

Couples' time use before and after the kids:

A fractional panel fixed effects approach

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July 12, 2018

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- **Method:** A logit-based fixed effects fractional response estimator is developed for this study.
- **Main result:** The impact of parenthood is relatively stronger on mothers' time allocations. We found heterogeneous effects by birth order, couples' education, income and attitude towards gender's role.

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- Being a mother is a significant factor attributed to these disadvantages: reduced hours of work, extra hours of child care and housework. ([Herr 2016, Lundborg et al., 2017](#)).
- Time allocation is a joint household coordination ([Rogerson and Wallenius, 2018](#)). Ignoring the interdependent role of the partner would induce potential bias.

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 - The importance of accounting for correlated couple fixed effects
 - Panel studies: [Foster and Stratton \(2018\)](#) - labour market events, [Craig and Siminski, \(2010\)](#) - housework and additional fertility

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 - We have each $y_{it}^{[k]} \in [0, 1]$, specifically they could be at 0 or 1; with their sum
$$\sum_{k=1}^K y_{it}^{[k]} = 1$$
- To the best of our knowledge, there is no non-linear panel method that could handle this type of data without either dropping some observations at the bounds or having to require distributional assumptions for the unobservable fixed effects.

Eliminating the fixed effects

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- For illustration, we start with a simple univariate logit-based conditional expectation function (CEF):

$$\mathbb{E}[y_{it}|\mathbf{x}'_{it}, \alpha_i] = \frac{\exp(\alpha_i + \mathbf{x}'_{it}\beta)}{1 + \exp(\alpha_i + \mathbf{x}'_{it}\beta)} \equiv \Lambda_{it}$$

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- And for $T = 2$, we notice that:

$$\frac{\Lambda_{i1}(1 - \Lambda_{i2})}{\Lambda_{i2}(1 - \Lambda_{i1})} = \frac{\exp(\alpha_i + \mathbf{x}'_{i1}\beta)}{\exp(\alpha_i + \mathbf{x}'_{i2}\beta)} = \exp(\mathbf{x}'_{i1}\beta - \mathbf{x}'_{i2}\beta)$$

Moment condition

- The sample analogue of our population moment condition is:

$$\frac{1}{N} \sum_{i=1}^N [y_{i1}(1 - y_{i2}) - \exp((\mathbf{x}'_{i1} - \mathbf{x}'_{i2})\beta)y_{i2}(1 - y_{i1})] = 0$$

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- The extension to multivariate fractional follows naturally with the multinomial logit conditional mean.
- A Monte Carlo simulation exercise shows its good small sample performance compared to other existing methods.

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- Our study uses 15 waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey (2002 - 2016).
- The outcome variable is originated from answers to the question "*How much time would you spend on each of the following activities in a typical week?*".
- We notate w_{it}^j , ch_{it}^j , h_{it}^j and l_{it}^j where $\sum_{j \in \{m, f\}} w_{it}^j + ch_{it}^j + h_{it}^j + l_{it}^j = 1$ to be the shares of work production, child care, home production and leisure hour for a person j of household i at time t .

The gender gap - Time allocation

	Male	Female	Difference
Time share - work	0.256 (0.121)	0.145 (0.119)	0.111*** (0.001)
Time share - child care	0.043 (0.061)	0.093 (0.132)	-0.050*** (0.001)
Time share - housework	0.059 (0.049)	0.138 (0.088)	-0.079*** (0.001)
Time share - leisure	0.642 (0.142)	0.623 (0.165)	0.019*** (0.001)
Age	44.30 (11.12)	42.07 (10.87)	2.23*** (0.097)
1 if highest education level is college	0.309 (0.462)	0.353 (0.478)	-0.044*** (0.004)
1 if being employed	0.879 (0.327)	0.721 (0.448)	0.157*** (0.003)
Log of hourly wage	3.009 (1.033)	2.569 (1.285)	0.440*** (0.010)
Annual non-labour income	16108 (55209)	10762 (37355)	5346*** (417)
N	25519	25519	

Notes: The first two columns show the mean and standard deviation in parentheses. The last column indicates the difference in mean between male and female with standard error in parentheses.
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Baseline results - Work hours

	Male				Female		
	Work	Child	House	Leisure	Work	Child	House
No. of kids (0-4 years old)	0.143*** (0.010)	0.586*** (0.029)	0.215*** (0.021)	0.093*** (0.008)	-0.631*** (0.037)	0.800*** (0.028)	0.339*** (0.019)
No. of kids (5-9 years old)	0.080*** (0.010)	0.457*** (0.031)	0.129*** (0.023)	0.055*** (0.008)	-0.289*** (0.026)	0.602*** (0.031)	0.209*** (0.020)
No. of kids (10-14 years old)	0.055*** (0.009)	0.366*** (0.034)	0.071*** (0.021)	0.035*** (0.006)	-0.140*** (0.020)	0.467*** (0.034)	0.150*** (0.019)
No. of kids (15-24 years old)	0.036*** (0.007)	0.239*** (0.034)	0.055** (0.017)	0.015** (0.005)	-0.024 (0.014)	0.294*** (0.035)	0.068*** (0.015)
Log wage ratio	-0.014*** (0.003)	0.007 (0.007)	0.021*** (0.004)	0.008*** (0.001)	0.116*** (0.007)	-0.032*** (0.007)	-0.008* (0.004)
Annual non-labour income (hh)	-0.033*** (0.006)	-0.002 (0.019)	-0.005 (0.012)	0.005 (0.004)	-0.030** (0.010)	-0.008 (0.020)	0.004 (0.011)
Local unempl. rate	-0.003 (0.004)	-0.008 (0.014)	0.006 (0.009)	-0.002 (0.002)	0.009 (0.007)	-0.025 (0.015)	-0.007 (0.008)
Time dummies	Yes						
No. of observations	25519						
No. of couples	5396						
J statistic	0.000						

