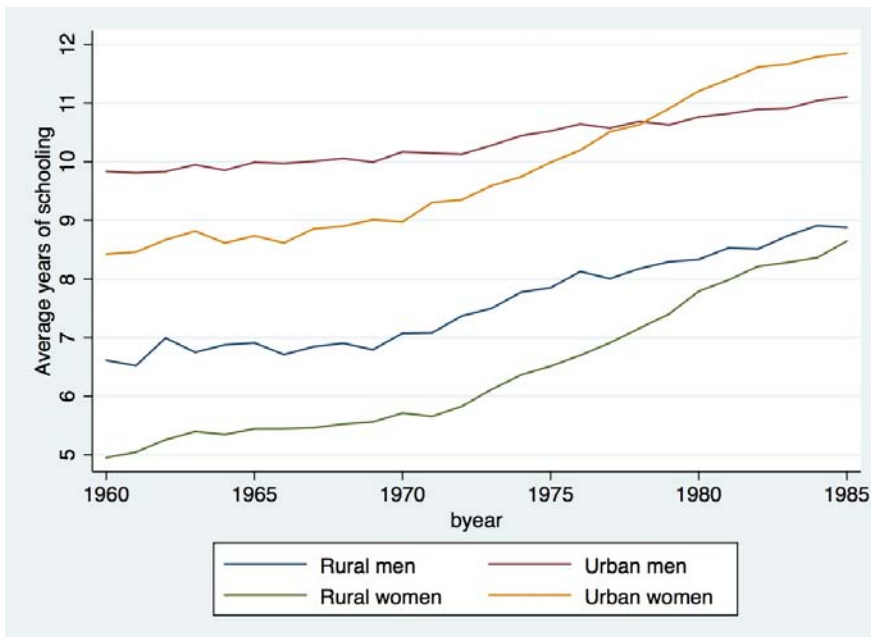
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Figure 1: Fertility Decline



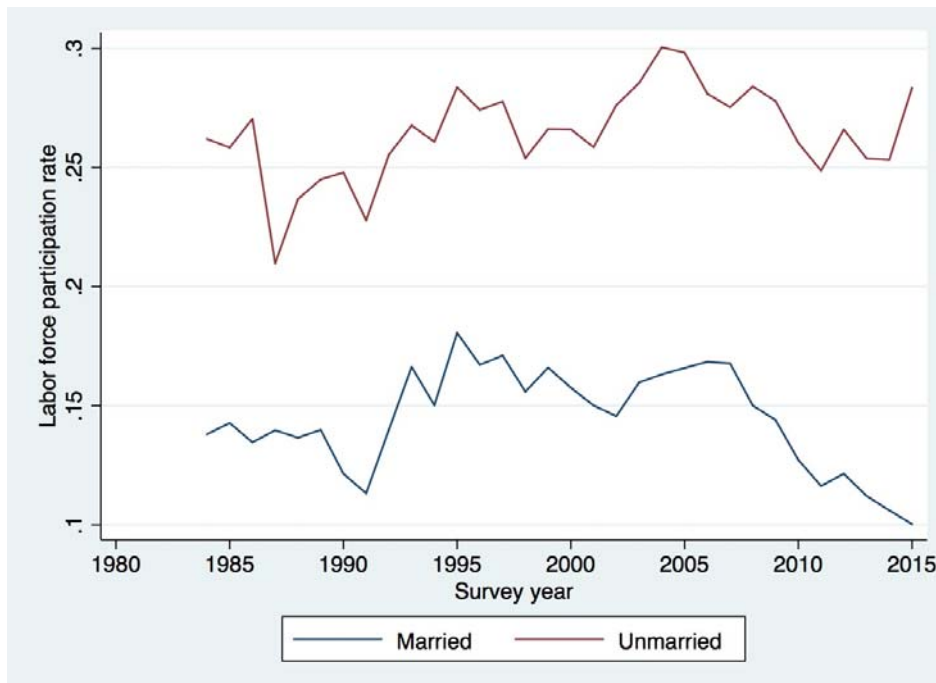
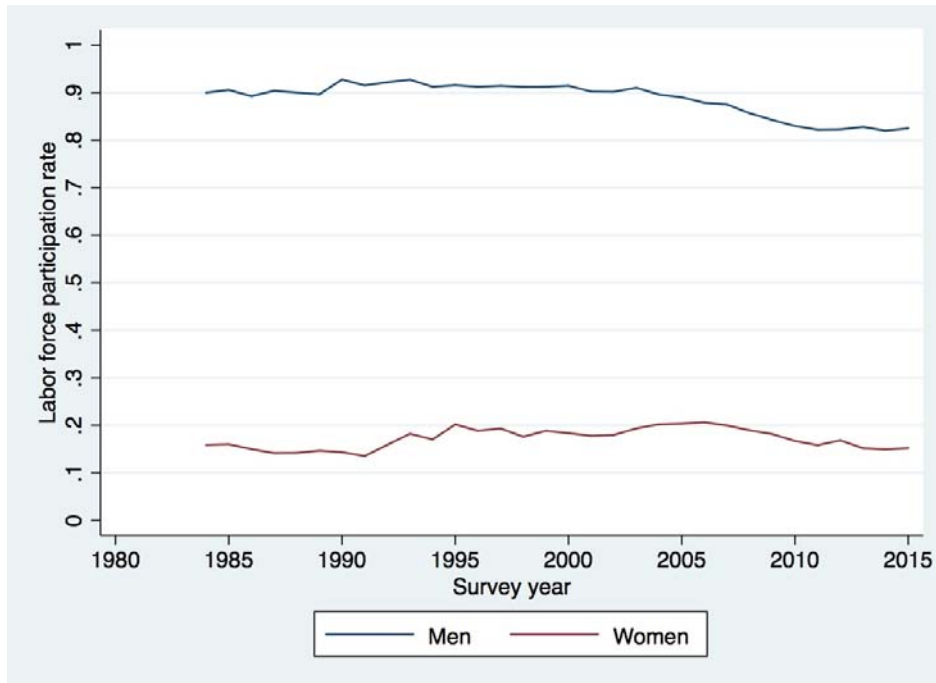
Source: abbasi2009.

