

Models of parenting and its effect on academic productivity: Preliminary results from an international survey

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Abstract

This preliminary paper investigates the cost of parenting engagement on academic productivity and impact. Instead of investigating the relationship between gender and academia, this study focuses on time invested in parenting as the lead factor underpinning productivity differences for both men and women. Survey responses from 17,519 first and last authors publishing between 2007 and 2017 yielded four distinct parenting types: Lead parents; Satellite parents; Sole parents; and Dual parents. In addition a free text box in the survey allowed for the analysis of 5976 qualitative responses about participant's experiences balancing parenting with their partners, and academic careers. Results show a significant difference across all types of parenting relative to gender for the number of papers produced, as well as for the proportion of papers published in top journals. In addition, for men and women who take on dual parenting roles (a hypothetical 50/50 split), the productivity cost is higher for women. Conversely, there is a significant cost for men and women who take on the role of Lead parent. Further qualitative investigation highlights the incidence of an 'invisible burden' in self-identified dual parenting families, wherein there is a significant amount of unacknowledged labor that is undertaken by females. This invisible labor may contribute to the difference in productivity between men and women in dual-parenting relationships.

Introduction

from describing the various forms taken by this gap (Lariviere et al., 2015; Lariviere et al., 2015) to the mechanism that drive it (Leslie et al, 2015; Moss-Racusin, et al., 2012). Among those, differences in academic rank, organisational approaches, and the extent of specialisation (Leahey, 2006), the main explanation remains an assumption that women are faced with the majority of childcare (Beddoes & Pawley, 2014). As a consequence this restricts their ability to engage fully in the demands of the academy, directly influencing their academic productivity both in the short and long term.

No one denies that raising children demands a considerable amount of time and effort that diminishes the time and energy that can be devoted to scholarship and on academic earnings.

Barriers for women when pursuing academic careers in science include systematic barriers such as child rearing and the inability of research systems to allow the flexibility necessary to juggle research with home-responsibilities (Feeney et al, 2014; van Anders, 2004). However, this centralisation of women as the primary caregiver, and hence the majority of the time burden in previous research further blurs an understanding of the productivity cost of parenting. This is especially when variables other than childcare perpetuate the gender gap in academia.

The concept of “balanced” parenting is also a relatively new social change (Bright Horizons, 2017) that questions the relevance of past studies of how commitments to the academy and parenting are fulfilled. A more modern perspective on parenting also acknowledges that both parents, irrespective of gender or marital status, involved in a degree of parenting. In addition it also recognises parenting strategies that incorporate non-parental figures (e.g. grandparents/extended family; formal childcare provision etc) that take an active role in maintaining the work-life balance in academia. These more modern parenting models allow families to strategise children, childcare and full time careers (for both parents potentially) around academic demands. What is missing in an understanding of how parenting influences academic labor is the productivity and performance costs of modern parenting strategies.

Using a world-wide survey of academic parents (n=17,519 respondents), this research in progress uses the term “parent” as gender neutral, acknowledging that modern parenting is a joint, or multiple-partner endeavour. As such, this research aims to avoid ascribing loss of productivity on a single individual “parent” alone, in order to further investigate the parenting cost on academic productivity.

Methods

Survey

Web of Science was used to sample all first and last authors who had published at least one article in the period 2007-2017. All authors were then invited to complete an online survey. The first survey question used skip logic to eliminate all potential respondents who were not parents. In total, 17,519 individuals who met this initial filtering requirement responded. Data cleaning was done to exclude unfinished responses and erroneous responses (e.g., doctoral degrees obtained before birth) and to account for missing data resulted in a final sample of 10,444.

Survey questions included: demographic information on children and partners; contribution to childcare; the balance of parental labor with other caregivers; and their perception of the relationship between childcare and academic careers. The underlying hypothesis guiding survey construction was that it was not the parental status, but rather time allocated to parenting that would lead to decreased productivity.

Quantitative Methods

The analytic set included the 10,444 respondents with complete surveys. ANOVA was used to test the null hypothesis that the mean productivity (i.e., number of papers) and impact (i.e., proportion of published papers that are considered highly cited relative to field and year (PPTop)), is the same for parenting type relative to gender (gender/parenting type categorisation). Permutation tests were used as a post hoc test comparison to further test the relationship between the gender/parenting type categorisation. Here, two test statistics were

used; one that measures the square distance between each observation and the group mean; and the other measuring the difference between the group median.

