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Female breadwinning and domestic abuse: evidence from Australia

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Abstract

We explore the relationship between heterosexual partners' relative income and the incidence of both domestic violence and emotional abuse. Using Australian data drawn from society-wide surveys, we find women who earn more than their male partners are subject to a 33% increase in partner violence and a 20% increase in emotional abuse compared to mean levels. We show the relationship between relative spouse income and female partner abuse is best modelled by a binary variable that captures "female breadwinning." This finding differs from those of some earlier studies that considered only serious abuse and found a continuous negative relationship between female partners' relative income and abuse. Instead, our findings suggest a mechanism related to gender norms generating domestic violence. We find no link between relative income and abuse of male partners.

Keywords Intimate partner violence · Female breadwinning · Relative income

JEL Classification J12 · K42 · D31

1 Introduction

The cost and damage caused by domestic violence against women is horrific. In 2015–2016, in Australia alone, domestic violence against women and children reduced GDP by almost $22 billion, in lost human-capital productivity and related medical care and law enforcement services. Beyond the economic costs are the direct physical and

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mental pain suffered by victims and the impact of violence and pain on their wellbeing and livelihoods, impacts potentially extending across generations.

Partner violence against women is not specific to less developed countries or lower socio-economic cohorts in developed countries, though mean incidence is marginally higher than in higher-income countries and cohorts. However, empirical studies of partner abuse over-represent low-income countries and low socio-economic cohorts. This raises the question: does increasing women's incomes and education reduce violence against women?

Globally, the World Health Organization (WHO) estimates that, of all women aged 15–49 years who have been in a relationship, 27% have experienced domestic abuse.[1] Its estimates across high-income countries average between 20 and 22%. Despite this data suggesting the answer to the question raised above is "to an extent," government policy is often motivated by the presumption that improving women's economic position alone will reduce violence against women. However, while education and economic development clearly help in reducing violence against women, the harsh reality remains that women's economic achievements, improvements in women's financial independence, and advances in education for women will not suffice to eliminate partner abuse. Well-educated and financially independent women are not immune from domestic abuse.

This paper focuses on the relationship between the relative earnings of partners in heterosexual couples in Australia and levels of domestic violence and abuse within that relationship. Two facts cited above motivated us to conduct the research presented in this paper: the horrific damage and cost of domestic violence against women and the tendency to over-emphasize financial and educational advancement as the solution, to the exclusion of other analyses. More quantitative evidence offering insight into the population-wide, individual experience of abuse is urgently required. Such evidence is key to finding new ideas to reduce and ideally eliminate domestic violence. Our paper, with evidence from Australia producing startling findings, clearly illustrates this.

Australia's comprehensive welfare system supports residents with a strong social safety net. Compared to the USA, victims of domestic violence who choose to leave an abusive relationship have more and better external support options. Yet, Australia has failed to eliminate the persistent problem of domestic abuse. Population survey data reveal that 1 in 6 women has experienced physical and/or sexual violence, and 1 in 4 has experienced emotional abuse by a partner (AIHW 2018). Men too report domestic abuse, with 1 in 16 and 1 in 6 men experiencing partner violence and emotional abuse, respectively.[2]

Like most western countries, Australia saw a rapid convergence in male and female wages and earnings from the 1960s to the 1990s which has since slowed. Australia's gender wage gap for full time workers is just below the average of the Organization for Economic Cooperation and Development (OECD) and just above the average for the European Union.[3] Against this backdrop, we offer Australia as a widely generalizable

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[1] https://www.who.int/news-room/fact-sheets/detail/violence-against-women. Fact sheet date: 9 March 2021. Retrieved on 6 May 2023.

[2] See also https://www.aihw.gov.au/reports-data/behaviours-risk-factors/domestic-violence/overview.

[3] https://www.oecd.org/els/LMF_1_5_Gender_pay_gaps_for_full_time_workers.pdf

context for examining possible channels of domestic abuse in relation to women's economic power.

This paper uses high-quality, population-wide survey data and measures of domestic violence derived from comprehensive questions on partner behavior to examine specifically the relationship between relative income within a heterosexual couple and the likelihood of experiencing physical or emotional abuse. We show that when women earn more than their male partners ("female breadwinning"), they are 33% more likely to experience domestic violence and 20% more likely to experience emotional abuse. Female breadwinning does not influence partner abuse experienced by men, either physical or emotional. These findings are robust to alternative specifications and estimation methods and alternative sample compositions.

Our identification strategy is data driven. In the raw data, we observe non-linearity in the relationship between domestic abuse and relative income. A structural change in the probability of experiencing domestic abuse occurs consistently at the point where women out-earn their male partner. When considered in combination with a large discontinuity in the share of women's income at 50%, this pattern is strongly suggestive of gender identity norms as the driving mechanism for the relationship between relative income and domestic abuse in Australia. Above and below the point at which women begin to out-earn their male partner, we find little relationship between relative income and domestic violence. This suggests that a bargaining explanation is either not present or is dominated by the effect of violating the gender norm.

Our work is related to Ericsson (2019), who also found a nonlinear association between relative income and female hospitalization due to assault and who discuss the non-linearities that arise when both bargaining and gender norm mechanisms are present.

To control for potential endogeneity of reported income, we proxy for both male and female income using a prospective income measure based upon individual characteristics and geographical factors. Our estimates are largely unchanged when using either reported income or this proxy.

One possible explanation for our results is that women are more likely to report violence when they out-earn their male partners. While we cannot rule this out definitively, we find that the relationship between women out-earning their male partners and higher levels of abuse holds for poorer and wealthier households, for more and less educated households, for younger and older households, and for both native and immigrant households. Any reporting bias would likely be correlated with these characteristics. The consistency of our findings across these different sub-populations argues against a reporting bias.

In addition to providing Australian-specific evidence, our paper makes four contributions. First, we show the existence of a structural break in the relationship between relative income and domestic violence when women begin to out-earn their male partners, consistent with a strong role for gender norms in generating domestic violence. Most other papers have considered this question using a continuous measure of relative income which may confound bargaining and gender norms. Second, we demonstrate a significant effect of gender norms and no visible effect of bargaining. This may also be the case in other countries and is an important insight for policy formulation. Third, we look at the entire population, not just disadvantaged groups, and we con-

sider a wide range of physical/emotional abuse, not just severe abuse (as measured by hospitalization). Finally, Australia, with its European-style social welfare protection and American-style labor market institutions and immigrant make-up, provides a case study of broad interest.

In what follows, we first discuss, at a high level, the theoretical backdrop to our question and the related literature. We then present our data and empirical strategy. After presenting our main results, we undertake several robustness checks. We examine whether reporting bias is likely to be driving the results. We conclude in the final section.

2 Theory and literature

The two main theories in family economics surrounding the mechanism of domestic violence are bargaining power and gender identity norms.[4] The former is derived from the economic theory which predicts that the increase in economic status of a family member improves his/her bargaining position in the household. Better labor market outcomes, more generous social safety nets or improved divorce laws, for example, improve the "outside option"—the fallback position in the case where the individuals in the household are unable to come to a cooperative agreement. A vast body of economic research began with the seminal work of Nash (1950). Bargaining theory predicts that the increase in the relative income of a family member will reduce the incidence of domestic violence against her (him).

Aizer (2010) formally derives a Nash bargaining model in the appendix to her paper. Women get utility from safety, and men get utility from violence. A parameter α controls the share of income a woman receives if the partnership were to end. Aizer demonstrates that there is some set of outcomes where Nash bargaining can take place and violence can occur. With some very straightforward assumptions about concavity, differentiability, and homotheticity, she shows that an increase in a woman's relative income leads to a decline in violence against her.

Nash bargaining is not required to generate a prediction that increased relative income of women will result in less violence against them. Tauchen et al. (1991) develop a model with a dominant decision-maker who derives utility from control and direct gratification from violence. Increases in the victim's (woman's) income "generally decrease violence" (page 492). The presence of transfers between partners and the fact that violence provides two benefits to the dominant person—victim control and direct gratification—results in cases where the effect of increasing women's income on violence can be ambiguous.

Yet, an alternative explanation—gender identity norm theory—posits a contrary prediction. The improvement in a woman's economic situation may lead to increased domestic violence against her because the male partner may try to regain power within the household, through abusive behavior, in response to the "threat" of the woman's increased power.

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[4] The latter is also referred to as the "male backlash model" in the sociology literature. Below, we also explore exposure reduction theory from criminology. See Hyde-Nolan and Juliao (2012) for an overview of theories of domestic violence.

Akerlof and Kranton (2000) develop a model where individuals have identity-related payoffs from other's actions. In a simple game theoretic framework, they show that an increase in a woman's relative income might lead to an increase in a woman's share of housework. This contradicts standard models of comparative advantage but are consistent with a model where individuals who cause identity-related dis-utility for the other individual may amend their behavior to assuage the other person. A modification of this model where men lose "identity utility" when they are out-earned by their female partner but gain utility by re-asserting their dominance through violence would produce a prediction that improved earning by women could increase violence if it violated the gender norm and threatened men's identity.

Both mechanisms have gained some support in previous empirical work. Using survey data from Canada, Bowlus and Seitz (2006) found an improved outside option in the labor market to be a significant deterrent to domestic abuse against women. Aizer (2010) explored this relationship by constructing a proxy for violence against women using female hospitalization for assault in California. She concluded that there was a negative effect of women's relative (to their male partners) income on the incidence of domestic violence. A randomized control trial in Ecuador compared the impacts from cash transfers and in-kind support targeted to women and found a decrease in domestic violence in response to both cash and in-kind transfers (Hidrobo et al. 2016). These studies all lend support to the household bargaining theory.

In contrast, another stream of literature finds support for the social norm theory. The relationship of social norms on gender roles and spousal violence was first studied in the sociology literature. Macmillan and Gartner (1999) documented that women's employment status may expose them to a higher risk of partner violence when men are unemployed. The proffered explanation was that the male partner attempts to reinstate his dominance at home when the gender rule is violated.

Some recent research exploits variation in shocks to labor market outcomes and their effect on domestic violence. Erten and Keskin (2018) examine the impact of compulsory schooling law changes on women's education levels in Turkey. They find that increased years of schooling and subsequent improvements in women's labor market outcomes led to an increased probability of women experiencing emotional abuse and financial control from their partner. Erten and Keskin (2021b) study the local labor demand shocks generated by Cambodia's accession to the World Trade Organization (WTO) and document that larger tariff reductions caused increased labor force participation for women and increased their chances of suffering from partner violence. Erten and Keskin (2021a) assess the exogenous shock induced by the inflow of Syrian refugees to the local labor market in Turkey and found that the arrival of refugees resulted in a reduction of female employment and a decline of partner violence against women among Turkish residents. This evidence all lends support to the presence of a gender-identity mechanism whereby improved economic conditions for women is positively associated with the risk of abusive partner behavior.