Figure 2: Rising Education of Women by Birth Year



Source: Authors' calculations using the 2 percent data files of the National Census of Population 2011, Statistical Center of Iran.

Figure 3: Labor Force Participation of Adults Aged 20-64, by Gender and Marital Status, 1984-2015



Source: Authors' calculations, Household Expenditures and Income Survey, Statistical Center of Iran, various years.

Table 1: Summary statistics

	Mean	Std. Dev.	Min	Max
Women's age	35.92	8.14	16	59
Men's age	40.88	8.77	21	77
Age difference of couple	4.96	4.33	-9	25
Women's education years	8.00	4.60	0	23
Men's education years	8.68	4.55	0	23
Education difference	0.68	3.69	-12	18
Household size	4.27	1.22	3	12
# children	2.22	1.16	1	10
# children <6	0.49	0.60	0	3
# children 6-11	0.54	0.65	0	5
# children 12-17	0.68	0.74	0	5
Child gender ratio	0.53	0.42	0	1
Presence of disabled	0.03	0.16	0	1
Summer	0.24	0.43	0	1
Weekend	0.16	0.37	0	1
Household wealth index	0.10	1.65	-6.28	4.16
Distribution of Women's education (15-59)				
Percent				
Illiterate	15.05			
Less than high school	44.95			
High school	22.97			
Associate degree	9.12			
College and above	7.91			
Total	100.00			

Note: Associate degree is a two-year post-secondary training program. The sample includes married women aged 15-59 who live with their husbands and have at least one child under age 18.

Table 2: Time Allocation of Men and Women by Marital Status (ages 20-59)

	Unmarried		Married	
	Women	Men	Women	Men
Housework	3.22 (2.72)	1.05 (1.67)	6.34 (2.65)	1.31 (1.77)
Market	1.27 (2.94)	3.84 (4.50)	0.62 (1.93)	6.38 (4.29)
Sleep	8.38 (2.13)	8.28 (2.31)	8.06 (2.05)	7.58 (1.98)
Leisure	11.14 (3.51)	10.82 (4.07)	8.98 (2.70)	8.73 (3.42)
# Obs	3338	3490	9907	8817

Notes: Hours per day. Leisure is calculated as a residual. Women aged 20-59 with at least one child under 18. Standard deviations in parentheses.

