Marriage Penalty: Unconditional Quantile Regression of Housework Participation in Japan

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ABSTRACT

We analyze cross-sectional time-use diaries from the 2011 and 2016 Survey on Time Use and Leisure Activities (*Shakai Seikatsu Kihon Chosa*) to investigate the association between educational level and housework participation at different quantiles. Using the unconditional quantile regression method, we test whether education is associated with less time spent on housework as the previous research on highly educated people suggests. We find that this hypothesis stands only for non-married Japanese women. On the other hand, among married Japanese women, especially those without children in higher deciles of housework participation, are more likely to increase their participation in housework with the increase in their educational level. The results suggest that in Japan, the institute of marriage places higher expectations on women's housework participation on married women with higher levels of education.

Keywords: gender, housework, Japanese households, routine housework, unconditional quantile regression

Introduction

In this discussion paper, we investigate whether educational level can predict the patterns of participation in the domestic labor uniformly across different levels of participation in housework, and on different life-course stages. The main purpose of this study is to explore whether higher educational attainment is associated with lower housework participation among Japanese women. We also analyze whether the association of education at different deciles of housework participation among Japanese women varies at different life stages. Thus, we compare patterns for non-married women, married women without children, and married women with children. Our primary contribution is two-fold. First, we show that marriage is still a barrier

to women in reducing their housework, regardless of their educational level. Second, we contribute to housework research by applying unconditional quantile regression method (Firpo, Fortin, & Lemieux, 2009) to the analysis of housework participation. The study addresses two principal research questions: (1) How is educational attainment associated with different levels of housework participation? (2) whether the patterns are similar among non-married and married women, as well as women with and without children.

Theoretical Expectations

Education is one of the individual resources. Moreover, it reflects the gender socialization as a result of the acquired educational level. According to the expectations of the resource-based housework theories, highly educated women are more likely to be employed and thus have less time on housework, compared to women with lower levels of education (England, Garcia-Beaulieu, & Ross, 2004; Kolpashnikova, 2018; Rubery, Smith, & Fagan, 1999). Following the resource-based housework participation explanation, we expect that:

Hypothesis 1: On all levels of housework participation the effects of education would be negatively associated with participation in housework.

Moreover, life-course transitions such as the transition from being single to being married are expected to have an effect on the participation in housework. For example, South and Spitze (1994) found that among both women and men, marriage was associated with more housework time. Marriage is also associated with more traditional gender attitudes (Zhou, 2017). On the

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other hand, Baxter, Hewitt, and Haynes (2008) found that the effects are applicable to women but not to men. They found that men's housework time remained considerably stable throughout life course stages. Thus, we expect the following:

Hypothesis 2: The higher the level of education, the less routine housework is performed but the association becomes weaker when women and men move across the life stages: from non-married to married, and from married with no children to married with dependent children.

Data and Methods

We employed microfiles of the 2011 and 2016 Survey on Time Use and Leisure Activities (STULA), also known as the *Shakai Seikatsu Kihon Chosa*. We accessed the microfiles at the data center of the Hitotsubashi University in Japan. The STULA collects time diaries for two consecutive days. This survey design allows treating the data as panel data, where the date of the diary is considered as a time variable. Time use diaries are more apt for measuring housework participation than the traditional 'stylized' surveys (Kan & Pudney, 2008). The survey sample uses a two-stage stratified sampling method. The primary sampling unit is the enumeration district (ED) of the Population Census and the secondary unit is households. In 47 Japanese prefectures, a total of 6,902 EDs were selected. All household members 10 years of age and above were asked to complete the survey. Foreigners living in Japan were also included in the survey.

There are three main subsamples within models: non-married women without children (10,544 observations in 2011 and 9,699—in 2016), married women without children (24,543 observations in 2011 and 21,248—in 2016), and married women with children (32,400

observations in 2011 and 29,034—in 2016). As the observation numbers show, the majority of women in the full sample reported to be married. We did not perform an analysis for non-married women with children because there are not enough observations in the Japanese dataset for the subsample. Moreover, we selected a sample of women who performed any housework on the diary day (n= 127,468) and personal weights were re-coded based on the original survey weights, scaled to the original sample size, where needed.

Measures

Dependent Variables

The dependent variable is represented by an aggregate measure of the time spent on indoor housework, such as cooking, cleaning, and doing the laundry. The participation in housework variables in all three countries is measured in minutes on a diary day.

Tables 1a-3b summarize the descriptive statistics for housework time among women in different deciles of housework participation in Japan. They show great differences among women in the top and bottom deciles of housework participation. Women in the top decile, on average, spend more than 10 times the time that women in the bottom decile spend on housework. Among all groups of women, women in the uppermost decile spend more than 500 minutes a day on housework, whereas women in the lowest decile spend about 40 minutes a day. The averages for women among the three groups show that married women spend substantially more time on housework than non-married women. For instance, non-married women who report doing housework on the diary day spend 133 minutes on housework on an average day in 2016, whereas married women with children—approximately 234 minutes.

Table 1a Descriptive statistics, 20 to 60-year-old non-married women, Japan 2011.