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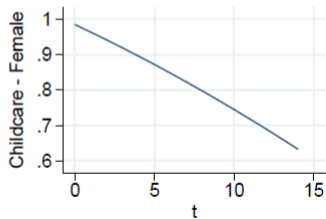
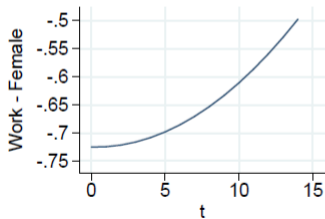
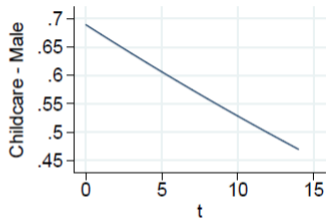
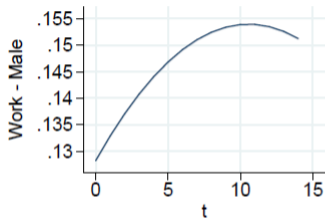
Baseline results - Relative wage Female/Male

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Over the last 15 years in Australia



Birth order - First vs. later births

	Male				Female		
	Work	Child	House	Leisure	Work	Child	House
First kid (0-4 years old)	0.295*** (0.019)	1.793*** (0.069)	0.358*** (0.040)	0.175*** (0.015)	-0.903*** (0.068)	2.201*** (0.062)	0.708*** (0.036)
First kid (5-9 years old)	0.184*** (0.026)	1.378*** (0.074)	0.220*** (0.054)	0.113*** (0.021)	-0.641*** (0.078)	1.733*** (0.077)	0.486*** (0.049)
Second kid (0-4 years old)	0.059*** (0.018)	0.075 (0.043)	0.143*** (0.039)	0.068*** (0.015)	-0.478*** (0.062)	0.319*** (0.042)	0.272*** (0.034)
Second kid (5-9 years old)	0.058* (0.028)	0.106 (0.067)	0.001 (0.057)	0.051** (0.019)	-0.245*** (0.067)	0.301*** (0.072)	0.222*** (0.049)
No. of higher parity kids (0-4 years old)	0.059** (0.022)	0.201*** (0.045)	0.096* (0.044)	0.025 (0.018)	-0.287*** (0.070)	0.295*** (0.052)	0.149*** (0.040)
No. of higher parity kids (5-9 years old)	0.048* (0.024)	0.230*** (0.060)	0.034 (0.047)	0.016 (0.018)	-0.133* (0.060)	0.409*** (0.071)	0.092 (0.047)
No. of kids (10-14 years old)	0.069* (0.027)	0.442*** (0.081)	0.109* (0.049)	0.043* (0.019)	-0.086 (0.067)	0.859*** (0.089)	0.166** (0.057)
No. of kids (15-24 years old)	-0.029 (0.025)	0.191 (0.102)	0.026 (0.066)	0.017 (0.018)	0.112* (0.051)	0.441*** (0.131)	-0.013 (0.068)
log wage ratio	-0.006 (0.004)	0.013 (0.010)	0.013 (0.008)	0.003 (0.003)	0.229*** (0.020)	-0.031*** (0.009)	-0.020** (0.007)

Heterogeneous Average Marginal Effects of having a 0 - 4 year old child

	Male				Female			
	Work	Childcare	Housework	Leisure	Work	Childcare	Housework	Leisure
Couples' education								
Low	0.0064	0.0088	0.0042	0.0028	-0.0418	0.0262	0.0156	-0.0221
High	0.0105	0.0138	0.0034	0.0043	-0.0705	0.0460	0.0205	-0.0280
Household income								
Low	0.0059	0.0105	0.0056	-0.0030	-0.0313	0.0276	0.0158	-0.0310
High	0.0117	0.0123	0.0031	0.0059	-0.0726	0.0393	0.0205	-0.0202
Attitude towards gender's role								
Traditional	0.0083	0.0073	0.0028	0.0041	-0.0375	0.0213	0.0168	-0.0232
Progressive	0.0081	0.0158	0.0052	0.0029	-0.0675	0.0417	0.0201	-0.0262

Male partners with progressive attitude towards gender role

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- We applied the estimator to Australian longitudinal data to estimate elasticities of households' time allocations to having children.
 - Effects are much stronger for first born than higher order births
 - On average, couples with higher education, higher income, more progressive gender attitude react stronger to the parenthood event - especially male partners in progressive households.