Table 3: Time Allocation of Husbands and Wives by Wife's Education (Children 0-5)

Women							
Youngest child 0-5							
	# children < 18	Childcare	Child education	Domestic	Market	Leisure	# Obs
Wife's education							
Illiterate	3.02 (1.28)	0.89 (1.33)	0.20 (0.48)	6.15 (1.91)	0.32 (1.06)	16.43 (2.55)	239
Less than high school	2.04 (0.93)	1.06 (1.44)	0.31 (0.59)	5.91 (2.08)	0.36 (1.34)	16.36 (2.48)	1194
High school	1.56 (0.72)	1.31 (1.60)	0.47 (0.76)	5.45 (2.12)	0.31 (1.27)	16.46 (2.66)	758
Associate degree	1.56 (0.72)	1.22 (1.63)	0.46 (0.69)	5.13 (2.25)	0.92 (2.31)	16.26 (2.70)	333
College and above	1.40 (0.56)	1.28 (1.65)	0.39 (0.62)	4.57 (2.36)	1.91 (3.29)	15.84 (2.97)	300
Total	1.86 (0.96)	1.16 (1.53)	0.37 (0.65)	5.56 (2.18)	0.58 (1.83)	16.32 (2.62)	2824

Men							
Youngest child 0-5							
	# children < 18	Childcare	Child education	Domestic	Market	Leisure	# Obs
Wife's education							
Illiterate	3.02 (1.28)	0.05 (0.25)	0.12 (0.32)	1.08 (1.58)	6.39 (4.01)	16.35 (3.47)	239
Less than high school	2.04 (0.93)	0.07 (0.37)	0.14 (0.33)	1.05 (1.59)	7.12 (4.06)	15.61 (3.50)	1194
High school	1.56 (0.72)	0.07 (0.31)	0.16 (0.38)	0.98 (1.53)	7.37 (4.08)	15.42 (3.62)	758
Associate degree	1.56 (0.72)	0.15 (0.66)	0.17 (0.37)	1.25 (1.69)	6.92 (3.97)	15.51 (3.32)	333
College and above	1.40 (0.56)	0.16 (0.59)	0.22 (0.43)	1.24 (1.58)	6.68 (3.76)	15.70 (3.27)	300
Total	1.86 (0.96)	0.09 (0.42)	0.15 (0.36)	1.08 (1.58)	7.06 (4.03)	15.62 (3.49)	2824

Notes: Hours per day. Leisure is calculated as a residual. Women ages 15-59 with at least one child under 18. Standard deviations in parentheses.

Table 4: Time Allocation of Husbands and Wives by Wife's Education (Children 6-17)

Women							
Youngest child 6-17							
	# children < 18	Childcare	Child education	Domestic	Market	Leisure	# Obs
Wife's education							
Illiterate	1.78 (0.98)	0.15 (0.41)	0.06 (0.27)	6.12 (2.30)	0.56 (1.68)	17.10 (2.52)	720
Less than high school	1.61 (0.74)	0.27 (0.61)	0.19 (0.48)	6.20 (2.24)	0.36 (1.37)	16.97 (2.44)	1669
High school	1.47 (0.63)	0.43 (0.83)	0.31 (0.68)	5.90 (2.29)	0.61 (2.02)	16.74 (2.59)	705
Associate degree	1.50 (0.60)	0.38 (0.80)	0.38 (0.63)	5.23 (2.33)	1.52 (2.72)	16.49 (2.62)	248
College and above	1.54 (0.57)	0.33 (0.62)	0.33 (0.58)	4.60 (2.33)	2.45 (3.22)	16.28 (2.94)	204
Total	1.60 (0.75)	0.29 (0.66)	0.22 (0.53)	5.95 (2.31)	0.67 (1.94)	16.86 (2.54)	3546

Men							
Youngest child 6-17							
	# children < 18	Childcare	Child education	Domestic	Market	Leisure	# Obs
Wife's education							
Illiterate	1.78 (0.98)	0.03 (0.23)	0.06 (0.25)	1.30 (1.73)	5.50 (4.30)	17.11 (3.81)	720
Less than high school	1.61 (0.74)	0.03 (0.17)	0.07 (0.28)	1.23 (1.70)	6.21 (4.37)	17.11 (3.76)	1669
High school	1.47 (0.63)	0.04 (0.18)	0.09 (0.31)	1.17 (1.68)	6.45 (4.24)	16.24 (3.71)	705
Associate degree	1.50 (0.60)	0.11 (0.60)	0.10 (0.35)	1.20 (1.62)	6.48 (3.98)	16.10 (3.38)	248
College and above	1.54 (0.57)	0.13 (0.44)	0.16 (0.41)	1.37 (1.69)	6.47 (4.00)	15.87 (3.37)	204
Total	1.60 (0.75)	0.05 (0.27)	0.08 (0.29)	1.24 (1.70)	6.17 (4.29)	16.46 (3.72)	3546

Notes: Hours per day. Leisure is calculated as a residual. Men married to women ages 15-59 with at least one child under 18. Standard deviations in parentheses.