	Women in 2011										Total
	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)	10 (90-100% of Housework)	
Housework	39.883	82.793	113.330	142.872	173.360	208.168	253.555	298.942	361.370	516.259	131.705
	(16.203)	(7.497)	(7.457)	(7.495)	(7.456)	(11.742)	(12.546)	(11.282)	(25.208)	(92.046)	(112.335)
Education	13.256	13.068	12.943	12.800	12.881	12.866	12.774	12.791	12.806	12.362	13.017
	(1.918)	(1.971)	(1.912)	(1.910)	(1.998)	(1.911)	(2.080)	(1.864)	(1.983)	(1.947)	(1.951)
Paid Work Time	272.398	216.386	180.664	148.875	110.617	96.676	60.972	51.537	29.098	6.259	183.345
	(255.933)	(242.205)	(226.763)	(214.260)	(192.074)	(176.347)	(143.252)	(127.773)	(96.113)	(34.429)	(236.457)
Age	36.979	40.313	41.440	43.219	43.611	45.176	45.895	46.363	46.909	46.766	41.011
	(11.357)	(11.970)	(11.746)	(11.804)	(11.429)	(10.924)	(11.196)	(10.481)	(11.123)	(10.333)	(11.972)
Household size	2.831	2.611	2.631	2.601	2.650	2.659	2.688	2.746	2.817	2.879	2.725
	(1.484)	(1.464)	(1.449)	(1.399)	(1.430)	(1.345)	(1.426)	(1.308)	(1.394)	(1.201)	(1.440)
Employed	0.822	0.743	0.682	0.644	0.604	0.543	0.488	0.431	0.432	0.341	0.684
	(0.382)	(0.437)	(0.466)	(0.479)	(0.489)	(0.499)	(0.500)	(0.496)	(0.496)	(0.475)	(0.465)
Urban	0.881	0.877	0.893	0.879	0.891	0.868	0.894	0.831	0.851	0.817	0.877
	(0.324)	(0.328)	(0.310)	(0.326)	(0.312)	(0.338)	(0.308)	(0.375)	(0.357)	(0.387)	(0.328)
Married	No	No	No	No	No	No	No	No	No	No	No
Children under 20	No	No	No	No	No	No	No	No	No	No	No
Children under 6	No	No	No	No	No	No	No	No	No	No	No
Household Income	548.943	499.281	470.869	465.917	456.821	457.463	459.801	425.819	458.463	428.966	497.250
	(373.616)	(357.399)	(336.370)	(324.055)	(329.592)	(332.213)	(328.239)	(304.129)	(295.607)	(305.892)	(350.350)
Personal Income	205.628	193.155	188.501	177.710	166.618	156.818	155.191	123.174	134.521	101.034	181.847
	(161.475)	(168.858)	(187.336)	(188.868)	(182.674)	(188.751)	(202.735)	(164.363)	(177.564)	(175.583)	(176.960)
Number of Adults	2.679	2.490	2.467	2.442	2.488	2.488	2.505	2.589	2.655	2.655	2.569
	(1.321)	(1.308)	(1.261)	(1.213)	(1.268)	(1.153)	(1.234)	(1.155)	(1.226)	(1.045)	(1.270)
N	10544										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1b Descriptive statistics, 20 to 60-year-old non-married women, Japan 2016

	Women in 2016										Total
	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)	10 (90-100% of Housework)	
Housework	39.914	83.359	113.674	142.735	173.641	209.118	252.864	297.463	360.338	514.278	133.027
	(16.395)	(7.453)	(7.411)	(7.501)	(7.418)	(11.506)	(12.392)	(11.020)	(25.108)	(102.031)	(111.267)
Education	13.340	13.227	13.094	13.105	12.985	13.028	12.889	13.012	13.062	12.680	13.158
	(2.337)	(2.324)	(2.225)	(2.231)	(2.497)	(2.277)	(2.273)	(1.993)	(2.294)	(2.487)	(2.313)
Paid Work Time	271.414	209.745	169.317	149.096	135.177	83.950	72.479	60.846	23.408	16.215	180.688
	(258.377)	(245.243)	(230.323)	(217.269)	(210.995)	(174.421)	(158.428)	(139.858)	(80.940)	(68.600)	(238.484)
Age	39.432	42.491	43.533	45.058	45.465	45.244	46.350	47.107	47.639	48.577	42.945
	(11.296)	(11.248)	(11.367)	(10.780)	(10.271)	(10.683)	(10.073)	(10.290)	(9.683)	(8.865)	(11.297)
Household size	2.715	2.542	2.518	2.479	2.436	2.590	2.648	2.668	2.642	2.870	2.614
	(1.387)	(1.355)	(1.355)	(1.326)	(1.272)	(1.294)	(1.432)	(1.171)	(1.159)	(1.483)	(1.353)
Employed	0.825	0.772	0.710	0.657	0.620	0.577	0.581	0.469	0.445	0.447	0.705
	(0.380)	(0.420)	(0.454)	(0.475)	(0.486)	(0.494)	(0.494)	(0.500)	(0.498)	(0.498)	(0.456)
Urban	0.888	0.894	0.878	0.889	0.888	0.882	0.906	0.905	0.907	0.891	0.890
	(0.315)	(0.308)	(0.327)	(0.315)	(0.316)	(0.322)	(0.293)	(0.294)	(0.291)	(0.312)	(0.313)
Married	No	No	No	No	No	No	No	No	No	No	No
Children under 20	No	No	No	No	No	No	No	No	No	No	No
Children under 6	No	No	No	No	No	No	No	No	No	No	No
Household Income	553.695	502.328	472.696	448.494	446.750	468.908	481.732	437.537	435.634	436.268	497.737
	(372.917)	(355.613)	(327.447)	(315.875)	(302.634)	(319.613)	(345.822)	(306.418)	(309.167)	(368.631)	(348.567)
Personal Income	225.259	216.260	200.391	182.822	184.749	170.588	183.705	137.018	137.817	144.982	199.312
	(166.500)	(178.711)	(179.260)	(175.772)	(185.393)	(179.800)	(209.207)	(164.503)	(165.707)	(208.284)	(178.963)
Number of Adults	2.593	2.418	2.371	2.334	2.292	2.458	2.461	2.496	2.501	2.634	2.475
	(1.261)	(1.215)	(1.207)	(1.139)	(1.109)	(1.161)	(1.176)	(1.064)	(1.064)	(1.302)	(1.207)
N	9699										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2a Descriptive statistics, 20 to 60-year-old married women without children, Japan 2011.