Tur-Prats (2019) and Tur-Prats (2021) examine the relationship between historical family structure and partner abuse. They provide suggestive evidence from places where stem family (co-residence of young couples with parents) arrangements are historically prevalent, that the current rate of partner violence is relatively low. Places where the nuclear family type (children forming independent households) dominated

in the past have a higher rate of partner violence today. The authors highlight the role of cultural norms (family type in this case) as a long-term and persistent determinant of domestic violence.

Bertrand et al. (2015) showed that women who are successful in their careers pay for their success by investing more time than they otherwise would in household chores, perhaps to make up for earning more than their male partners. They also find that when women appear more likely to earn more than their (unmarried) male partner, marriage rates decline. Using Australian survey data, Foster and Stratton (2021) document that female breadwinning leads to lower marriage quality among young couples in cohabiting partnerships.

Ericsson (2020) uses the approach of Aizer (2010) with Swedish administrative data on income and assault due to hospitalization. She shows that an increase in women's potential earnings is responsible for an increased probability of women's hospital visits with assault-related injuries and increased stress, anxiety, and destructive behavior for their husbands.

Evidence from evaluations of public transfer programs has also suggested a similar association between an improved financial situation for women and a higher likelihood of abuse. Angelucci (2008) documented husbands' abusive behavior varying with the size of transfers in a Mexican cash transfer program. While small transfers reduced abuse, large transfers to women led to increased violence from husbands holding traditional views of gender roles. Bobonis et al. (2013) further showed that, though physical abuse reduced for some households in response to the cash transfer intervention, threats of violence against female beneficiaries increased significantly.

Collectively, this research presents a mixed view of the relationship between improved economic conditions for women and physical/emotional violence against them. It suggests that the relationship might differ in different countries depending on the underlying framework of gender relations. It also suggests the possibility that the two mechanisms—bargaining and gender norms—co-exist. Both may be present, but one might be stronger in some settings than in others.

One common feature of the literature is to use the change in income or the share of a woman's income in the household to explain partner abuse. Researchers then conclude, ex-post, that either bargaining or backlash is present, based on their empirical results. They did not necessarily examine the non-linearities which may arise in the relationship when both mechanisms are present. Estimated coefficients obtained with the standard approach provide the average effect of income variation and could pick up both mechanisms at the same time, even though one mechanism may be dominant under particular conditions.

We examine the unconditional relationship between the share of women's income and the experience of domestic abuse. Non-parametric regressions suggest a structural change at the point where women earn more than men. Based on the observed relationship, we then examine the experience of domestic abuse in a multi-variate regression context and use the threshold where women earn more than 50% of household income as the key treatment variable.

Income rank within couple and its impacts have been well-documented in labor economics. With the US data, Bertrand et al. (2015) observed a sharp drop in the distribution of female household income shares just above one-half. This discontinuity

is apparent in cross-sectional data and over time. Foster and Stratton (2021) found a similar discontinuity in the distribution of relative income with Australian data. The discontinuous pattern of relative income is explained as an aversion to deviate from the gender identity norm of male breadwinning. Hederos and Stenberg (2022) also documented a drop using Swedish data. As the drop became modest once equal-earning couples were excluded, they concluded that Swedish couples may weakly comply with the gender norm.

However, with simulation data based upon a Beckerian framework, Binder and Lam (2018) show that a discontinuity in relative income is compatible with a variety of different social preferences on relative earnings of men and women in the presence of positive assortative matching. A discontinuity at the 50% share of couple income could be observed under a male breadwinning norm, an equal-earning norm or even a female breadwinning norm. The authors caution against inferring a particular gender norm *solely* on the basis of the relative household income distribution.

Empirical studies on domestic violence mostly focus on female respondents (Aizer 2010; Bobonis et al. 2013; Caridad Bueno and Henderson 2017). Although women are the majority of domestic abuse victims, men also suffer from physical and emotional violence. Our data allow us to look at the experience of domestic violence for men and women. Thus, an important contribution of our study is to provide estimates for both genders on the relationship between income rank within couple and the incidence of domestic violence and emotional abuse.

In addition to competing evidence about the relationship, the literature suggests significant cross-country heterogeneity in the determinants of domestic abuse (Cools and Kotsadam 2017; Guarnieri and Rainer 2018). Our study, the first using Australian data, adds to the global knowledge evidence base. Next, we introduce the data and variables used for the analysis.

3 Data

Our analysis mainly draws on data from the Personal Safety Survey (PSS). PSS is a de-identified, individual-level survey administered by the Australian Bureau of Statistics (ABS) covering a broad sample of Australians.[5] Three independent cross-sections have been collected in 2005, 2012, and 2016. The data include information about the respondent and his/her partner.

"Partner" refers to the person with whom the respondent lives in either a married or a de facto relationship. PSS collects information on partner violence and emotional abuse experiences with the current partner and with the previous partner, but only gathers socio-economic information about the current partner. The major outcome variables for this study are binary indicators of whether the respondent has suffered violence or emotional abuse from the current partner.

In the data published in PSS, partner violence is defined as "any incident involving the occurrence, attempt or threat of either physical or sexual assault since the age of 15," and emotional abuse refers to "repeated behaviors or actions that are aimed at

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[5] See Australian Bureau of Statistics (2017) and https://www.abs.gov.au/ausstats/abs@.nsf/mf/4906.0.

gaining control through manipulation or intimidation or causing emotional harm or fear to the respondent by the current partner since the age of 15." These variables are derived by the ABS from a detailed, comprehensive list of questions on the experience of abuse.[6] In the appendix, we list all of the items which map into the definitions of "physical violence" and "emotional abuse" that we use in this study.

The frame of the survey was all private dwellings in Australia, excluding very remote areas. The survey was designed to provide representative samples of women at both the state and national levels and a representative sample of men at the national level. The female sample is thus three times larger than the male sample. Dwellings were chosen and randomly assigned to either the "female" or "male" sample. The male and female samples are thus independent of one another by construction. Within each household, a random member of that gender aged 18 or older was selected to be interviewed. Only one person is interviewed in each household.

Interviews were conducted face-to-face by female interviewers who received special sensitivity training.[7] When the portion of the survey relating to violence and abuse was reached, participants were offered the opportunity to continue the interview on a laptop using a computer-assisted interview technique in which the interviewer could not see any of the information that was being entered by the respondent. Interviews were conducted in private with no other person present. More details can be found in Australian Bureau of Statistics (2017).

The 2005 and 2016 cross-sections of the PSS contain continuous measures of income which we use in our analysis.[8] Respondents were asked to provide information on income for all members of the household aged 15 and over including any resident partner (Australian Bureau of Statistics 2017). To obtain high-quality data on income, respondents were asked to provide income from six different income categories (wages and salary, business/partnership, rental income, government payments, retirement pensions, and other regular income) for each household member. Measurement error may exist in these income reports and may be more pronounced in reports of other people's income since respondents may not know the exact income of their partner or other household members. Since this measurement error is likely correlated across individuals within households and correlated with other data gathered through the survey, the nature of the measurement error is certainly non-classical. It is difficult to assess how this may bias our results. Reassuringly, for the distribution of relative income, the PSS data produce results similar to a nationally representative survey with

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[6] For physical violence, questions cover actions including but not limited to the following: thrown anything at you that could hurt you; pushed, grabbed, or shoved you; slapped you; kicked, bitten, or hit you with a fist; hit you with something else that could hurt you, etc. For emotional abuse, questions cover actions including but not limited to the following: controlled or tried to control your contact with family, friends, or community; controlled or tried to control your use of the telephone, Internet, or family car; controlled or tried to control where you went and who you saw; kept track of where you were and who you were with (e.g., constant phone calls, GPS tracking, monitoring you through social media websites); controlled or tried to control you from knowing about, having access to, or making decisions about household money, etc. For a complete list, please refer to Appendix or online at https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4906.0.55.0032016?OpenDocument

[7] Male subjects were assigned female interviewers by default but could request a male interviewer, of which there were a small number who were trained to conduct this survey.

[8] In 2012, income is only provided in categories.

a much more detailed and dis-aggregated approach to gathering income data. See the discussion of Figs. 4 and 5 below.

As a further check on the possibility of measurement error affecting our results, and to address potential endogeneity concerns, we construct a prospective continuous income measure for all three years—2005, 2012, and 2016—using other data sources provided by the ABS. We obtain weekly income from the Survey of Income and Housing (SIH) and employment data from the census.[9] Using the census data, we construct the proportion of individuals in each industry within gender/education/age/region cells in 2016. For region, we use Level 4 Statistical Area.[10] Using the SIH, we construct average weekly income by year, state, industry, and gender.[11] We combine these to provide an average income for each gender/education/age/region cell weighted by the proportion of employment in each industry. The rationale for and construction of the prospective income variable is discussed in more detail in Sect. 4 below.

We use this prospective income measure as an alternative income measure to address the potential endogeneity of reported income in the PSS as discussed below. We compare estimates using both income measures. Hereafter, *reported income* refers to the income data collected from PSS, and *prospective income* refers to the derived measure using aggregate income from the SIH and census employment, both from the ABS.

We construct the ratio of the respondent's income (for women in the female sample and for men in the male sample) over the total income of the couple for both reported and prospective income as follows:

$$\widetilde{RelativeIncome}_i = \frac{IndividualIncome_i}{IndividualIncome_i + PartnerIncome_i}$$

In the subsequent analysis, we specify an **indicator** variable, $RelativeIncome_i$, equal to 1 if $\widetilde{RelativeIncome}_i > \frac{1}{2}$, and zero otherwise.[12]

Tables 1 and 2 summarize the data for PSS survey participants and their partners for a sample corresponding to the most parsimonious specification of Table 3.[13] Columns 1–6 present descriptive statistics for the sample based upon the continuous measure of reported income, and columns 7–12 present the descriptive statistics for the sample based upon prospective income. As discussed above, the reported income sample includes 2 years of data, and the prospective income sample includes 3 years of data.

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[9] For SIH, see Australian Bureau of Statistics (2019) and https://www.abs.gov.au/ausstats/abs@.nsf/mf/6553.0. Census data is from Table Builder, see https://www.abs.gov.au/websitedbs/censushome.nsf/home/tablebuilder.

[10] SA4 is roughly analogous to a labor force region and has a high degree of social and economic integration. See Australian Bureau of Statistics (2016) for details of Australia's geographical classification system.

[11] We use three cross-sections of data from the SIH: 2005–2006, 2011–2012, and 2015–2016.

[12] The results, as shown in online Appendix Table G-1, are nearly identical if we use total household income as the denominator rather than total couple income.