Table 5: Time Allocation of Married Women to Childcare, Child Education, Domestic Work, and Market Work in Weekdays

	Childcare	Child education	Domestic	Market
Women's education				
Less than high school	-0.031 (0.041)	0.047** (0.019)	0.180* (0.104)	-0.029 (0.079)
High school	0.137** (0.059)	0.170*** (0.028)	-0.206* (0.123)	0.203* (0.110)
Associate degree	0.118 (0.084)	0.224*** (0.037)	-0.647*** (0.153)	0.730*** (0.149)
College or above	0.175** (0.085)	0.136*** (0.036)	-1.400*** (0.164)	2.022*** (0.200)
Age	-0.111*** (0.020)	0.013* (0.007)	0.147*** (0.033)	0.061** (0.028)
Age sq/1000	0.887*** (0.242)	-0.275*** (0.092)	-1.820*** (0.444)	-0.566 (0.379)
Husband-wife age difference	-0.010*** (0.004)	0.001 (0.002)	-0.011 (0.007)	-0.014** (0.006)
# of children 6-11	-0.027 (0.026)	0.084*** (0.013)	0.066 (0.052)	0.111** (0.048)
# of children 12-17	-0.095*** (0.024)	-0.055*** (0.011)	0.092* (0.051)	-0.031 (0.041)
Child gender ratio	0.114*** (0.040)	0.009 (0.019)	0.050 (0.077)	0.018 (0.068)
Presence of disabled	0.174 (0.113)	0.021 (0.044)	0.225 (0.208)	-0.093 (0.128)
Summer	-0.169*** (0.032)	-0.200*** (0.014)	-0.463*** (0.070)	-0.173*** (0.055)
Household wealth index	-0.002 (0.012)	-0.006 (0.005)	-0.042* (0.021)	0.006 (0.018)
Constant	3.390*** (0.392)	0.141 (0.152)	3.431*** (0.654)	-0.414 (0.577)
R-squared	0.154	0.105	0.090	0.108
Observations	5323	5323	5323	5323

Note: The sample includes married women ages 15-59 with at least one child under age 18. Regressions have province-level fixed effects. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Time Allocation of Married Women to Childcare, Domestic Work, and Market Work in Holidays

	Childcare	Child education	Domestic	Market
Women's education				
Less than high school	-0.064 (0.071)	0.095** (0.038)	-0.304 (0.221)	-0.027 (0.111)
High school	-0.094 (0.096)	0.183*** (0.057)	-0.346 (0.285)	-0.001 (0.132)
Associate degree	-0.170 (0.140)	0.118* (0.066)	-1.251*** (0.336)	0.805*** (0.291)
College or above	0.181 (0.160)	0.168** (0.072)	-1.285*** (0.373)	0.574** (0.256)
Age	-0.172*** (0.036)	-0.002 (0.014)	0.225*** (0.073)	0.082** (0.036)
Age sq/1000	1.671*** (0.447)	-0.086 (0.170)	-2.979*** (0.964)	-0.998** (0.472)
Husband-wife age difference	-0.007 (0.006)	-0.005** (0.003)	-0.021 (0.016)	-0.015 (0.010)
# of children 6-11	0.008 (0.048)	0.087*** (0.032)	-0.209* (0.112)	0.101 (0.067)
# of children 12-17	-0.120*** (0.040)	-0.031 (0.024)	0.156 (0.114)	0.018 (0.073)
Child gender ratio	0.096 (0.071)	-0.045 (0.036)	-0.074 (0.168)	-0.116 (0.112)
Presence of disabled	0.038 (0.152)	-0.010 (0.066)	0.283 (0.414)	0.126 (0.273)
Summer	-0.004 (0.073)	-0.173*** (0.033)	-0.501*** (0.193)	-0.019 (0.117)
Household wealth index	0.018 (0.019)	-0.013 (0.010)	0.001 (0.049)	-0.005 (0.028)
Constant	4.415*** (0.714)	0.422 (0.262)	1.973 (1.382)	-0.564 (0.718)
R-squared	0.214	0.115	0.100	0.071
Observations	1047	1047	1047	1047