Qualitative data

A free text section was included at the end of the survey that encouraged participants to “*Please feel free to add any additional comments you have regarding childcare and scientific labor, drawing upon your own experiences*”. In total, 5976 participants completed this section. To analyse this, a random sample of 500 was selected and coded thematically using a grounded theory-informed approach. Themed categories were developed (n=59) and then collapsed into 8 overarching thematic codes capable of facilitating the manual coding of large numbers of responses.

Results

A breakdown of how respondents described their involvement in parenting is shown below in Table 1.

Table 1. Proportion of respondents (Male and Female) in different parenting styles

<i>Parenting style</i>	<i>Male</i>	<i>Female</i>
I am the primary caregiver to my child(ren)	4.2	31.8
My partner is the primary caregiver to my child(ren)	33.2	4.0
The majority of childcare is performed by non-parental caregiver(s)/other	5.8	12.5
I share equal parenting roles with my partner	55.1	46.6
I share equal parenting roles with non-parental caregiver(s)/other	1.7	5.1
TOTAL	100	100

Here, 31.8% of female respondents indicated that they were the ‘primary caregiver’ to their children, compared with 4.2% of male respondents. In contrast, 33.2% of men indicated that their ‘partner is the primary caregiver’ to their children. A relatively equal proportion of male (55.1%) and Female (46.6%) respondents indicated that they ‘share equal roles with my partner’. These results hid whether respondents were able to share parenting duties as a married and/or partnered relationship, and those were not but still “shared” parenting. Therefore the results of Table 1 were cross-referenced with marital status gender/parenting type categorisation us to create the following parenting classifications.

Table 2. Classification of parenting types and proportion of respondents in each category

<i>Parenting type</i>	<i>Definition</i>	<i>Male</i>	<i>Female</i>
Sole parent	Are ‘primary caregiver’ to their children AND are single/widowed/divorced or separated	1.1	6.5
Lead parent	Are within married/partnered relationships AND ‘the primary caregiver’	2.9	24.1
Satellite parents	Any relationship arrangement AND have a ‘partner who is a primary caregiver’; or ‘the majority of childcare is performed by a non-parental caregiver(s)/other’	38.8	17.4
Dual parents	Any relationship arrangement AND have ‘share equal parenting roles with a partner’; AND ‘share equal parenting roles with non-parental caregivers(s)/other’	57.2	51.9

Although both genders report engaging in dual-parenting arrangements and/or as a satellite parent; 24.1% of women are acting as the Lead-parent whereas less than 3% (2.9%) of men act the same.

Figure 1. Number of papers by parenting type and gender (outliers removed)