[13] We drop individuals who report same sex partners. Abuse can, of course, exist between same sex partners but the appropriate gender norm is unclear for these couples. We also drop all non-partnered individuals from our analysis.

Table 1 DESCRIPTIVE STATISTICS FOR RESPONDENT AND PARTNER CHARACTERISTICS

Variables	Estimation sample: reported income						Estimation sample: prospective income					
	Men (respondent)			Women (respondent)			Men (respondent)			Women (respondent)		
	Mean (1)	St.Dev (2)	Obs (3)	Mean (4)	St.Dev (5)	Obs (6)	Mean (7)	St.Dev (8)	Obs (9)	Mean (10)	St.Dev (11)	Obs (12)
Panel A. Respondent background characteristics												
Born in Australia	0.672	0.469	3621	0.708	0.455	14,277	0.678	0.467	4916	0.713	0.453	18,822
First language as English	0.855	0.352	3621	0.884	0.321	14,278	0.849	0.358	4916	0.876	0.330	18,822
Experienced childhood abuse	0.113	0.316	3559	0.172	0.378	13,980	0.115	0.319	4857	0.182	0.386	18,540
Past partner violence	0.027	0.161	3621	0.108	0.310	14,278	0.027	0.163	4916	0.108	0.311	18,822
Highest educational attainment												
- Postgraduate degree	0.078	0.269	3558	0.059	0.236	13,978	0.081	0.272	4916	0.064	0.245	18,822
- Graduate diploma/graduate certificate	0.033	0.180	3558	0.047	0.212	13,978	0.030	0.170	4916	0.046	0.208	18,822
- Bachelor degree	0.178	0.383	3558	0.207	0.405	13,978	0.194	0.395	4916	0.221	0.415	18,822
- Advanced diploma/diploma	0.113	0.317	3558	0.116	0.320	13,978	0.116	0.320	4916	0.125	0.331	18,822
- Certificates I–IV and high school or less	0.596	0.491	3558	0.570	0.495	13,978	0.580	0.494	4916	0.544	0.498	18,822
Respondent Age Band												
≤ 29	0.090	0.286	3621	0.126	0.332	14,278	0.094	0.292	4916	0.130	0.337	18,822
≥ 30, ≤ 39	0.214	0.410	3621	0.248	0.432	14,278	0.213	0.409	4916	0.244	0.429	18,822
≥ 40, ≤ 49	0.221	0.415	3621	0.221	0.415	14,278	0.220	0.414	4916	0.221	0.415	18,822
≥ 50, ≤ 59	0.184	0.387	3621	0.183	0.386	14,278	0.183	0.386	4916	0.183	0.387	18,822
≥ 60	0.291	0.454	3621	0.222	0.416	14,278	0.291	0.454	4916	0.223	0.416	18,822

Table 1 continued

Variables	Estimation sample: reported income						Estimation sample: prospective income					
	Men (respondent)			Women (respondent)			Men (respondent)			Women (respondent)		
	Mean (1)	St.Dev (2)	Obs (3)	Mean (4)	St.Dev (5)	Obs (6)	Mean (7)	St.Dev (8)	Obs (9)	Mean (10)	St.Dev (11)	Obs (12)
Panel B. Partner background characteristics												
Born in Australia	0.682	0.466	3617	0.705	0.456	14,274	0.679	0.467	4914	0.707	0.455	18,818
First language as English	0.854	0.354	3621	0.885	0.320	14,278	0.845	0.362	4916	0.878	0.327	18,822
Highest Educational Attainment												
- Postgraduate degree	0.056	0.230	3501	0.066	0.248	13,836	0.061	0.239	4916	0.070	0.255	18,822
- Graduate diploma/graduate Certificate	0.032	0.175	3501	0.020	0.141	13,836	0.029	0.167	4916	0.019	0.136	18,822
- Bachelor degree	0.233	0.422	3501	0.172	0.377	13,836	0.244	0.430	4916	0.178	0.382	18,822
- Advanced diploma/diploma	0.113	0.316	3501	0.079	0.270	13,836	0.115	0.319	4916	0.084	0.278	18,822
- Certificates I–IV and high school or less	0.567	0.496	3501	0.663	0.473	13,836	0.551	0.497	4916	0.649	0.477	18,822
Partner age band												
≤ 29	0.123	0.329	3621	0.093	0.290	14,278	0.127	0.333	4916	0.095	0.293	18,822
$\geq 30, \leq 39$	0.237	0.425	3621	0.226	0.418	14,278	0.229	0.420	4916	0.223	0.416	18,822
$\geq 40, \leq 49$	0.215	0.411	3621	0.224	0.417	14,278	0.221	0.415	4916	0.224	0.417	18,822
$\geq 50, \leq 59$	0.193	0.395	3621	0.184	0.388	14,278	0.187	0.390	4916	0.186	0.389	18,822
≥ 60	0.232	0.422	3621	0.273	0.445	14,278	0.236	0.425	4916	0.272	0.445	18,822

Note: data from the Personal Safety Survey (PSS). Descriptive statistics shown for two different estimation samples

Table 2 Descriptive statistics for outcomes, relative income, and other couple characteristics

| Variables | Estimation sample: reported income | | | | | | Estimation sample: prospective income | | | | | |
| | Men (respondent) | | | Women (respondent) | | | Men (respondent) | | | Women (respondent) | | |
	Mean (1)	St.Dev (2)	Obs (3)	Mean (4)	St.Dev (5)	Obs (6)	Mean (7)	St.Dev (8)	Obs (9)	Mean (10)	St.Dev (11)	Obs (12)
Panel C. Outcome variables												
Current partner violence	0.023	0.151	3621	0.049	0.215	14,278	0.023	0.150	4916	0.049	0.215	18,822
Current partner emotional abuse	0.063	0.243	3621	0.089	0.284	14,277	0.057	0.231	4916	0.082	0.275	18,821
Panel D. Relative income variation												
Income share within couple	0.639	0.231	3621	0.398	0.229	14,278	0.594	0.162	4916	0.441	0.168	18,822
Relative income over half	0.653	0.476	3621	0.225	0.417	14,278	0.640	0.480	4916	0.245	0.430	18,822
Panel E. Other Couple Characteristics												
Registered marriage	0.842	0.365	3621	0.828	0.378	14,278	0.840	0.367	4916	0.818	0.386	18,822
Having dependent children	0.437	0.496	3621	0.453	0.498	14,278	0.432	0.495	4916	0.452	0.498	18,822
Couple weekly cash income												
- Lowest decile	0.073	0.260	3621	0.078	0.268	14,278	0.077	0.267	4916	0.079	0.269	18,822
- Second decile	0.110	0.313	3621	0.107	0.309	14,278	0.101	0.301	4916	0.102	0.302	18,822
- Third decile	0.095	0.293	3621	0.098	0.297	14,278	0.092	0.289	4916	0.090	0.287	18,822
- Fourth decile	0.098	0.298	3621	0.104	0.305	14,278	0.096	0.294	4916	0.100	0.300	18,822
- Fifth decile	0.094	0.292	3621	0.099	0.298	14,278	0.094	0.292	4916	0.102	0.303	18,822

Table 2 continued

Variables	Estimation sample: reported income						Estimation sample: prospective income					
	Men (respondent)			Women (respondent)			Men (respondent)			Women (respondent)		
	Mean (1)	St.Dev (2)	Obs (3)	Mean (4)	St.Dev (5)	Obs (6)	Mean (7)	St.Dev (8)	Obs (9)	Mean (10)	St.Dev (11)	Obs (12)
- Sixth decile	0.097	0.297	3621	0.103	0.304	14,278	0.100	0.301	4916	0.101	0.302	18,822
- Seventh decile	0.099	0.298	3621	0.107	0.309	14,278	0.102	0.302	4916	0.105	0.306	18,822
- Eighth decile	0.102	0.302	3621	0.105	0.306	14,278	0.106	0.308	4916	0.111	0.314	18,822
- Ninth decile	0.104	0.305	3621	0.106	0.308	14,278	0.108	0.310	4916	0.110	0.313	18,822
- Highest decile	0.128	0.334	3621	0.094	0.292	14,278	0.124	0.330	4916	0.100	0.300	18,822
Relative educational attainment within couple												
- Same education	0.575	0.494	3443	0.606	0.489	13,564	0.57	0.495	4916	0.588	0.492	18,822
- Higher education	0.211	0.408	3443	0.243	0.429	13,564	0.208	0.406	4916	0.257	0.437	18,822
- Lower education	0.213	0.410	3443	0.151	0.358	13,564	0.222	0.415	4916	0.155	0.362	18,822
Waves												
- 2005 wave	0.460	0.498	3621	0.431	0.495	14,278	0.202	0.402	4916	0.227	0.419	18,822
- 2012 wave				N/A			0.425	0.494	4916	0.373	0.484	18,822
- 2016 wave	0.540	0.498	3621	0.569	0.495	14,278	0.373	0.484	4916	0.401	0.490	18,822

Note: prospective income distribution data are from the Survey of Income and Housing (SIH) and ABS Census Table Builder. Other data are from the Personal Safety Survey (PSS). Descriptive statistics shown for two different estimation samples

Table 3 IMPACT OF VIOLATING GENDER NORM ON PARTNER VIOLENCE- - - BASELINE ESTIMATES

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Female						
Earning more than half share	0.016***	0.015**	0.016***	0.015***	0.013***	0.014***
of income	(0.005)	(0.005)	(0.005)	(0.003)	(0.004)	(0.003)
adj.R-squared	0.002	0.006	0.015	0.001	0.005	0.013
Observations	14,278	13,560	13,283	18,822	18,818	18,536
Panel B. Male						
Earning more than half share	0.005	−0.000	−0.001	0.004	−0.002	−0.003
of income	(0.004)	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)
adj.R-squared	−0.002	0.003	0.009	−0.002	0.001	0.007
Observations	3621	3439	3382	4916	4914	4855
Panel C. Gender Difference						
Earning more than half share of income	0.011	0.011	0.013*	0.012*	0.012**	0.013**
× Female	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)
Earning more than half share	0.005	0.004	0.003	0.002	0.001	0.001
of income	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Female	0.025***	0.019***	0.016***	0.022***	0.017***	0.015***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
adj.R-squared	0.004	0.007	0.015	0.003	0.006	0.013
Observations	17,899	16,999	16,665	23,738	23,732	23,391
Year and SA4 Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Variables	No	Yes	Yes	No	Yes	Yes
Current Partner Controls	No	Yes	Yes	No	Yes	Yes
Childhood Abuse	No	No	Yes	No	No	Yes
Previous Partner Violence	No	No	Yes	No	No	Yes
SA4 Unemployment Rate	No	No	Yes	No	No	Yes
Source of Income	*Reported*	*Reported*	*Reported*	*Prospective*	*Prospective*	*Prospective*

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Each cell in this table shows the estimated coefficient from a separate regression

Reported coefficients in panels A and B display the estimates of β_1 on $Relative Income$ in Eq. 2. Panel C examines a gender difference in the main effect by estimating a DiD specification and reporting the coefficients on the interaction term of $Relative Income$ and $Female$

Robust standard errors are clustered at state/territory-year level and reported in parentheses

Columns 1–3 present estimates using reported income, and columns 4–6 present estimates using prospective income

SA4 indicates Statistical Area Level 4 in the Australian Statistical Geography Standard

The mean values of the variables are very close across the two samples. We next describe the differences in variables across gender.