Note: The sample includes married women ages 15-59 with at least one child under age 18. Regressions are province-level fixed effects. The reference category for education is less than primary. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix

Table 7: Time Allocation of Married Women by Quintiles of Household Wealth

Youngest child 0-5						
	# children	Childcare	Child education	Domestic	Market	Leisure
Quintile						
	2.06	1.11	0.33	5.93	0.37	16.26
	(1.18)	(1.44)	(0.63)	(2.13)	(1.42)	(2.59)
2	1.87	1.16	0.35	5.78	0.41	16.31
	(0.95)	(1.54)	(0.56)	(2.16)	(1.33)	(2.44)
3	1.72	1.15	0.43	5.58	0.46	16.37
	(0.86)	(1.50)	(0.79)	(2.03)	(1.51)	(2.64)
4	1.79	1.18	0.38	5.26	0.68	16.50
	(0.85)	(1.65)	(0.58)	(2.19)	(2.05)	(2.71)
5	1.83	1.21	0.40	5.07	1.15	16.17
	(0.77)	(1.55)	(0.66)	(2.31)	(2.74)	(2.78)
Total	1.86	1.16	0.37	5.56	0.58	16.32
	(0.96)	(1.53)	(0.65)	(2.18)	(1.83)	(2.62)
Youngest child 6-17						
	# children	Childcare	Child education	Domestic	Market	Leisure
Quintile						
	1.83	0.30	0.18	6.16	0.58	16.78
	(0.95)	(0.62)	(0.46)	(2.29)	(1.78)	(2.55)
2	1.61	0.30	0.25	6.12	0.43	16.89
	(0.77)	(0.68)	(0.57)	(2.27)	(1.46)	(2.46)
3	1.61	0.28	0.24	5.94	0.57	16.97
	(0.74)	(0.63)	(0.57)	(2.29)	(1.74)	(2.47)
4	1.54	0.30	0.21	5.83	0.79	16.85
	(0.67)	(0.70)	(0.56)	(2.27)	(2.11)	(2.62)
5	1.49	0.29	0.21	5.80	0.87	16.82
	(0.65)	(0.65)	(0.48)	(2.39)	(2.26)	(2.59)
Total	1.60	0.29	0.22	5.95	0.67	16.86
	(0.75)	(0.66)	(0.53)	(2.31)	(1.94)	(2.54)

Note: The sample includes married women ages 15-59 with at least one child under age 18.

Table 8: Time Allocation of Married Women and Men by Number of Children Younger Than 18 Years Old

Women						
	Childcare	Child education	Domestic	Market	Leisure	# Obs
# children < 18	0.07 (0.42)	0.04 (0.22)	5.61 (2.41)	0.54 (1.91)	17.74 (2.59)	2353
1	0.64 (1.20)	0.27 (0.58)	5.66 (2.29)	0.62 (1.88)	16.81 (2.59)	3022
2	0.69 (1.23)	0.33 (0.62)	5.78 (2.25)	0.72 (2.05)	16.48 (2.62)	2289
3	0.72 (1.15)	0.26 (0.53)	6.13 (2.16)	0.53 (1.58)	16.35 (2.49)	798
4 and more	0.66 (1.12)	0.21 (0.56)	6.27 (2.15)	0.36 (1.21)	16.49 (2.56)	261
Total	0.50 (1.08)	0.22 (0.53)	5.73 (2.31)	0.61 (1.90)	19.94 (2.64)	8723
Men						
	Childcare	Child education	Domestic	Market	Leisure	# Obs
# children < 18	0.01 (0.11)	0.02 (0.15)	1.29 (1.69)	5.00 (4.58)	17.68 (4.14)	2353
1	0.05 (0.31)	0.10 (0.31)	1.18 (1.71)	6.46 (4.29)	16.20 (3.70)	3022
2	0.08 (0.38)	0.12 (0.33)	1.12 (1.54)	6.77 (4.14)	15.91 (3.64)	2289
3	0.06 (0.39)	0.14 (0.37)	1.22 (1.73)	6.40 (4.03)	16.17 (3.47)	798
4 and more	0.06 (0.27)	0.14 (0.36)	1.22 (1.61)	6.19 (4.08)	16.38 (3.52)	261
Total	0.05 (0.30)	0.09 (0.29)	1.20 (1.66)	6.11 (4.37)	16.54 (3.86)	8723

Note: The sample includes married women ages 15-59 with at least one child under age 18.