	Women in 2011										Total
	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)	10 (90-100% of Housework)	
Housework	44.549	83.723	113.644	143.169	173.088	209.410	254.234	299.108	361.732	509.464	218.020
	(15.111)	(7.401)	(7.414)	(7.472)	(7.479)	(12.122)	(12.364)	(11.817)	(25.108)	(91.863)	(133.514)
Education	12.835	12.751	12.709	12.657	12.607	12.689	12.626	12.698	12.729	12.688	12.699
	(1.858)	(1.851)	(1.819)	(1.729)	(1.741)	(1.702)	(1.656)	(1.748)	(1.753)	(1.756)	(1.760)
Paid Work Time	301.109	273.028	256.855	218.252	192.304	147.158	104.140	68.982	41.387	19.958	161.589
	(261.145)	(247.293)	(240.811)	(226.545)	(217.440)	(198.406)	(172.392)	(139.469)	(107.592)	(73.214)	(219.054)
Age	47.259	49.388	50.094	50.535	51.106	51.486	51.803	52.402	52.577	52.906	50.958
	(10.425)	(9.319)	(8.695)	(8.471)	(7.847)	(7.695)	(7.429)	(6.780)	(6.750)	(6.517)	(8.238)
Household size	2.835	2.893	3.014	3.000	3.037	3.097	3.108	3.176	3.214	3.329	3.070
	(1.316)	(1.291)	(1.333)	(1.267)	(1.306)	(1.311)	(1.298)	(1.278)	(1.305)	(1.286)	(1.307)
Employed	0.653	0.593	0.562	0.506	0.450	0.376	0.324	0.289	0.257	0.243	0.423
	(0.476)	(0.491)	(0.496)	(0.500)	(0.498)	(0.484)	(0.468)	(0.453)	(0.437)	(0.429)	(0.494)
Urban	0.852	0.853	0.855	0.845	0.858	0.862	0.863	0.877	0.867	0.847	0.858
	(0.355)	(0.355)	(0.352)	(0.362)	(0.349)	(0.345)	(0.344)	(0.329)	(0.340)	(0.360)	(0.349)
Married	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 20	No	No	No	No	No	No	No	No	No	No	No
Children under 6	No	No	No	No	No	No	No	No	No	No	No
Household Income	706.760	722.913	734.726	722.642	724.717	723.199	729.768	742.773	740.946	746.565	729.029
	(392.904)	(407.900)	(402.326)	(392.226)	(397.734)	(398.706)	(401.740)	(410.549)	(403.628)	(408.292)	(401.327)
Personal Income	205.614	189.514	171.302	153.671	137.474	121.461	105.595	95.747	89.021	84.390	134.750
	(201.922)	(206.429)	(184.425)	(183.154)	(174.126)	(158.598)	(160.258)	(147.382)	(155.592)	(149.875)	(177.445)
Number of Adults	2.693	2.766	2.866	2.870	2.911	2.957	2.974	3.043	3.084	3.180	2.934
	(1.079)	(1.088)	(1.123)	(1.076)	(1.111)	(1.128)	(1.122)	(1.117)	(1.105)	(1.122)	(1.116)
N	24543										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2b Descriptive statistics, 20 to 60-year-old married women without children, Japan 2016

	Women in 2016										
	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)	10 (90-100% of Housework)	Total
Housework	44.733	84.278	113.997	143.550	173.346	209.375	253.698	298.818	362.738	517.039	212.783
	(15.458)	(7.288)	(7.351)	(7.428)	(7.454)	(11.683)	(12.416)	(11.804)	(25.447)	(100.187)	(135.642)
Education	13.182	13.190	13.060	12.944	13.001	12.914	12.993	13.016	12.997	13.010	13.030
	(2.112)	(2.084)	(1.936)	(2.105)	(1.909)	(2.001)	(2.013)	(1.950)	(2.186)	(2.078)	(2.042)
Paid Work Time	302.806	285.291	254.108	226.829	170.688	144.468	101.153	78.045	45.397	24.116	167.130
	(264.081)	(255.742)	(245.408)	(236.782)	(213.969)	(195.912)	(169.417)	(151.040)	(115.145)	(81.256)	(224.850)
Age	48.779	49.517	50.292	50.700	50.788	51.840	52.079	52.514	52.715	52.908	51.159
	(9.527)	(8.969)	(8.418)	(8.308)	(8.084)	(7.302)	(6.967)	(6.574)	(6.548)	(6.010)	(7.914)
Household size	2.758	2.817	2.830	2.874	2.967	2.992	3.031	3.036	3.087	3.198	2.953
	(1.202)	(1.159)	(1.172)	(1.191)	(1.240)	(1.224)	(1.213)	(1.216)	(1.216)	(1.222)	(1.213)
Employed	0.669	0.621	0.564	0.524	0.457	0.404	0.343	0.309	0.275	0.240	0.446
	(0.471)	(0.485)	(0.496)	(0.500)	(0.498)	(0.491)	(0.475)	(0.462)	(0.447)	(0.427)	(0.497)
Urban	0.876	0.869	0.862	0.868	0.877	0.868	0.878	0.878	0.863	0.873	0.871
	(0.330)	(0.338)	(0.345)	(0.339)	(0.329)	(0.339)	(0.327)	(0.327)	(0.343)	(0.333)	(0.335)
Married	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 20	No	No	No	No	No	No	No	No	No	No	No
Children under 6	No	No	No	No	No	No	No	No	No	No	No
Household Income	741.015	752.505	741.671	752.400	759.443	771.318	774.533	766.331	773.084	779.751	760.890
	(397.586)	(400.600)	(393.122)	(406.162)	(400.439)	(406.875)	(413.951)	(403.103)	(411.071)	(415.156)	(404.893)
Personal Income	225.484	213.254	187.706	176.506	154.019	144.036	128.094	106.958	108.778	88.532	155.418
	(202.778)	(199.903)	(178.403)	(186.694)	(174.763)	(174.427)	(173.245)	(145.726)	(162.454)	(145.362)	(181.799)
Number of Adults	2.636	2.698	2.711	2.756	2.831	2.866	2.906	2.930	2.935	3.050	2.826
	(1.030)	(1.039)	(1.033)	(1.070)	(1.086)	(1.081)	(1.071)	(1.085)	(1.080)	(1.093)	(1.073)
N	21248										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3a Descriptive statistics, 20 to 60-year-old married women with children, Japan 2011