Panel A of Table 1 indicates that violence experienced at the hands of a past partner is more than three times more common amongst women than men. Fifty percent more women than men report having suffered childhood abuse. While male respondents are more likely to have postgraduate degrees, they are also more likely to only have completed high school or less. In both samples, female respondents tend to be slightly younger in age than their male partners. The females in the female sample look similar to the female partners in the male sample and similarly for men.

Panels C and D of Table 1 report mean values of key outcome variables and relative income. Women are about 1.5 and two times more likely than men to be the victims of current partner emotional abuse and violence, respectively.[14] The reported incomes in PSS suggest that, on average, husbands earn the majority of total income within the couple, with only small variation across the samples of different genders. In the male sample, men report earning about 64% of combined couple income whereas, in the female sample, women report 40%. The proportions of income earned by men and women within couples are not statistically different across the male and female samples. Using prospective income results in only slightly different shares, with male respondents "earning" 59% of combined couple income and female respondents 44%.

In terms of our dichotomous measure of relative income, 65% of men in the male respondent group are the primary breadwinner. Twenty-three percent of women in the female respondent group are the primary breadwinner, based upon reported income. This difference is due to the non-trivial number of households where men and women earn the same amount. This is considered further below. Using prospective income, results are similar. Sixty-four percent of men in the male respondent group have "more income" than their partner. In the female respondent group, 25% have "more income" than their partner. Note that these are constructed separately for each respondent and her/his partner from average income within gender/education/age/region cells and do not represent actual income of the individuals.

Figure 1 presents the distribution of the log of income for those women who make more than their male partners, compared to those who make the same amount or less than their male partners. Women who make more than their male partners earn more than other women, on average. We will control for total couple income in the regression models that we estimate, and we will explore whether or not the relationship between relative income and abuse differs by overall income levels. We will show that this difference does not explain our results.

In Panel E of Table 2, we can see that the majority of couples have the same educational level, but that in those couples where there is a difference, the females tend to have more education than the males. This is consistent in both the male and female samples and reflects that in Australia, women's educational attainment is higher than that of men and has been for several decades.[15] Tables 1 and 2 report weighted sample

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[14] Appendix Fig.7 plots baseline probabilities of experiencing physical or emotional abuse by age, education and household income deciles.

[15] https://blog.grattan.edu.au/2019/07/the-gender-divides-at-university/
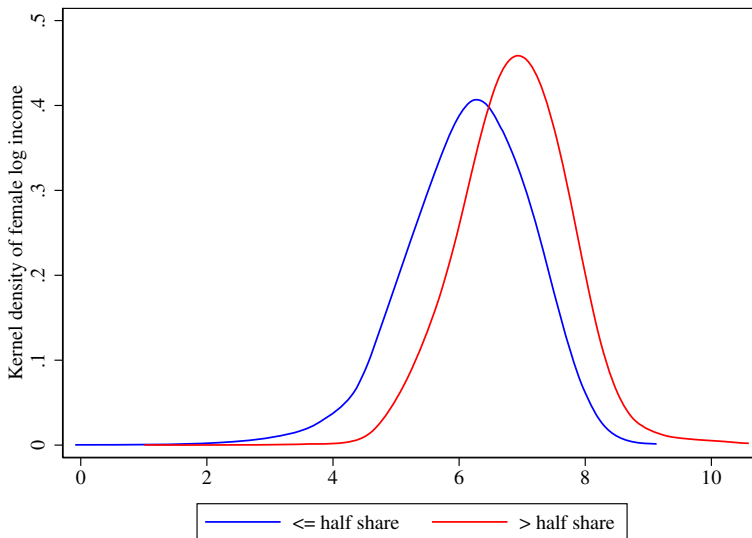
Fig. 1 DISTRIBUTION OF FEMALE LOG INCOME SPLIT BY WHETHER THE FEMALE EARNS MORE THAN THE MALE. Note: figure shows the Kernel density of the logarithm of female weekly income for those women who make more than their male partners (red line) and those who make the same amount or less than their male partners (blue line)

statistics. The numbers are nearly identical for the unweighted statistics. Throughout the paper, we report unweighted regression estimates.[16]

Before discussing our empirical strategy and our main estimation, we examine the relationship between the probability of reporting violence and the continuous measure of relative income with raw data. Figure 2 plots the probability of reported partner violence for men and women against relative income; Fig. 3 produces analogous plots for reports of emotional abuse.

Examining panels (a) and (b) in Fig. 2, we can see a large spike in reports of partner violence when women earn more than men. The relationship is essentially flat for values of relative income between zero and 0.5, when women earn less than their male partners. For both reported and prospective income the relationship appears to be non-linear. Reports of violence increase above the point where women begin to out-earn male partners and then appear to fall around the point where women earn more than 70% of couple income. This group is relatively small, however, and the confidence intervals become quite wide.

This would suggest that income rank within couple is a strong factor in domestic violence in Australia. It also provides some evidence against a bargaining story. Were bargaining an important factor, we would expect to see reports of violence decreasing as relative income increases from 0 to 0.5, even in the presence of violence related to the male backlash channel. Another possibility is that both mechanisms operate

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[16] Weighted estimation produces qualitatively similar results to those we present. In general, the unweighted estimates tend to be slightly more precise. Since the point estimates do not differ, we prefer the unweighted estimates.
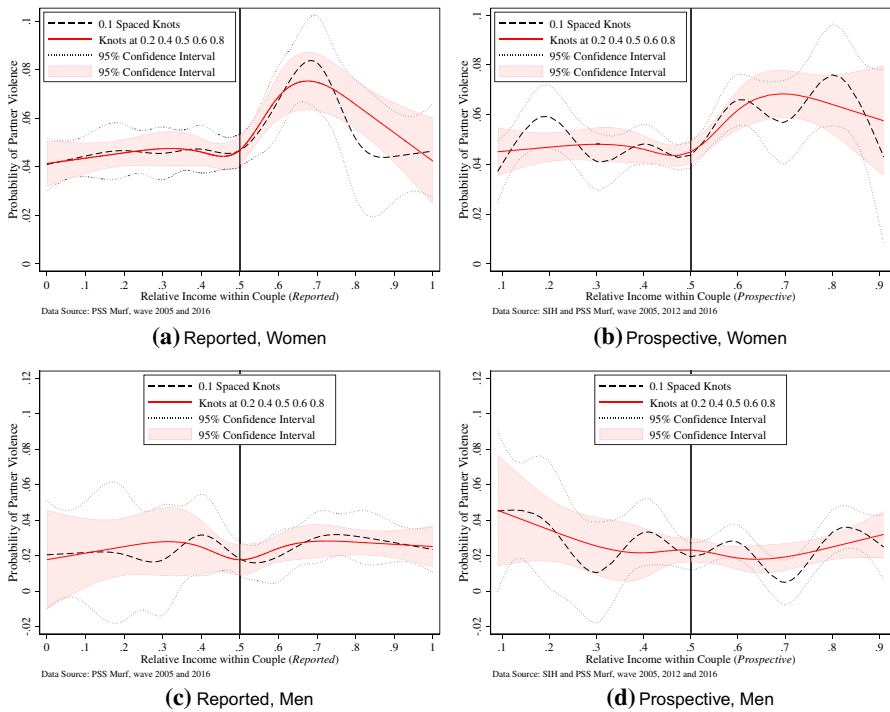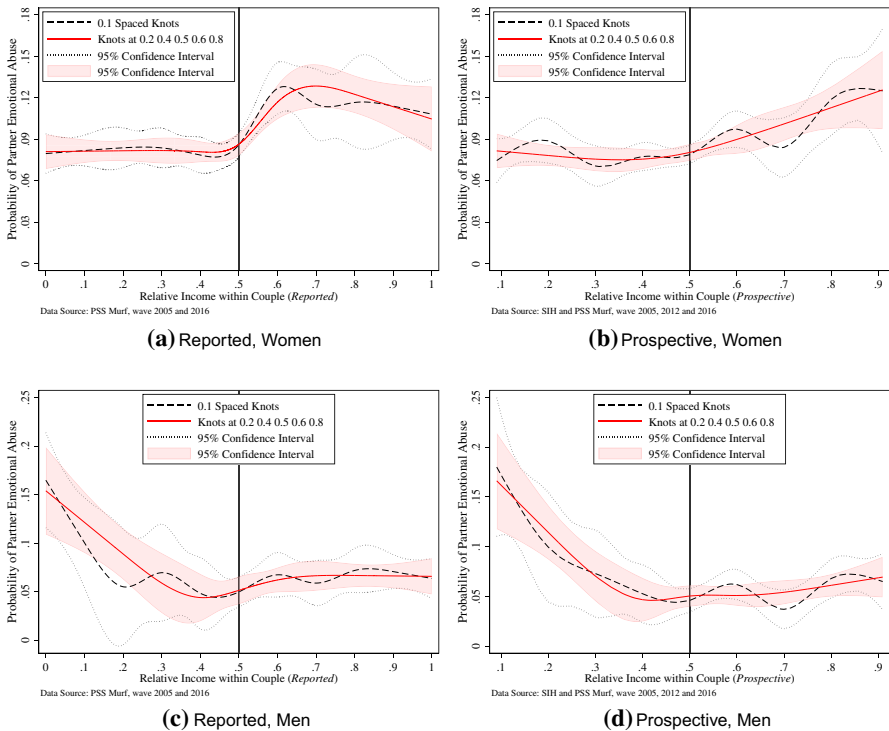
Fig. 2 PARTNER VIOLENCE AS A RESTRICTED CUBIC SPLINE OF RELATIVE INCOME BY GENDER. Note: figure shows the probability of partner violence as a restricted cubic spline of relative income. The knots for the spline are set at 0.2, 0.4, 0.5, 0.6, and 0.8 (solid line) and 0.1 through 0.9 with gaps of 0.1 (dashed line). **a** and **b** are for the female sample, and **c** and **d** are for the male sample. Relative income was generated using reported income in **a** and **c** and using prospective income in **b** and **d**. Reported income is the income reported by individuals in the survey. Prospective income is estimated as the amount of income that men and women would expect to earn based upon their age, education, industry, and geographical location. Its construction is described in detail in the text

when women earn less than men but they offset each other to produce no effect. But something clearly changes when women start to earn more than men.