Table 9: Time Allocation of Married Women to Childcare, Child Education, Domestic Work, and Market Work in Weekdays During Summer

	Childcare	Child education	Domestic	Market
Women's education				
Less than high school	-0.050 (0.074)	-0.026 (0.021)	0.041 (0.199)	-0.046 (0.141)
High school	0.026 (0.098)	0.092** (0.038)	-0.115 (0.244)	0.013 (0.176)
Associate degree	0.143 (0.172)	0.086* (0.048)	-0.270 (0.287)	-0.135 (0.239)
College or above	0.194 (0.139)	0.108** (0.052)	-0.778** (0.307)	0.620** (0.264)
Age	-0.090*** (0.028)	-0.015 (0.012)	0.160*** (0.059)	0.058 (0.043)
Age sq/1000	0.680* (0.348)	0.132 (0.153)	-2.181*** (0.778)	-0.650 (0.556)
Husband-wife age difference	-0.010* (0.006)	0.004 (0.002)	-0.012 (0.014)	-0.012 (0.009)
# of children 6-11	-0.028 (0.039)	-0.003 (0.014)	0.050 (0.090)	0.093 (0.072)
# of children 12-17	-0.123*** (0.035)	-0.051*** (0.016)	0.059 (0.094)	-0.097* (0.054)
Child gender ratio	0.121** (0.059)	0.035 (0.027)	0.111 (0.138)	0.022 (0.114)
Presence of disabled	-0.255** (0.114)	-0.022 (0.040)	0.163 (0.428)	-0.285 (0.194)
Household wealth index	-0.040** (0.018)	0.004 (0.007)	-0.055 (0.042)	-0.020 (0.035)
Constant	2.743*** (0.565)	0.325 (0.214)	2.360** (1.106)	0.241 (1.037)
R-squared	0.208	0.130	0.108	0.076
Observations	1358	1358	1358	1358

Note: The sample includes married women ages 15-59 with at least one child under age 18. Regressions have province-level fixed effects. The reference category for education is less than primary. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Time Allocation of Married Women to Childcare, Domestic Work, and Market Work in Holidays During Summer

	Childcare	Child education	Domestic	Market
Women's education				
Less than high school	-0.494** (0.216)	0.112** (0.053)	-0.751 (0.567)	-0.095 (0.310)
High school	-0.193 (0.283)	0.134** (0.062)	-0.678 (0.695)	-0.027 (0.279)
Associate degree	-0.382 (0.343)	0.168** (0.071)	-1.078 (0.749)	0.176 (0.365)
College or above	-0.263 (0.416)	-0.002 (0.094)	-0.865 (0.922)	0.134 (0.694)
Age	-0.115* (0.064)	-0.044* (0.025)	0.314** (0.158)	0.127 (0.082)
Age sq/1000	0.947 (0.808)	0.452 (0.293)	-4.383** (2.008)	-1.583 (1.067)
Husband-wife age difference	0.017 (0.015)	-0.002 (0.003)	-0.017 (0.049)	-0.023 (0.037)
# of children 6-11	0.142 (0.119)	0.052 (0.043)	0.155 (0.272)	-0.081 (0.171)
# of children 12-17	-0.173 (0.113)	0.029 (0.027)	0.070 (0.307)	0.142 (0.232)
Child gender ratio	0.159 (0.125)	0.049 (0.048)	-0.098 (0.425)	0.103 (0.226)
Presence of disabled	-0.147 (0.291)	0.145 (0.109)	2.535** (0.990)	-1.035 (0.669)
Household wealth index	0.018 (0.041)	0.003 (0.016)	0.115 (0.152)	0.040 (0.066)
Constant	3.505*** (1.247)	0.842* (0.491)	0.036 (3.221)	-1.542 (1.637)
R-squared	0.372	0.330	0.216	0.145
Observations	191	191	191	191