	Women in 2011										Total
	1	2	3	4	5	6	7	8	9	10	
	(0-10% of Housework)	(10-20% of Housework)	(20-30% of Housework)	(30-40% of Housework)	(40-50% of Housework)	(50-60% of Housework)	(60-70% of Housework)	(70-80% of Housework)	(80-90% of Housework)	(90-100% of Housework)	
Housework	45.974	83.938	113.994	143.256	173.199	209.772	254.029	299.158	362.126	511.198	236.076
	(15.061)	(7.363)	(7.351)	(7.463)	(7.468)	(11.897)	(12.442)	(12.051)	(25.323)	(95.977)	(133.043)
Education	13.159	13.201	13.165	13.219	13.188	13.218	13.275	13.242	13.286	13.289	13.231
	(1.705)	(1.702)	(1.674)	(1.710)	(1.720)	(1.691)	(1.645)	(1.699)	(1.676)	(1.645)	(1.685)
Paid Work Time	246.206	227.076	199.453	182.253	157.552	124.143	89.794	72.470	52.824	28.078	126.239
	(258.641)	(247.487)	(234.033)	(228.316)	(210.972)	(191.002)	(162.960)	(145.273)	(123.079)	(88.672)	(200.708)
Age	38.332	38.715	39.326	39.064	39.447	39.785	40.379	40.695	41.709	42.858	40.190
	(7.314)	(7.282)	(7.284)	(7.103)	(7.041)	(6.984)	(6.696)	(6.667)	(6.651)	(6.334)	(7.019)
Household size	4.330	4.201	4.283	4.257	4.217	4.234	4.251	4.301	4.295	4.403	4.277
	(1.299)	(1.208)	(1.221)	(1.195)	(1.152)	(1.139)	(1.115)	(1.233)	(1.182)	(1.148)	(1.183)
Employed	0.533	0.502	0.466	0.411	0.385	0.311	0.285	0.248	0.224	0.187	0.336
	(0.499)	(0.500)	(0.499)	(0.492)	(0.487)	(0.463)	(0.452)	(0.432)	(0.417)	(0.390)	(0.472)
Urban	0.855	0.867	0.883	0.857	0.876	0.884	0.879	0.884	0.884	0.882	0.876
	(0.353)	(0.340)	(0.321)	(0.351)	(0.329)	(0.320)	(0.326)	(0.321)	(0.320)	(0.323)	(0.329)
Married	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 6	0.462	0.466	0.412	0.436	0.404	0.396	0.361	0.362	0.296	0.245	0.375
	(0.499)	(0.499)	(0.492)	(0.496)	(0.491)	(0.489)	(0.480)	(0.481)	(0.456)	(0.430)	(0.484)
Household Income	687.186	678.284	683.774	666.779	662.484	661.750	680.791	675.271	693.367	720.034	680.633
	(354.376)	(338.641)	(350.103)	(325.949)	(327.807)	(325.105)	(333.662)	(335.181)	(346.877)	(359.088)	(339.358)
Personal Income	172.639	167.589	155.525	138.566	126.244	106.673	99.471	88.450	85.463	73.966	115.529
	(181.134)	(185.502)	(170.014)	(164.847)	(154.084)	(145.579)	(145.217)	(137.704)	(136.549)	(132.721)	(156.196)
Number of Adults	2.621	2.488	2.534	2.468	2.423	2.396	2.396	2.431	2.405	2.456	2.450
	(1.043)	(0.964)	(0.961)	(0.935)	(0.900)	(0.866)	(0.856)	(0.865)	(0.849)	(0.877)	(0.904)
N	32400										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3b Descriptive statistics, 20 to 60-year-old married women with children, Japan 2016