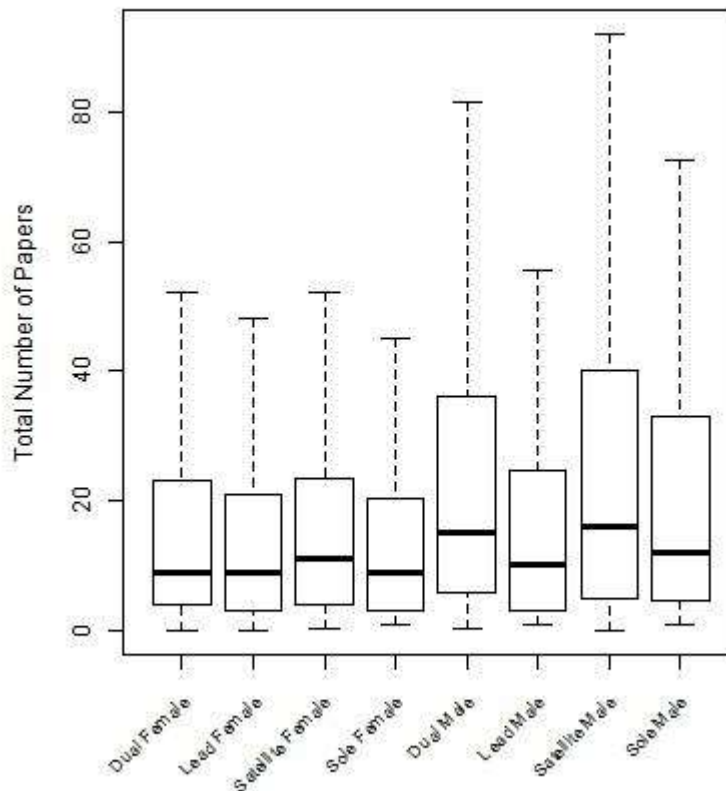
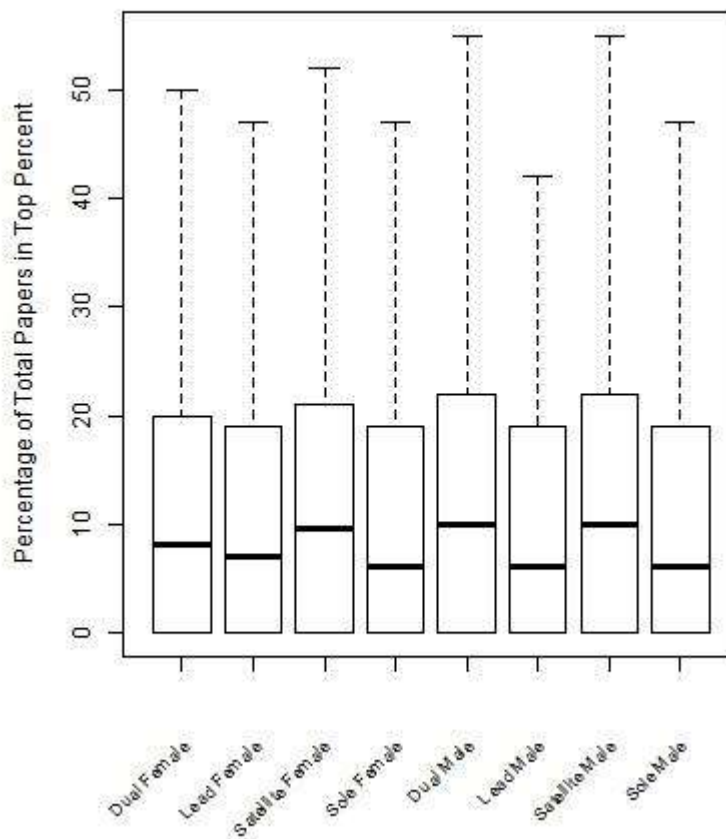


Figure 1 shows the average number of papers, with the outliers removed, for each parenting type relative to gender. A one-way ANOVA test was performed across all gender/parenting type categorisation showing a significant difference (F(leadparent) $F=25.31$ $p<0.001$), and a further two way test, showed interactional effects indicating that the effects of taking on the Lead parenting role on academic productivity are different for men and women $F(\text{gender:leadparent}) F=3.34$, $p=0.01$. Further, using a permutation test for the number of papers, the probability that the expected mean number of papers and median number of papers is not different for at least one gender/lead parenting level is almost 0.

In addition, Figure 2 shows the proportion highly cited papers relative to field an year (PPTop) for each gender/parenting type categorisation. The single factor analysis shows how the expected percentage is different for at least on gender/parenting type categorisation ($F=3.40$, $p=0.001$). The two-factor interaction ANOVA indicates that while there is a difference in the expected percentage between males and females ($F(\text{gender:leadparent}) F=0.15$, $p=0.92$), there is no difference for the lead parent role regardless of gender. Permutation tests verified this finding by showing a probability that the means and medians were the same for each gender/lead parent categorisation of close to 0 ($=10^{-4}$), $p=0.0016$.

Figure 2. Proportion of parent types by gender in PPTop



Qualitative results

A free text question allowed respondents to comment further on the survey or experiences balancing parenting with an academic career. In these responses, participants reflected on the flexibility of an academic career as being useful for allowing the time necessary to engage in parenting activities. However when the spouse was not an academic this flexibility was taken for granted as outwardly it seemed that they were “not busy”, resulting in parenting tasks being unconsciously conducted by the academic parent.