Note: The sample includes married women ages 15-59 with at least one child under age 18. Regressions are province-level fixed effects. The reference category for education is less than primary. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Time Allocation of Married Men to Childcare, Child Education, Domestic Work, and Market Work in Weekdays

	Childcare	Child education	Domestic	Market
Men's education				
Less than high school	0.022* (0.013)	-0.004 (0.014)	0.229*** (0.081)	-0.441* (0.229)
High school	0.010 (0.016)	0.010 (0.016)	0.329*** (0.093)	-0.603* (0.257)
Associate degree	0.062** (0.030)	0.035* (0.021)	0.413*** (0.110)	-1.166*** (0.282)
College or above	0.093*** (0.028)	0.053*** (0.020)	0.312*** (0.108)	-1.112*** (0.291)
Age	-0.008* (0.005)	-0.001 (0.003)	0.029 (0.021)	0.197*** (0.052)
Age sq/1000	0.077 (0.053)	-0.023 (0.037)	-0.050 (0.238)	-3.523*** (0.602)
Husband-wife age difference	0.001 (0.001)	-0.000 (0.001)	-0.015** (0.006)	0.029** (0.015)
# of children 6-11	0.003 (0.008)	0.031*** (0.008)	0.000 (0.035)	-0.018 (0.092)
# of children 12-17	-0.012* (0.006)	-0.022*** (0.006)	-0.069* (0.036)	-0.018 (0.093)
Child gender ratio	-0.000 (0.011)	0.023** (0.010)	-0.054 (0.054)	-0.067 (0.134)
Presence of disabled	0.014 (0.025)	0.032 (0.029)	0.064 (0.148)	-0.947*** (0.351)
Summer	-0.021 (0.013)	-0.053*** (0.009)	0.027 (0.051)	-0.403*** (0.116)
Household wealth index	0.005 (0.004)	-0.001 (0.003)	0.012 (0.015)	0.142*** (0.040)
Constant	0.192* (0.106)	0.189** (0.078)	0.626 (0.470)	6.116*** (1.186)
R-squared	0.027	0.048	0.070	0.122
Observations	5323	5323	5323	5323

Note: The sample includes married men with at least one child under age 18. Regressions have province-level fixed effects. The reference category for education is less than primary. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Time Allocation of Married Men to Childcare, Domestic Work, and Market Work in Hoildays

	Childcare	Child education	Domestic	Market
Men's education				
Less than high school	0.017 (0.021)	0.015 (0.038)	0.081 (0.185)	0.002 (0.524)
High school	-0.026 (0.032)	0.051 (0.046)	0.359 (0.229)	-0.999* (0.600)
Associate degree	0.039 (0.040)	0.059 (0.059)	0.496** (0.250)	-1.468** (0.672)
College or above	0.128** (0.061)	0.168** (0.069)	0.269 (0.229)	-1.319* (0.684)
Age	-0.020** (0.010)	-0.024** (0.010)	0.012 (0.045)	0.093 (0.103)
Age sq/1000	0.194** (0.098)	0.217** (0.109)	0.044 (0.511)	-2.103* (1.130)
Husband-wife age difference	-0.004 (0.002)	-0.002 (0.003)	-0.005 (0.013)	0.066* (0.034)
# of children 6-11	0.010 (0.018)	0.065*** (0.022)	-0.007 (0.083)	-0.072 (0.221)
# of children 12-17	-0.000 (0.017)	-0.005 (0.020)	-0.103 (0.087)	0.277 (0.221)
Child gender ratio	0.005 (0.024)	-0.042 (0.029)	-0.141 (0.124)	0.794** (0.324)
Presence of disabled	0.036 (0.048)	0.038 (0.081)	0.004 (0.252)	-0.324 (0.689)
Summer	0.007 (0.033)	-0.087*** (0.027)	-0.131 (0.124)	0.026 (0.378)
Household wealth index	0.017* (0.010)	0.007 (0.009)	0.044 (0.035)	-0.035 (0.101)
Constant	0.463** (0.229)	0.702*** (0.229)	2.479* (1.344)	5.775** (2.404)
R-squared	0.056	0.100	0.105	0.098
Observations	1047	1047	1047	1047

Note: The sample includes married men with at least one child under age 18. Regressions are province-level fixed effects. The reference category for education is less than primary. Standard errors in parentheses.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.