	Women in 2016										Total
	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)	10 (90-100% of Housework)	
Housework	45.476	84.383	114.083	143.657	173.286	209.510	254.235	299.658	362.181	519.773	233.533
	(15.128)	(7.261)	(7.332)	(7.412)	(7.460)	(11.910)	(12.479)	(11.767)	(24.767)	(107.805)	(139.801)
Education	13.459	13.404	13.428	13.377	13.476	13.470	13.409	13.367	13.447	13.378	13.424
	(2.231)	(2.150)	(2.127)	(2.191)	(2.024)	(2.097)	(2.097)	(2.174)	(2.106)	(2.029)	(2.118)
Paid Work Time	233.503	215.669	200.658	185.700	163.722	135.309	106.555	87.073	62.104	30.729	134.701
	(260.029)	(247.146)	(241.369)	(224.818)	(213.106)	(197.619)	(177.584)	(161.229)	(136.185)	(93.101)	(206.632)
Age	39.002	39.841	40.012	40.636	40.687	41.128	41.428	42.299	42.793	43.751	41.289
	(7.274)	(7.176)	(7.068)	(7.140)	(6.918)	(6.916)	(6.586)	(6.712)	(6.416)	(6.254)	(6.950)
Household size	4.225	4.209	4.167	4.165	4.133	4.177	4.203	4.220	4.265	4.375	4.216
	(1.224)	(1.204)	(1.155)	(1.116)	(1.052)	(1.095)	(1.076)	(1.087)	(1.132)	(1.099)	(1.121)
Employed	0.561	0.522	0.495	0.455	0.413	0.383	0.323	0.291	0.252	0.208	0.377
	(0.496)	(0.500)	(0.500)	(0.498)	(0.493)	(0.486)	(0.468)	(0.454)	(0.434)	(0.406)	(0.485)
Urban	0.894	0.876	0.885	0.875	0.883	0.873	0.888	0.880	0.897	0.893	0.885
	(0.308)	(0.329)	(0.319)	(0.331)	(0.322)	(0.333)	(0.315)	(0.325)	(0.303)	(0.310)	(0.319)
Married	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 20	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Children under 6	0.478	0.444	0.423	0.369	0.386	0.357	0.341	0.298	0.280	0.222	0.353
	(0.500)	(0.497)	(0.494)	(0.483)	(0.487)	(0.479)	(0.474)	(0.457)	(0.449)	(0.416)	(0.478)
Household Income	717.904	716.967	709.631	709.977	708.743	703.349	704.727	710.523	723.314	734.470	713.767
	(334.280)	(343.789)	(334.092)	(334.396)	(335.349)	(326.761)	(330.575)	(337.182)	(342.614)	(357.757)	(337.557)
Personal Income	189.753	183.358	175.943	156.304	147.467	136.053	117.761	111.084	102.321	89.747	136.976
	(180.213)	(177.467)	(179.251)	(167.989)	(163.648)	(158.722)	(145.431)	(150.050)	(145.790)	(141.965)	(163.106)
Number of Adults	2.462	2.431	2.375	2.387	2.313	2.348	2.320	2.341	2.362	2.407	2.370
	(0.903)	(0.878)	(0.843)	(0.837)	(0.757)	(0.811)	(0.779)	(0.792)	(0.826)	(0.811)	(0.822)
N	29034										

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Independent and Control Variables

The main independent variable - education - is measured in years spent in school. If to analyze the education variable across deciles of housework participation in Tables 1a-3b, we can see that there are few differences in the sample of all women. On average, women have about 13 years of education (a little more than high school).

Control variables include household and personal incomes, which are both measured in thousands of Japanese yen. The controls also include work time (measured in minutes on the diary day) and employment status (1 = 'employed full-time or part-time', 0 = 'otherwise'). Dummy variables are used for measuring marital status (1=married, 0=otherwise), whether the respondent owns the house, where he/she resides, and whether the respondent resides in an urban area. The models also include the number of adults in the household and year-fixed effects.

Additionally, we control for the presence of children, which are coded as 1 for the individuals who have children under 20. We also use age in years trying to capture the age effects. Since there are usually considerable differences in diaries depending on the day of the week when the diary was collected, we also control for whether the diary day was completed for a weekday or on the weekend (1=weekday, 0=Saturday or Sunday).

Models

To analyze the effects of gender, marital status, and education on participation in routine housework, we also employ unconditional quantile regression models (UQR) (Firpo et al., 2009). UQR has been recently used in many family studies, particularly in the research of motherhood premiums (Budig & Hodges, 2014; England, Bearak, Budig, & Hodges, 2016; Killewald & Bearak, 2014). It is preferred to the conditional quantile regression, which is more prone to

biased results (Killewald & Bearak, 2014). For a more detailed explanation on UQR please refer to Firpo et al. (2009), Killewald and Bearak (2014), and Cooke and Hook (2018).

The results presented in this paper are robust to the exclusion of correlates of the resource-based frameworks (household and personal income, as well as paid work time).

Results and Discussions

Following the suggestion in Firpo et al. (2009), Budig and Hodges (2014), Killewald and Bearak (2014), England et al. (2016), we run unconditional quantile regression (UQR) models on participation in housework for non-married women without children, married women without children, and married women with children. The summaries of the UQR estimates are represented in Figure 1 and Table 4. Negative effects mean that the association between educational level and participation in housework is reverse (as expected): the higher the education level, the lower the housework participation. The stronger negative effects mean that educational level is effective in reducing the housework burden. Conversely, if the effects are positive, it means that higher levels of education are associated with higher levels of housework involvement.

Table 4 summarizes the results of the UQR models, which can be found in full in the Appendix A. One main conclusion that can be drawn immediately from the table is that the results are mostly significant only for married women. These are also confirmed in the full tables in the Appendix. Thus, the limitations of the present findings are that the findings mostly apply to married women without children, whereas there are more uncertainties about the findings in other groups of women.

Table 4 Summary of UQR results for Japanese Women Education's Association with Housework

2

	UQR				
	2 (10-20% of Housework)	3 (20-30% of Housework)	5 (40-50% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)
Non-Married Women	-0.003***	-0.002	-0.006	0.003	0.016
	(0.001)	(0.003)	(0.005)	(0.007)	(0.013)
Married Women without Children	-0.004*	-0.004	0.011***	0.028***	0.025***
	(0.002)	(0.004)	(0.004)	(0.007)	(0.008)
Married Women with Children	-0.000	0.001	0.003	0.005	-0.001
	(0.004)	(0.002)	(0.003)	(0.005)	(0.006)