“It is hard to balance academic work and home life - as in many cases your partner does not understand that reading and working on your computer is your job. Thus, you find that you have various tasks (family, children, house, errands) thrown to you by your spouse who works a “regular” job because you are “not busy”.

The assumed-flexibility of an academic career also served to ingrain practices that burdened academic women with the majority of responsibility for parenting;

“I didn't want to miss out on anything and had the more flexible career, so I did most of the parenting roles. However, this eventually just became the habit of “how we did things” and my husband had time for hobbies while every moment of my time was taken up by work and kids.”

In addition, the invisible burden of parenting on academic women, and the flexibility of academic work that allowed parents to appear “not busy” by working at home, infiltrated the reasoning of dual-parents around who would assume the majority of the parenting

responsibilities; *“Inevitably, we both feel that if a sacrifice must be made, it is my schedule”*. This decision was made irrespective of salary considerations.

In many cases, the adoption of invisible parenting labor was not a result of a conscious decision about how to divide roles between parents, but still incorporated a large temporal and emotional burden;

The mental labor of researching and remembering EVERYTHING related to kids activities and school falls to me - including selecting locations, remembering deadlines for sign-ups, getting proper equipment: summer camps, swimming lessons, dance, after school care, parties at school (bringing snacks/valentines etc.), field trips. It is constant, exhausting, and under-appreciated.

Men who were part of dual-parenting arrangements acknowledged the existence of this invisible parenting labor burden on women; *“Although I try to be active in child care and share responsibilities equally, my wife still takes care of more child care tasks than I do”*. A further analysis of men in satellite-parenting arrangements also reinforced the benefits they accrue in academic productivity when their partner takes on the lead parenting role. Men in self-declared dual-parenting relationships also acknowledged the invisible burden on their partners; *I like to think we shared, but the wife apparently did more.*

Finally, there are benefits for women who adopt a lead-, and dual-parenting arrangement, provided that their partner takes a lead or dual-parenting role as well; *“The system was not perfectly equal in all regards, but he made every effort to make it as fair to both of us as possible. That is a big reason why I have had a successful career in science.*

Discussion

The results showed that there is a connection between the amount of parental responsibility assumed by an individual and research productivity as measure by the number of papers, and the proportion of papers considered highly cited for the field and year (PPTop). The model also show that there is a significant interaction with gender, suggesting that the link between parenting arrangements and productivity differs is different for men than it is for women. This study demonstrates how the level of parental responsibility is a powerful variable to explain academic productivity differences between men and women. Further research is currently underway to investigate these effects in more detail, which also includes a deeper understanding of the nature of the invisible parenting labor burden, and its interactions with the parenting typologies and academic productivity and impact.

References

- Beddoes, K., Pawley, A.L. (2014) Different people have different priorities: work-family balance, gender, and the discourse of choice. *Studies in Higher Education*, 39(9), 1573-1585.
- Bright Horizons. (2017) Modern Family Index 2017. Available at https://solutionsatwork.brighthorizons.com/~media/BH/SAW/PDFs/GeneralAndWellbeing/MFI_2017_Report_v4.ashx
- Feeney, M.K., Bernal, M., Bowman, L. (2014) Enabling work? Family-friendly policies and academic productivity for men and women scientists. *Science and Public Policy*, 41(6), 750-764.
- Larivière, V., Ni, C., Gingras, Y., Cronin, B., & Sugimoto, C. R. (2013). Bibliometrics: Global gender disparities in science. *Nature*, 504(7479), 211.
- Leahey, E. (2006). Gender differences in productivity: Research specialization as a missing link. *Gender & Society*, 20(6), 754-780.

- Leslie, S. J., Cimpian, A., Meyer, M., & Freeland, E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science*, 347(6219), 262-265.
- Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences*, 109(41), 16474-16479.
- Nittrouer, C. L., Hebl, M. R., Ashburn-Nardo, L., Trump-Steele, R. C., Lane, D. M., & Valian, V. (2018). Gender disparities in colloquium speakers at top universities. *Proceedings of the National Academy of Sciences*, 115(1), 104-108.
- Van Anders, S.M., (2004) Why the academic pipeline leaks: Fewer men than women perceive barriers to becoming professors. *Sex roles*, 51(9-10): 511-521.