Due to a lack of data, confidence intervals become very large when we move into a range where women are earning more than 75% of couple income. However, even for households where women earn a very high fraction of couple income, the point estimates only return to the levels we observe below the 50% threshold. This provides little evidence of strong bargaining power for women who earn most of the couple's income.

Looking at panels (c) and (d) of Fig. 2, reports of violence on men seem unrelated to which member of the couple earns more.

For women, we see a similar pattern when it comes to reports of emotional abuse as for female reports of physical violence. Panels (a) and (b) in Fig. 3 show no relationship between relative income and reports of emotional abuse when women earn less than men. However, there is a discernible increase in reports of emotional abuse in households where women earn more than men. The pattern for the reported and

(a) Reported, Women

(b) Prospective, Women

(c) Reported, Men

(d) Prospective, Men

Fig. 3 PARTNER EMOTIONAL ABUSE AS A RESTRICTED CUBIC SPLINE OF RELATIVE INCOME BY GENDER. Note: figure shows the probability of partner emotional abuse as a restricted cubic spline of relative income with the knots set at 0.2, 0.4, 0.5, 0.6, and 0.8. **a** and **b** are for the female sample and **c** and **d** are for the male sample. Relative income was generated using reported income in **a** and **c** and using prospective income in **b** and **d**. Reported income is the income reported by individuals in the survey. Prospective income is estimated as the amount of income that men and women would expect to earn based upon their age, education, industry, and geographical location. Its construction is described in detail in the text

prospective income measures is slightly different, with the former decreasing as we move towards households where women earn all of the income and the latter continuing to increase through the range of data. Again, the confidence intervals are wide, so it is difficult to make precise statements about the relatively small number of households where women earn the vast majority of income. However, the main observation, of increased reported emotional abuse for female breadwinners, is clear.

For men, there seems to be some relationship between emotional abuse and relative income. Panels (c) and (d) in Fig. 3 provide evidence for both the gender norm story and the bargaining story. When men earn more than women, the spline is essentially flat suggesting no relationship between emotional abuse and relative income. But when men earn less than women, men report higher levels of emotional abuse. There seems to be a decreasing relationship between reports of emotional abuse and relative income—as men's incomes approach those of their female partners, reports of emotional abuse decrease. These apparent relationships in the figure are not borne out in the regression

analysis. These patterns do not, for the most part, generate statistically significant estimates when we control for other factors. Figures 2 and 3 are not sensitive to the choice of knots in the spline. We present the results of regression versions of the splines in online Appendix C. The main features of Figs. 2 and 3 do not change when we add regression controls.

Binder and Lam (2018) caution against inferring a preference for male bread-winning *solely* on the basis of a discontinuity in the distribution of relative income at 50%. Such a discontinuity may arise from a preference for male breadwinning, female breadwinning, or equal earning.

A discontinuity at 50% exists in Australia. Figure 4 presents the relative, within-couple income distribution from the perspective of both genders using 17 years of data from the nationally representative Household, Income and Labour Dynamics in Australia (HILDA) survey. Figure 5 plots the share of income from the perspective of each gender using the PSS data for the 2 years where continuous income is available (2005 and 2016). In both data sets, the discontinuity is clearly present and is robust to the exclusion of those couples who report earning identical amounts. HILDA has a very detailed module for gathering income whereas the PSS asks very aggregated, general income questions. The histogram based upon the PSS is, unsurprisingly, noisier than the one from HILDA. In both pictures, we have separated out those households where male and female partners report identical income and show that point with an "x." For the PSS, we separately show the percentage of households where either the male or female partner earns all of the income.

The World Values Survey (Inglehart et al. 2014) shows a surprising number of Australian women who think that women earning more than men causes trouble. Thirty-two percent agree with the statement: "If a woman earns more than her husband, it's almost certain to cause a problem."[17]

The combination of a discontinuity in relative income, the survey responses of Australians and the evidence on increased domestic abuse in households where women earn more than men would seem strongly suggestive of a gender norm in which male breadwinning is the dominant preference. Below, we will also examine, and rule out, a reporting explanation for what we observe.

Finally, as we pool across multiple years of survey data, it is important to determine whether there have been any shifts in the percentage of households where women earn more than men which might affect our results. Using HILDA, Appendix Fig. 8 examines the trend in the proportion of men and women who earn more than 50% of combined couple income from 2001 to 2017. While gender differences have narrowed slightly over the time period, the distance remains remarkably large and there is no structural change during this period.

We now turn to our empirical strategy and estimation results.

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[17] In the 2010-2014 WVS, 51% of women worldwide agree with the statement. A referee also drew our attention to the following statement in the 2012 World Development Report: "A man's identity is deeply rooted in ability to provide for his family … a wife with a higher income was generally seen as a threat to male status rather than as a boost to the household income. Violence against women earning more, can be viewed as male backlash against a violation of the social norm."

**(a)** Male partner   **(b)** Female partner
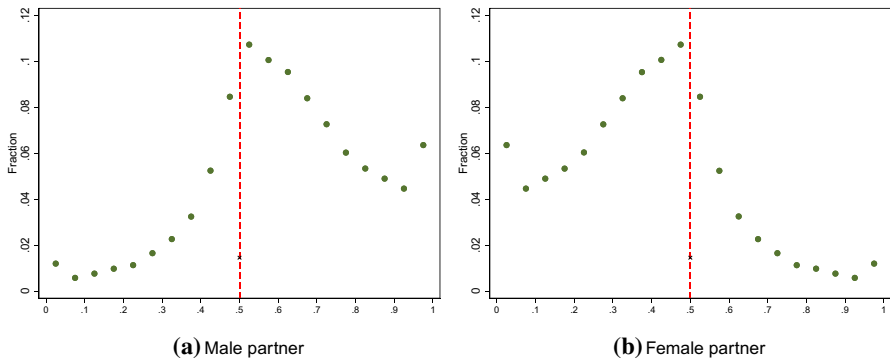
Fig. 4 RELATIVE INCOME DISTRIBUTION (2001 TO 2017) BY GENDER. Note: figure uses nationally representative data from the Household, Income and Labour Dynamics in Australia (HILDA) survey to show the distribution of relative income in bins of 5% for couples where both partners earn positive annual total disposable income and are between 18 and 65 years of age. Couples with identical income were dropped from distribution and their frequency is marked with "x"

4 Empirical strategy

We focus on the role of income rank within couple in predicting partner abuse and violence. While not being able to rule out a bargaining effect, our approach will primarily pick up the effect of female breadwinning. As discussed above, Figs. 2 and 3, combined with other evidence, suggest a dominant role for gender norms and little role for bargaining, at least for abuse against women.

Our study has the advantage of using a much wider range of reported types of abuse, rather than relying on reports of extreme violence that result in hospitalization. The care with which the PSS was undertaken, as described above, inspires confidence in the survey data.

(a) Male sample   **(b)** Female sample
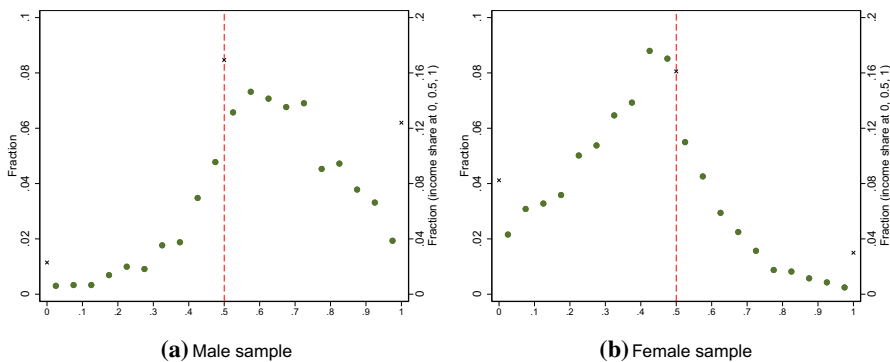
Fig. 5 RELATIVE INCOME DISTRIBUTION (PSS 2005 AND 2016 BY GENDER). Note: figure shows the distribution of relative income in bins of 5% using PSS data. Couples with identical income share, 0% income share, and 100% income were dropped from distribution, and their frequencies are marked with "x"

One challenge in identification is the possibility of selection into marriage and income endogeneity as a consequence of previous abuse. Our identification strategy to use relative income to predict violence will fail if there is a dynamic decision-making process in which victims from a previous abusive relationship strategically change their subsequent labor market behavior and/or marriage market outcomes to avoid potential conflicts with a partner. In this case, the gender difference in the relative income share distribution could be a function of past domestic abuse. Individuals who have experienced partner abuse from a previous relationship might endogenously change the situation by making sure to choose a partner for their next relationship who makes more income than they do or by avoiding earning more than their partner through choice of job or work hours. In either case, the causal direction would be reversed.

We adopt two strategies to solve the issue. First, we check for a statistically significant relationship between female breadwinning in the current relationship and past partner violence. If the causality runs from partner abuse to norm compliance, then the current income distribution will be associated with past partner violence. If such a link is established in the data, we can not rule out the possibility that the income distribution could just be picking up the effect of previous partner violence on current partner abuse.

Second, to overcome the potential endogeneity of income, we construct a prospective income measure, which reflects the external labor market demand for each gender, as an alternative measure of income. Literature examining the impact of the gender wage gap has been using the method developed in Bartik (1991) to establish a measure of potential income to an individual rather than the realized one to proxy the wage variation over genders (Aizer 2010; Bertrand et al. 2015). This approach takes into account gender, age, and education segregation by industry when constructing labor market conditions for men and women.

In this spirit, we construct an average weekly income in year t by gender g, age a and education e in each Level 4 Statistical Area (SA) s in the following manner:

$$\overline{income}^{gaest} \equiv \sum_d \gamma_d^{gaes,2016} \times income_d^{-Sgt} \tag{1}$$

where $income_d^{-Sgt}$ is the average weekly income in industry d earned in year t for a given gender group g living in geographic areas excluding the state/territory S where SA4 s is located. $\gamma_d^{gaes,2016}$ is the proportion of individuals working in industry d, given gender g, age band a, education group e and living in SA4 s. There are five education categories (postgraduate degree; graduate diploma or graduate certificate; bachelor degree; advanced diploma or diploma; certificate level and school qualification (high school or lower)), six age bands (see Table 1) and 107 SA4 regions. SA4 regions generally represent about 100,000–150,000 people and are large enough to allow for accurate regional labor market estimates. In rural areas, SA4s represent aggregations of multiple small labor markets with socio-economic connections or similar industry characteristics. Large regional city labor markets are generally defined by a single SA4. Within major metropolitan labor markets, SA4s represent sub-labor markets.