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Figure 1 shows that among Japanese women, marriage penalizes the effects of education, and the association between educational level and housework participation reverses, especially on the higher deciles of housework participation among married women. The black arrows in Figure 1 indicate the (expected) negative association of educational level with housework participation. These arrows show the deciles where higher educational levels are associated with lower housework participation. On the other hand, red arrows indicate where the association is positive. These arrows are in the deciles where higher educational levels are associated with higher housework participation. The relative strength of the association on different quantiles of participation in housework is represented by the size of an arrow in Figure 1. The figure, thus, shows that the positive association is stronger among married women without children in higher deciles of housework participation. This might indicate that married women's role deviance (such as not having children) might result in more gender performance in housework participation in this group on Japanese women. Conversely, among non-married women in Japan, the association between educational level and housework participation generally follows the expectations of the resource-based frameworks and Hypothesis 1. Mostly only for non-married women in Japan, the educational level has positive effects on the reduction of housework burden, while it does not for married women.
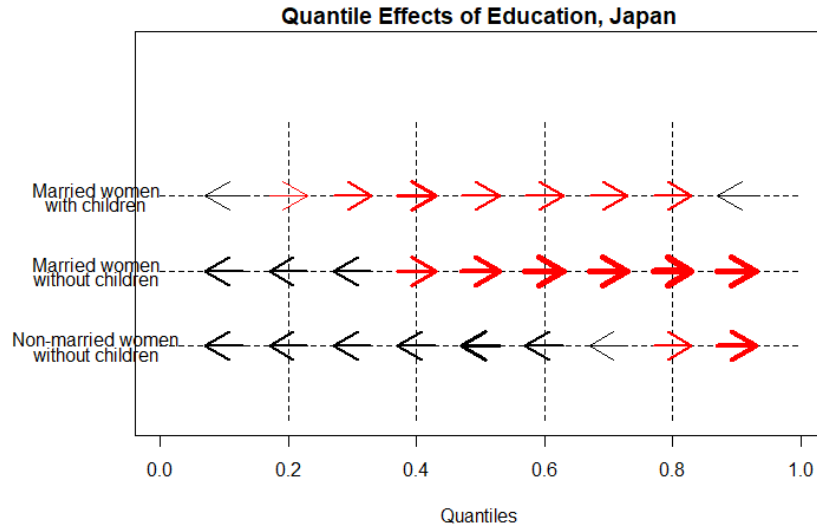
Figure 1 Quantile Effects of Education as Force Field

Education, therefore, helps to unburden only non-married women in Japan. However, it has an opposite effect on married women, especially those without children. It can be that until Japanese women are married, higher educated women do not feel the pressure of having to perform more housework. However, the pressure rises when they marry and continues to rise until they have kids. Married women without children are continuously under pressure to increase their housework performance, especially if they are highly educated. When they have kids, the pressure subsides but does not evaporate.

Conclusions

The resource-based approaches to housework participation might apply differently in different contexts and on different life-stages. The ways how these factors work in different cultural contexts are often underplayed (Kan & Hertog, 2017; Kan & Laurie, 2016). The results of the present study show that even though education provides non-married Japanese women with an ability to reduce their housework burden, married women with higher educational levels are unlikely to do so. We know from the studies in the global north that education is associated

with the reduction in housework time among women (Kan & Gershuny, 2010; Kan, Sullivan, & Gershuny, 2011; Kolpashnikova, 2016, 2018). In other cultural contexts, such as that of the Japanese society analyzed in the present paper, we find the evidence that the association of education is more complex and culturally-bound than the researchers of housework assume. Thus, we find that married Japanese women, especially those without children, actually increase their housework participation with the increase in their educational level. It is likely that education as the socialization medium may convey different value sets in different countries, moreover, the institution of marriage might place expectations on women other than those expected in the global north.

The future research of gendered division of housework could benefit from developing theoretical frameworks which take into consideration these contextual nuances. Specifically, we urge the proponents of the resource-based theoretical stances to reconsider and take into account cultural and other social factors, not only economic, which are equally important when we analyze gender inequality. At times, the effects of sociocultural factors may be more meaningful than that of the resource-based explanations.

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Appendix

Table A1 UQR Coefficients, Japanese Non-Married Women without Children, STULA 2011 and 2016