$income_d^{-Sgt}$ is a leave-one-out "national" average weekly income by year, industry and gender for each individual. We calculate the average across Australia but drop the state in which that individual lives. As a result, women in the same industry and state will have the same leave-one-out "national' average weekly income in a given year but women in the same industry in a different state will have a different leave-one-out "national" average weekly income. By excluding the individual's own state in the prospective income measure, we remove the effect of local labor market conditions which could be another source of endogeneity. We construct the "national" average weekly income by region/year/industry/gender following Aizer (2010). In online Appendix Table F-1, we report the estimates generated when we construct the "national" average weekly income using smaller cells including demographic information on age and education. Pursuing this approach with the relatively small sample size of the SIH results in a large number of cells having no data and a corresponding reduction in the sample size available for estimation.

The proportion of employment, $gamma_d^{gaes,2016}$, is calculated from the ABS Census TableBuilder using 2016 as the base year. For each gender-education-SA4-age cell, the γ sum to one. For example, for women with school qualification level in SA4 "Bendigo" aged 30–39, the industry γ will sum to one. Following Aizer (2010), the base year is fixed to rule out potential income variation driven by sorting across industries over years. This removes another potential source of income endogeneity.

The *prospective income* variable that we calculate in Eq. 1 captures differential earnings potentials at the national level for men and women defined separately for each gender at the level of individual cells defined by age, education and industry. Prospective income is constructed independently for each respondent and her/his partner. That is, we use the respondent's information to construct prospective income for the respondent and the partner's information to construct partner's prospective income. Keeping the base year proportion of employment fixed means that this income measure is picking up aggregate changes in men and women's income potential that might be shifting the balance of power towards or away from women, but removing any effect of selective sorting across industries over time. Some industries might be growing or offering higher wages and others may be shrinking or offering lower-than-average wages. Individuals may leave or join these industries in ways that are correlated with education, age or gender. Such variation is removed by this measure.

The prospective income measure will be uncorrelated with a woman's (or a man's) decision about whether to work or not based upon local labor market effects or effects specific to the industry in which she works. It will also be uncorrelated with a woman's decision about who to marry or how much to work. We can thus use this measure to check whether our results using reported income are affected by these various potential sources of endogeneity.

Using prospective income, while reducing endogeneity, may introduce some measurement error that arises from using cell averages. However, the nature of that measurement error will be very different to the possible measurement error in reported income. In this respect, we view results from the two different income sources as complementary. As we will see below, they give similar results, particularly for partner

violence. This would seem to reduce the likelihood that measurement error is playing a large role in our results.
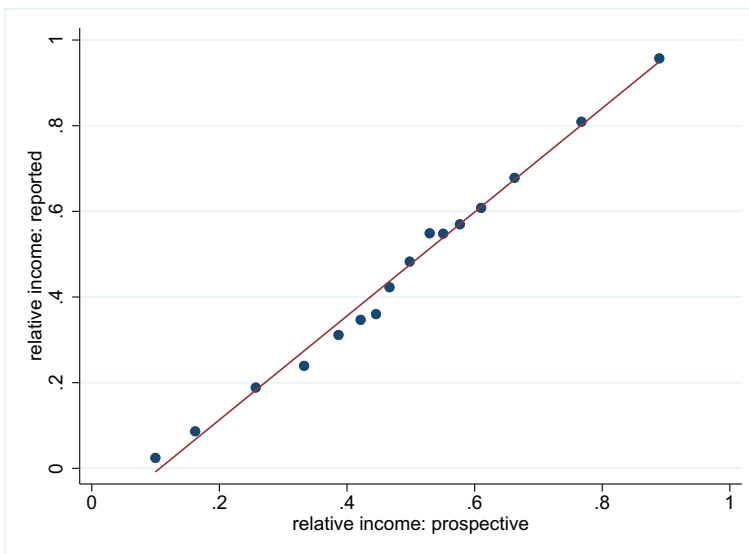
Figure 6 displays the correlation between reported relative income and prospective relative income in a binned scatter plot. The two are highly correlated and, unsurprisingly, there is more variation in reported relative income than in prospective relative income. While reported relative income ranges from 0 to 1, prospective income ranges from 0.1 to 0.9. We can also see that the data are much thicker in the 0.3 to 0.6 range, consistent with the wide confidence intervals in Figs. 2 and 3 outside of those ranges. The correlation in the probability of earning more than half share between reported and prospective income is about 0.75. We also provide, in online Appendix Figure B-1, a binned scatter plot of the correlation between the levels of reported and prospective income.

Unlike previous studies, rather than also using aggregate information for the incidence of violence and macro-level controls, we match prospective income data back to survey observations to exploit other individual level variation for respondent and partner.

For each gender, we separately estimate the linear probability model:

$$Y_{ist} = \beta_0 + \beta_1 RelativeIncome_{ist} + \beta_2 SA4_s + \beta_3 Years_t + \beta_4 Unemp_{st} + X_{ist} \cdot \gamma + \epsilon_{ist} \quad (2)$$

Y_{ist} equals one if individual i in SA4 s reports partner violence (or emotional abuse) from the current partner at time t. We estimate separate models for the two outcomes. $RelativeIncome$ is equal to one when the individual earns more than her (his) partner. $SA4$ and $Year$ are region and time fixed effects, controlling for unobserved variation in

Fig. 6 BINNED SCATTER PLOT OF REPORTED AND PROSPECTIVE RELATIVE INCOME. Note: figure shows the correlation between reported relative income and prospective relative income in a binned scatter plot. The number of bins was automatically chosen by the *binscatter* command in STATA

outcomes over geographic areas and survey years. $Unemp_{st}$ is the unemployment rate in each SA4 at year t. X includes individual, partner and couple characteristics. For the individual i, we include dummy variables for being born in Australia; for highest level of education completed (five categories); for speaking English as the first language at home; for experiencing childhood abuse; for experiencing past partner violence; for being in a registered marriage; and for having dependent children. For the partner, we control for being born in Australia; education; and speaking English as the first language at home. For both the individual and the partner we control for a quadratic in age. Reports of domestic abuse have been shown to be correlated with income so we control for income using decile dummies of total couple income. Decile is calculated by the ABS and provided in the data. The parameter associated with the individual's income share being greater than one-half (β_1) in Eq. 2 is our primary measure of the impact of women out-earning men on domestic violence (or emotional abuse). All estimates are clustered at the State/Territory-year level.[18]

5 Baseline results

We begin by examining the effect, for both men and women, of being the primary earner on partner violence and emotional abuse. For each outcome, we first report estimates from a simple specification controlling only for SA4 and year fixed effects. We then proceed to include a full set of individual/partner characteristics.

In some models, we include reports of the individual's experience of abuse before the age of 15 and experience of past partner violence. The inclusion of childhood abuse controls for unobserved shocks from the past which may contribute to the current situation of abuse. Previous partner violence controls for unobservables in the new partner selection process which could explain the incidence of current partner abuse. For both of these variables, we have no strong prior about the expected sign. Previous experience of abuse may lead individuals to avoid abuse in the future but it may also be that individuals select similar partners over time (or select partners similar to family members), leading to a positive correlation over time between current and past abuse.

We follow our main estimates with an investigation on whether the impact of being the primary earner acts on the intensive or extensive margin of current partner violence. We then undertake a variety of robustness checks and examine effect heterogeneity.

5.1 Relative income, partner violence and emotional abuse

Tables 3 and 4 display the estimates for partner violence and emotional abuse, respectively. Columns 1–3 display estimates with relative income constructed from the reported data in PSS; columns 4–6 report coefficients with relative income constructed using our prospective income measure as described above.[19] Overall, we observe a

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[18] Cameron and Miller (2015) suggest "be conservative and avoid bias and use bigger and more aggregate clusters when possible, up to and including the point at which there is concern about having too few clusters." Clustering at lower levels, such as SA4, does not affect the significance of our results–see Table 8.

[19] The prospective income estimates include all three years of data whereas the reported income estimates only include the two years for which we have a continuous measure of income—2005 and 2016. If we

Table 4 IMPACT OF VIOLATING GENDER NORM ON EMOTIONAL ABUSE- - - BASELINE ESTIMATES

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Female						
Earning more than half share	0.033***	0.028***	0.027***	0.016***	0.012**	0.013***
of income	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
adj.R-squared	0.008	0.013	0.032	0.004	0.009	0.026
Observations	14,277	13,559	13,282	18,821	18,817	18,535
Panel B. Male						
Earning more than half share	−0.000	−0.016	−0.010	0.008	−0.002	0.002
of income	(0.008)	(0.011)	(0.012)	(0.008)	(0.009)	(0.010)
adj.R-squared	0.009	0.014	0.023	0.007	0.018	0.024
Observations	3621	3439	3382	4916	4914	4855
Panel C. Gender difference						
Earning more than half share of income	0.032***	0.037***	0.031**	0.009	0.010	0.007
× Female	(0.010)	(0.011)	(0.012)	(0.010)	(0.010)	(0.010)
Earning more than half share	0.000	−0.009	−0.004	0.007	0.002	0.006
of income	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
Female	0.017**	0.005	0.002	0.025***	0.017***	0.013***
	(0.007)	(0.007)	(0.008)	(0.004)	(0.005)	(0.005)
adj.R-squared	0.008	0.013	0.030	0.006	0.011	0.026
Observations	17,898	16,998	16,664	23,737	23,731	23,390
Year and SA4 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Demographic variables	No	Yes	Yes	No	Yes	Yes
Current partner controls	No	Yes	Yes	No	Yes	Yes
Childhood abuse	No	No	Yes	No	No	Yes
Previous partner violence	No	No	Yes	No	No	Yes
SA4 unemployment rate	No	No	Yes	No	No	Yes
Source of Income	*Reported*	*Reported*	*Reported*	*Prospective*	*Prospective*	*Prospective*

See notes to Table 3

positive relationship between women out-earning their male partners and the two types of domestic abuse for women. Estimated coefficients do not vary much across the different specifications from the simplest specification using only year- and area-fixed effects to the full specification including demographic variables and reports of past

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estimate the models with prospective income using only those two years, the results are almost identical to what we present. Any differences are thus not driven by sample composition differences across those years.

abuse either in childhood or from a previous partner. All estimates for women are statistically significant at the 1% level.[20]

In panel A of Table 3, we find that women are 1.4 to 1.6 percentage points more likely to suffer from partner violence when they earn more than their partner. Using reported data produces slightly higher impacts than using prospective income, which attempts to capture changes in women's labor market prospects separate from any decisions made within the household. Compared with the average likelihood of experiencing partner violence, 4.9 percentage points (see Table 2), these estimates suggest that women out-earning their male partner leads to large increases of 29 to 33% (1.4/4.9 and 1.6/4.9) in the incidence of partner violence.