	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)
Education	-0.00266***	-0.00214	-0.00365*	-0.00403	-0.00621	-0.00469	-0.000157	0.00308	0.0159
	(0.000978)	(0.00267)	(0.00194)	(0.00370)	(0.00498)	(0.00378)	(0.00797)	(0.00746)	(0.0130)
Paid Work	-0.000177***	-0.000698***	-0.000615***	-0.00126***	-0.00180***	-0.00136***	-0.00263***	-0.00223***	-0.00280***
	(1.21e-05)	(2.84e-05)	(1.99e-05)	(3.64e-05)	(4.61e-05)	(3.47e-05)	(6.78e-05)	(6.09e-05)	(0.000101)
Household Inc	0.00509	-0.00497	0.00271	-0.0148	-0.0371	-0.0178	0.0632	0.0563	-0.0420
	(0.0102)	(0.0249)	(0.0176)	(0.0328)	(0.0428)	(0.0323)	(0.0665)	(0.0618)	(0.109)
Personal Inc	-0.00990	-0.0150	-0.00587	-0.00633	0.0176	-0.0192	-0.0750	-0.0547	-0.324
	(0.0174)	(0.0440)	(0.0320)	(0.0611)	(0.0825)	(0.0632)	(0.130)	(0.121)	(0.201)
Weekday	-0.00401	0.0113	0.0108	0.0342**	0.0445**	0.0201	0.0248	0.0290	0.0610
	(0.00496)	(0.0121)	(0.00866)	(0.0164)	(0.0216)	(0.0164)	(0.0333)	(0.0311)	(0.0549)
Age	0.00310***	0.0140***	0.0110***	0.0238***	0.0328***	0.0248***	0.0490***	0.0418***	0.0556***
	(0.000202)	(0.000514)	(0.000370)	(0.000698)	(0.000936)	(0.000711)	(0.00148)	(0.00140)	(0.00254)
Household Size	0.0123***	0.0361***	0.0261***	0.0698***	0.130***	0.104***	0.158***	0.139***	0.165***
	(0.00380)	(0.0104)	(0.00756)	(0.0143)	(0.0194)	(0.0150)	(0.0327)	(0.0308)	(0.0546)
Owns Home	-0.0157***	-0.0523***	-0.0396***	-0.0689***	-0.0317	-0.0189	-0.0202	0.00919	0.0176
	(0.00509)	(0.0130)	(0.00949)	(0.0183)	(0.0248)	(0.0190)	(0.0396)	(0.0370)	(0.0645)
Employed	-0.0204***	-0.0932***	-0.0907***	-0.238***	-0.393***	-0.310***	-0.670***	-0.604***	-0.853***
	(0.00538)	(0.0142)	(0.0106)	(0.0208)	(0.0290)	(0.0224)	(0.0474)	(0.0449)	(0.0788)
Urban	-0.0196***	-0.0164	-0.00396	-0.0248	-0.0342	-0.0362	-0.0565	-0.0795*	-0.188**
	(0.00618)	(0.0164)	(0.0118)	(0.0225)	(0.0296)	(0.0227)	(0.0468)	(0.0447)	(0.0806)
Year	-0.000607	-0.00209	0.000692	0.000689	-0.000163	-2.82e-06	-0.0115*	-0.0109*	-0.0324***
	(0.000851)	(0.00212)	(0.00153)	(0.00291)	(0.00388)	(0.00295)	(0.00612)	(0.00574)	(0.0100)
# adults	-0.0217***	-0.0498***	-0.0308***	-0.0784***	-0.130***	-0.0985***	-0.118***	-0.0780**	-0.0330
	(0.00460)	(0.0123)	(0.00892)	(0.0168)	(0.0227)	(0.0175)	(0.0381)	(0.0358)	(0.0645)
Constant	31.28***	48.98***	58.47***	73.24***	104.7***	119.6***	186.9***	230.8***	348.7***
	(1.714)	(4.262)	(3.077)	(5.864)	(7.803)	(5.935)	(12.30)	(11.56)	(20.18)
Observations	20,243	20,243	20,243	20,243	20,243	20,243	20,243	20,243	20,243
R-squared	0.041	0.098	0.129	0.158	0.180	0.181	0.166	0.143	0.089

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1

Table A2 UQR Coefficients, Japanese Married Women without Children, STULA 2011 and 2016

	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)
Education	-0.00376*	-0.00398	-0.00253	0.00514	0.0113***	0.0171***	0.0224***	0.0277***	0.0250***
	(0.00204)	(0.00366)	(0.00390)	(0.00397)	(0.00419)	(0.00472)	(0.00500)	(0.00677)	(0.00770)
Paid Work	-0.000594***	-0.00178***	-0.00232***	-0.00263***	-0.00285***	-0.00317***	-0.00312***	-0.00370***	-0.00310***
	(2.38e-05)	(3.83e-05)	(3.83e-05)	(3.66e-05)	(3.68e-05)	(3.97e-05)	(4.04e-05)	(5.23e-05)	(5.81e-05)
Household Inc	0.0512***	0.155***	0.166***	0.167***	0.161***	0.168***	0.136***	0.132***	0.0606
	(0.0113)	(0.0205)	(0.0223)	(0.0229)	(0.0245)	(0.0280)	(0.0303)	(0.0409)	(0.0464)
Personal Inc	-0.206***	-0.634***	-0.663***	-0.657***	-0.610***	-0.669***	-0.620***	-0.612***	-0.501***
	(0.0311)	(0.0541)	(0.0563)	(0.0556)	(0.0564)	(0.0628)	(0.0649)	(0.0831)	(0.0904)
Weekday	0.0779***	0.199***	0.244***	0.285***	0.303***	0.344***	0.373***	0.476***	0.455***
	(0.00788)	(0.0140)	(0.0148)	(0.0149)	(0.0157)	(0.0178)	(0.0191)	(0.0259)	(0.0300)
Age	0.00881***	0.0213***	0.0235***	0.0245***	0.0261***	0.0267***	0.0256***	0.0291***	0.0224***
	(0.000608)	(0.000992)	(0.00102)	(0.000994)	(0.00101)	(0.00111)	(0.00113)	(0.00146)	(0.00160)
Household Size	-0.0106	-0.0129	-0.0199	-0.0113	-0.00817	-0.0138	-0.0113	0.0197	0.0433
	(0.00774)	(0.0137)	(0.0148)	(0.0151)	(0.0159)	(0.0178)	(0.0189)	(0.0256)	(0.0299)
Owns Home	0.0467***	0.106***	0.128***	0.120***	0.117***	0.138***	0.131***	0.147***	0.0559
	(0.0121)	(0.0207)	(0.0218)	(0.0217)	(0.0225)	(0.0251)	(0.0261)	(0.0340)	(0.0378)
Employed	-0.0522***	-0.162***	-0.218***	-0.245***	-0.270***	-0.273***	-0.227***	-0.249***	-0.176***
	(0.00987)	(0.0179)	(0.0194)	(0.0195)	(0.0203)	(0.0224)	(0.0231)	(0.0295)	(0.0318)
Urban	-0.00910	-0.0376*	-0.0400*	-0.0292	-0.0437**	-0.0395	-0.0486*	-0.0875**	-0.119***
	(0.0107)	(0.0192)	(0.0205)	(0.0206)	(0.0216)	(0.0243)	(0.0257)	(0.0344)	(0.0394)
Year	-0.00274*	-0.00921***	-0.00894***	-0.00858***	-0.00905***	-0.0109***	-0.00781**	-0.00977**	0.00136
	(0.00146)	(0.00260)	(0.00279)	(0.00284)	(0.00299)	(0.00338)	(0.00359)	(0.00477)	(0.00537)
# adults	0.0388***	0.0983***	0.129***	0.138***	0.145***	0.169***	0.167***	0.170***	0.145***
	(0.00858)	(0.0156)	(0.0169)	(0.0174)	(0.0184)	(0.0206)	(0.0220)	(0.0298)	(0.0350)
Constant	65.19***	122.5***	151.8***	180.9***	211.8***	245.4***	284.1***	332.9***	385.9***
	(2.929)	(5.238)	(5.616)	(5.704)	(6.020)	(6.794)	(7.214)	(9.594)	(10.80)
Observations	45,791	45,791	45,791	45,791	45,791	45,791	45,791	45,791	45,791
R-squared	0.053	0.127	0.165	0.190	0.194	0.185	0.157	0.124	0.071