In columns 1–3 of panel A in Table 4, we see an increase in partner emotional abuse of women, of about 3 percentage points, when women out-earn their male partners. This is stable across specifications. However, when we use the prospective income measure, we find effects that are only about half as large. The point estimates reported in columns 4–6 range from 1.3 to 1.6 percentage points. Given the average probability of experiencing emotional abuse of 8.9 and 8.2 percentage points for the reported and prospective income samples, respectively (see Table 2), this second set of estimates amounts to a 16 to 20% (1.3/8.2 and 1.6/8.2) increase in the likelihood of women being victims of emotional abuse when they out-earn their male partners.

The low R^2 in our models indicates that the models will not be useful in predicting who is likely to suffer from partner abuse. The large percentage increases that we document are small absolute increases because the baseline probability of experiencing partner abuse is fairly low in Australia.

The fact that the coefficient estimates for reports of partner violence using reported income are similar to those using prospective income, but quite different for reports of emotional abuse suggests that endogeneity of reported income may be a problem for the models of emotional abuse. It may also be that measurement error in income interacts with reports of emotional abuse differently for the reported and prospective income measures. This appears not to be a problem for the models of partner violence.

Analogous estimation is conducted for male respondents. However, the interpretation of the coefficient is slightly different. For men, earning more than half of couple income represents compliance with the norm of male breadwinning. Thus, a statistically significant negative coefficient can be interpreted as men suffering from more abuse when the norm is violated. Results in panel B of Tables 3 and 4 indicate that men earning less than their female partner does not affect the propensity of men to suffer from partner violence or emotional abuse. This result holds across all specifications and when using either reported or prospective income. The fact that we do not find any effects for men could also be due to the smaller sample size, as we have less than 5,000 observations for male respondents even in the largest sample.

Panel C presents the estimates for an alternative specification in which we pool men and women together and include *Relative Income* and the interaction between

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[20] In Table B-3 of the online Appendix, we present tests of the mean difference in the experience of domestic violence and emotional abuse for women on either side of the threshold. We consider a variety of distances from the threshold. The differences are always at least as large as those reported in Tables 3 and 4.

Female and *RelativeIncome*.[21] This is a restricted version of the models in Panels A and B which imposes a similar response to co-variates (except for *RelativeIncome*) for men and women. The impact on partner violence is robust to this specification although the standard errors increase slightly. When we undertake a likelihood ratio test, we always reject the pooled model of Panel C in favor of the separate estimates of Panels A and B. This suggests that the effect of co-variates differs between men and women and leads us to prefer separate estimation by gender.

Our estimates provide an average treatment effect (ATE) and the average impact on abuse of women out-earning their male partners. In online Appendix I.1, we present results where we also allow for a changing intensity of treatment across different levels of *RelativeIncome*. We add a continuous measure of relative income into Eq. 2 and we allow the effect of relative income to vary above and below the 50% threshold. We show the estimated probabilities of experiencing domestic abuse from that model in Appendix Figs. 9 and 10. These figures reveal some trends with respect to relative income, but the marginal effects of experiencing domestic violence or emotional abuse are not statistically different from the model presented above with a constant impact above the threshold. We thus prefer the more parsimonious model.

5.2 Partner violence frequency

Along with the experience of partner violence, the PSS also collects information on the frequency of violence. Respondents are asked how frequently they have experienced violence from their partner. We categorize violence as "frequent" or "infrequent" based upon these responses. In 2005, possible responses were "often," "sometimes," "rarely," and "one incidence of violence." In the two later years, possible responses are "all of the time," "most of the time," "some of the time," "a little of the time," and "once only." We group the responses to this question into two categories: "frequently" if the respondent says "often" or "sometimes" (2005) or "all of the time," "most of the time," "some of the time" (2012 and 2016); and "infrequently" if the respondent says "rarely" or "one incidence of violence" (2005) or "a little of the time" or "once only" (2012 and 2016). We examine how earning more than half of couple income is associated with the frequency of violence.

Table 5 presents the estimates from an ordered probit model with three outcomes: no violence, infrequent violence and frequent violence. The marginal effect of violating the gender norm is three to five times larger for infrequent violence than it is for frequent violence.

We take this as evidence that violating the gender norm of male breadwinning impacts primarily on the extensive margin rather than the intensive margin. It appears that violating the gender norm is more likely to result in the occurrence of infrequent violence rather than resulting in increased violence for those already experiencing abuse.

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[21] Note that the difference between the male and female coefficient is not exactly equal in Panel C when compared to Panels A and B. Since the model is estimated with other co-variates that are restricted to have the same response for both genders, differences can arise. In a fully saturated model, where all coefficients are interacted with gender, we exactly match the differences across Panels A and B.

Table 5 IMPACT OF VIOLATING GENDER NORM ON PARTNER VIOLENCE- - - ORDERED PROBIT ESTI-MATION, EXTENSIVE VS. INTENSIVE MARGIN, AND FEMALE SAMPLE

	(1)	(2)	(3)	(4)	(5)	(6)
No violence occurs	−0.012***	−0.010***	−0.011***	−0.013***	−0.010***	−0.011***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Violence occurs	0.010***	0.008***	0.009***	0.010***	0.008***	0.009***
occasionally	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Violence occurs	0.002***	0.002**	0.002***	0.003***	0.002***	0.002***
sometimes to often	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Observations	14,278	13,560	13,283	18,822	18,818	18,536
Year and SA4 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Demographic variables	No	Yes	Yes	No	Yes	Yes
Current partner controls	No	Yes	Yes	No	Yes	Yes
Childhood abuse	No	No	Yes	No	No	Yes
Previous partner violence	No	No	Yes	No	No	Yes
SA4 unemployment rate	No	No	Yes	No	No	Yes
Source of Income	*Reported*	*Reported*	*Reported*	*Prospective*	*Prospective*	*Prospective*

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Each cell presents the marginal effect evaluated at the mean from a separate ordered probit estimation

Robust standard errors are clustered at state/territory-year level and reported in parentheses

Columns 1–3 present estimates using reported income, and columns 4–6 present estimates using prospective income

SA4 indicates Statistical Area Level 4 in the Australian Statistical Geography Standard

We also estimated order probit models with a wider set of categories and we estimated a probit model of frequent violence conditional on any violence. We do not report these results as they produced very large standard errors. There are only about 100 individuals in each survey year who report "frequent" violence which makes finer estimation impossible with these data.

We can, however, rule out the story that female breadwinning makes frequent violence go down and infrequent violence go up, leading to a lower overall level of violence.

It may seem odd that women who make more than their male partner choose to remain in a relationship even after an episode of abuse when divorce is an option. In the vast majority of cases in our data, the abuse was either a single episode or very infrequent in nature, which may provide one explanation. Separation and divorce depend upon many factors beyond financial considerations, including the presence of children, cultural considerations and psychological reasons. One or several of these can contribute to the decision to remain in an abusive relationship (Strube and Barbour 1984). In as much as women who make more than men might be more likely to leave the relationship than women who don't (especially in the case of frequent abuse), our estimates will be an under-estimate of the impact of women earning more than men on the incidence of domestic abuse.

6 Robustness checks and reporting bias

The results presented above point to a role for violating the male breadwinning norm in partner violence and emotional abuse against women. In this section we first explore whether our results are affected by the inclusion of couples who report exactly equal earnings. We then look at whether our results are explained by past partner violence or by two possible alternative explanations: exposure reduction or power imbalances created by educational differences. We look at heterogeneity of our results and whether our results are driven by greater reporting of abuse by women who out-earn their male partners. We examine whether an alternative scheme for clustering the standard errors, suggested in the literature on using shift-share variables, affects our results. Finally, we briefly discuss a wide variety of robustness checks which are available in an online Appendix to this paper and compare our effect sizes to others from the literature.

6.1 Dropping the equal-earning couples

In our estimates thus far, couples where husbands and wives report equal income have *Relative Income* equal to zero in both the male and female samples. As a robustness check, we drop those observations. Given that the PSS data appear to show a larger fraction of such couples compared to other nationally representative data, we want to make sure that our results are not driven by couples reporting equal income.

One notable feature in Fig. 5 is the pronounced spikes at 0, 0.5 and 1. These represent points where one of the two partners earns no income or where the two partners report exactly equal income. The first and last of these are not implausible as there are couples where one partner works and one does not. The second seems unlikely but there are two reasons why we might observe this in the data. Many individuals in Australia use small business structures combined with trusts to run family business such as small shops or trade professions. In order to minimize tax, they often distribute equal amounts of income through these structures to all family members. The spike could also be due to rounding errors in reporting income. This latter explanation would also explain why there is more bunching at 50% in the PSS data than in the HILDA data. The latter has a much more refined and detailed income survey instrument.

Table 6 displays results without couples where the share of income in the couple is 0.5. Columns 1–2 and 5–6 present estimates with relative income from the reported PSS data, while columns 3–4 and 7–8 display the estimation results using the prospective income measure. Overall, the results are almost identical to that presented previously.

Unlike in Table 3, the effect of complying with the gender norm for men becomes marginally significant. As shown in columns 3 and 4 of panel B, earning more than half of couple income decreases the chance of men suffering from partner violence by about 1.2 percentage points. This represents a 50% decrease compared to the baseline level of reported abuse for men, though the effect is only significant with prospective income and only at the 10% level. The effect of emotional abuse is similar and more like what we might have expected from Fig. 3, but not statistically significant. Overall, we conclude that there is no compelling evidence that female breadwinning affects violence or emotional abuse against men.