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A3 UQR Coefficients, Japanese Married Women with Children, STULA 2011 and 2016

	1 (0-10% of Housework)	2 (10-20% of Housework)	3 (20-30% of Housework)	4 (30-40% of Housework)	5 (40-50% of Housework)	6 (50-60% of Housework)	7 (60-70% of Housework)	8 (70-80% of Housework)	9 (80-90% of Housework)
Education	-0.000307	0.000780	0.00277	0.00519*	0.00307	0.00279	0.00200	0.00453	-0.000915
	(0.00366)	(0.00249)	(0.00276)	(0.00275)	(0.00313)	(0.00395)	(0.00450)	(0.00470)	(0.00637)
Paid Work	-0.00146***	-0.00142***	-0.00181***	-0.00200***	-0.00237***	-0.00290***	-0.00312***	-0.00295***	-0.00296***
	(4.77e-05)	(2.98e-05)	(3.09e-05)	(2.87e-05)	(3.13e-05)	(3.74e-05)	(4.16e-05)	(4.28e-05)	(5.71e-05)
Household Inc	0.0540**	0.0842***	0.102***	0.127***	0.155***	0.184***	0.193***	0.206***	0.223***
	(0.0232)	(0.0162)	(0.0183)	(0.0184)	(0.0214)	(0.0278)	(0.0322)	(0.0347)	(0.0500)
Personal Inc	-0.417***	-0.508***	-0.664***	-0.667***	-0.748***	-0.789***	-0.791***	-0.698***	-0.740***
	(0.0641)	(0.0432)	(0.0470)	(0.0457)	(0.0517)	(0.0639)	(0.0724)	(0.0753)	(0.103)
Weekday	0.287***	0.265***	0.327***	0.348***	0.393***	0.500***	0.561***	0.547***	0.561***
	(0.0145)	(0.00970)	(0.0107)	(0.0106)	(0.0122)	(0.0158)	(0.0182)	(0.0196)	(0.0281)
Age	0.0295***	0.0264***	0.0344***	0.0375***	0.0460***	0.0589***	0.0656***	0.0644***	0.0675***
	(0.00109)	(0.000723)	(0.000788)	(0.000766)	(0.000864)	(0.00108)	(0.00122)	(0.00129)	(0.00182)
Household Size	0.102***	0.100***	0.131***	0.150***	0.180***	0.225***	0.239***	0.235***	0.263***
	(0.00851)	(0.00621)	(0.00714)	(0.00731)	(0.00837)	(0.0103)	(0.0112)	(0.0128)	(0.0183)
Owns Home	0.0433***	0.0324***	0.0246*	0.0295**	0.0192	0.0386**	0.0337*	0.0315	0.0784***
	(0.0163)	(0.0113)	(0.0126)	(0.0126)	(0.0144)	(0.0181)	(0.0205)	(0.0214)	(0.0287)
Employed	-0.128***	-0.119***	-0.140***	-0.151***	-0.180***	-0.235***	-0.248***	-0.226***	-0.209***
	(0.0193)	(0.0132)	(0.0146)	(0.0144)	(0.0162)	(0.0198)	(0.0221)	(0.0225)	(0.0293)
Urban	-0.0437**	-0.0302**	-0.0327**	-0.0269*	-0.0420**	-0.0194	-0.0275	-0.0133	-0.0350
	(0.0204)	(0.0141)	(0.0157)	(0.0155)	(0.0176)	(0.0221)	(0.0250)	(0.0261)	(0.0358)
Year	-0.0171***	-0.0149***	-0.0157***	-0.0157***	-0.0178***	-0.0154***	-0.0145***	-0.00853**	0.00705
	(0.00262)	(0.00180)	(0.00201)	(0.00199)	(0.00229)	(0.00289)	(0.00329)	(0.00346)	(0.00478)
# adults	-0.179***	-0.152***	-0.193***	-0.198***	-0.216***	-0.245***	-0.242***	-0.231***	-0.231***
	(0.0116)	(0.00807)	(0.00912)	(0.00914)	(0.0105)	(0.0130)	(0.0145)	(0.0160)	(0.0227)
Constant	108.4***	149.0***	180.4***	210.1***	244.1***	283.5***	311.3***	344.4***	402.7***
	(5.261)	(3.631)	(4.045)	(4.013)	(4.601)	(5.816)	(6.613)	(6.963)	(9.617)
Observations	61,434	61,434	61,434	61,434	61,434	61,434	61,434	61,434	61,434
R-squared	0.055	0.101	0.128	0.149	0.157	0.149	0.136	0.114	0.066

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1