Table 6 ROBUSTNESS CHECKS- - IMPACT OF VIOLATING GENDER NORM ON DOMESTIC ABUSE: DROPPING CASES WHERE PARTNERS EARN EXACTLY EQUAL INCOME

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Partner violence				Emotional abuse			
	Panel A. Female							
Earning more than half	0.014**	0.016**	0.012**	0.013***	0.030***	0.030***	0.014**	0.015***
share of income	(0.006)	(0.006)	(0.004)	(0.004)	(0.007)	(0.007)	(0.005)	(0.005)
adj.R-squared	0.006	0.015	0.005	0.013	0.013	0.029	0.009	0.024
Observations	11,369	11,124	14,195	13,978	11,368	11,123	14,194	13,977
	Panel B. Male							
Earning more than half	−0.004	−0.004	−0.013*	−0.012*	−0.021	−0.014	−0.016	−0.008
share of income	(0.006)	(0.005)	(0.006)	(0.006)	(0.014)	(0.014)	(0.012)	(0.014)
adj.R-squared	0.005	0.013	0.003	0.011	0.008	0.018	0.013	0.022
Observations	2,863	2,820	3,819	3,777	2,863	2,820	3,819	3,777
Year and SA4 fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Current partner controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Childhood abuse	No	Yes	No	Yes	No	Yes	No	Yes
Previous partner violence	No	Yes	No	Yes	No	Yes	No	Yes
SA4 unemployment rate	No	Yes	No	Yes	No	Yes	No	Yes
Source of Income	*Reported*	*Reported*	*Prospective*	*Prospective*	*Reported*	*Reported*	*Prospective*	*Prospective*

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
This table shows the estimation results after dropping observations where husband and wife earn an equal share of total couple income. Each cell in this table shows the estimated coefficient from a separate regression

Robust standard errors are clustered at state/territory-year level and reported in parentheses

Columns 1–2 and 5–6 present estimates using reported income; columns 3–4 and 7–8 present estimates using prospective income

Columns 1–4 report estimates for the effect on partner violence; columns 5–8 display estimates for the effect on emotional abuse

SA4 indicates Statistical Area Level 4 in the Australian Statistical Geography Standard

Table 7 ROBUSTNESS CHECKS- - - IMPACT OF VIOLATING GENDER NORM ON DOMESTIC ABUSE: PRE-VIOUS PARTNER VIOLENCE

	(1) Female	(2)	(3) Male	(4)
Earning more than half	0.011	0.011	0.009	0.009
share of income	(0.007)	(0.007)	(0.005)	(0.005)
adj.R-squared	0.047	0.064	0.032	0.035
Observations	13,560	13,283	3439	3382
Year and SA4 fixed effects	Yes	Yes	Yes	Yes
Demographic variables	Yes	Yes	Yes	Yes
Current partner controls	Yes	Yes	Yes	Yes
Childhood abuse	No	Yes	No	Yes
SA4 unemployment rate	No	Yes	No	Yes
Source of Income	*Reported*			

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Each cell in this table shows the estimated coefficient from a separate regression where the experience of violence from a past partner is the dependent variable
Robust standard errors are clustered at state/territory-year level and reported in parentheses
SA4 indicates Statistical Area Level 4 in the Australian Statistical Geography Standard

6.2 Previous partner violence

We next examine one possibility of reverse causality induced by past partner violence. As noted in the discussion of our identification strategy above, it is possible that a dynamic decision-making process involving choices about the labor and marriage markets based upon past experience of partner violence could determine an equilibrium which explains the observed data patterns. In that case, it could be previous partner violence which determines the current income distribution within the couple and we would expect to observe an association between previous partner violence and the respondent's current relative income situation.

Table 7 presents estimates which explore this possibility. We keep everything the same as in the full specification from our main results as shown in columns 3 and 6 of Table 3 but replace the outcome variable with past partner violence.[22] If the current income split in the couple is significantly associated with past partner violence, this would suggest some type of reverse causation. The good news for our identification strategy is that there are no significant associations for men or women using either reported or prospective income.

Note that in the full specification from Table 3 (our main results), we control for past partner violence. The coefficient on relative income increases slightly in magnitude after adding this control (although this change is not statistically significant). This suggests that our measure of income distribution between husband and wife does not pick up the impact of previous partner violence.

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[22] We drop "past partner violence" from the set of control variables for obvious reasons.

6.3 Exposure reduction

Exposure reduction theory suggests that domestic violence should be negatively associated with employment because couples spend less time together when both are employed (Dugan et al. 1999; Chin 2012). Our main finding on the impact of women out-earning their male partner suggests a positive relationship between better labor market outcomes for women and the incidence of violence. This suggests that exposure reduction is unlikely to be the driving force determining partner violence in our data.

In this section we investigate heterogeneous impacts by time spent at work for women. In Appendix Table 9, we include a dummy variable for whether the woman works more than 40 h per week and interact this dummy with *Relative Income*. If exposure reduction were an important factor, we should see a negative association between working over 40 h a week and domestic abuse. We should also see that working over 40 h a week reduces the effect of female breadwinning on domestic abuse.

What we actually see is a positive, although insignificant, effect on partner violence of working more than 40 h per week. This is probably partially picking up the income effect associated with working long hours. We do see a slight, statistically insignificant effect of mitigation on the exposure variable. The results are similar for reported and prospective income.

For emotional abuse, we draw a similar conclusion. Using prospective income, we see a statistically positive effect on women's working over 40 h on emotional abuse and a nearly equal offsetting effect on the interaction term. The net result is that a woman working over 40 h per week making more than her husband is 0.3% less likely to experience emotional abuse than a woman working less than 40 h per week but earning more than her husband. However, this difference is only just significant at the 10% level and only for prospective income. Overall, these results suggest that exposure reduction does not explain our observations.

6.4 The role of education

We have thus far examined differences in relative income as a factor in domestic abuse. Instead, could it be differences in education and a power imbalance arising from those differences that explain our results? Erten and Keskin (2018) found that increased years of schooling for women increases the risk of experiencing psychological violence and financial control behavior. Recall from Panel E of Table 2 that women tend to be more educated than their male partners when there is a difference in educational levels.

If we re-estimate all models using relative education (equal to one if the respondent has higher education than her/his partner) and controlling for income and education, we find no statistically significant relationships between partner violence or abuse and relative education.[23] Women out-earning men, conditional on partners' education levels and household income, impacts domestic abuse. Women having more education than men, conditional on household education and income, does not impact domestic abuse.

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[23] We find this result whether or not we include a control for relative income.

The increase in domestic violence which occurs just above the point where women out-earn men and then appears to decrease as women's earnings approach 100% of household earnings may suggest that conflict is greater among couples who are similar in terms of income than among those who are very different. We do not know people's incomes prior to marriage so it is difficult for us to investigate assortative matching in income in the marriage market. We can, however, look at assortative matching in education which is much less subject to change post-marriage. About two-thirds of our sample of couples have identical education levels.

If we estimate the main model using relative income as the predictor of violence but we limit the sample to the subset of people who are assortatively matched (that is who have identical educational levels), we find similar results for partner violence and emotional abuse against women. We find a slight attenuation of the effects for emotional abuse using prospective income when we use five education categories instead of two, but the results are not statistically different from that presented in Table 4. The confidence intervals largely overlap. For men, using this restricted sample, we mostly find effects that are statistically insignificant. For emotional abuse, using reported income, we find some negative effects that are just statistically significant at the 10% level. It could be that men at the same education level do experience more emotional abuse when they violate the gender norm. It could also be a function of the smaller sample size that we use. We do not find the effect with prospective income. These results are shown in online Appendix Table E-1.

The overall conclusion is that the relationship we find between relative income and partner violence does not seem to be stronger for those couples who are assortatively matched on education.

6.5 Reporting and effect heterogeneity

Could our results be a reporting effect? Are women who out-earn their male partners more likely to report abuse than women who don't? We now examine this question further.

The literature on the mis-reporting of domestic violence identifies four main reasons for mis-reporting/under-reporting: privacy concerns; fear of reprisal; a desire to protect the offender and; some evidence that higher income/higher education individuals might be less likely to report domestic violence because of stigma (see Joseph et al. (2017); Felson et al. (2002); and Aizer and Dal Bo (2009)). Agüero and Frisancho (2017), using an experimental approach, show that under-reporting of domestic abuse is more common among higher-educated women. Reporting might also be related to age or cultural background. Gender norms about a woman's role and working outside the home can vary by cultural background (see Antecol (2000)).

The fact that we find no effect of education differences on reports of abuse (Sect. 6.4) seems to argue against a reporting effect. Based on the literature that suggests more educated women are less likely to report domestic abuse, our estimates are more likely to be under-estimates of the true effect rather than over-estimates.

In the regression estimates, we controlled for factors such as age, income, education and being Australian-born which might affect reporting. The only one of these that

significantly effects reporting is income: higher income couples report less domestic violence and emotional abuse.[24] We do not find any effects of age, education or of being Australian-born in explaining the levels of reports. The effects reported in our main results are robust to these controls, including income, as can be seen by comparing columns (1) and (3) of Tables 3 and 4.

If our results are driven by reporting, then we should see differences in our findings when splitting the data by observable characteristics that are also correlated with reporting. We split the sample (sometimes in half, sometimes more finely) by age, education, income and country of birth to see whether there is heterogeneity in the impact of $RelativeIncome$ on reports of domestic abuse.

Appendix Table 10 explores effect heterogeneity using both income measures for female respondents. We report estimates from the complete model with controls for the full set of background information. Conditional on earning less than their male partner, women under age 40 are less likely to report emotional abuse (although this is only just significant at the 10% level for reported income). Women from couples whose incomes rank in the lower five deciles of combined couple income tend to experience more emotional abuse and, when we use prospective income, more violence. The higher prevalence of violence amongst those with lower incomes is consistent with the results from the regression controls in our main model estimates.

However, when examining the interaction between relative income and demographics, we find that the effect does not vary by age group, income or education. In the third row of each panel of Appendix Table 10, we interact the $RelativeIncome$ variable with the female being aged under 40, being in a household with couple total income below the median and having high school or less education, respectively. For the most part the relationships are insignificant, leading to the conclusion that the relationship between female breadwinning and partner abuse does not differ by these characteristics. For emotional abuse, when using prospective income, we find an interaction that is positive and significant at the 10% level, but only for prospective income.

Appendix Table 10 compares couples above and below median couple income in deciles. For income, we also estimated models where we compared people in the bottom decile to the top nine deciles; people in the bottom two deciles to the top eight deciles; people in the bottom three deciles to those in the top seven and people in the bottom four deciles to people in the top six. The only case where we find any differential effect of relative income is for the lowest income decile where the interaction between being in the bottom decile and violating the male breadwinning norm was negative and statistically significant at the 10% level. This suggests that the bargaining mechanism may dominate the gender norm in the bottom decile. For none of the other splits did we find any significant difference between income groups in terms of the impact of relative income on the incidence of abuse. We undertook a similar exercise with

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[24] Reasons why higher income couples may report less abuse include: there may be less abuse; higher income women may be more likely to leave a relationship because the outside option is likely to be better, creating selection in our sample; or, there may be more stigma associated with abuse, and therefore less reporting, amongst higher-income women (see Joseph et al. (2017) or Agüero and Frisancho (2017)). The correlation between relative income, measured continuously or as an indicator variable for the female share being greater than one half, and household income deciles is quite low, 0.05. As explained above, the presence of either selection or mis-reporting related to income would result in our estimates being underestimates of the true effect.

the education variable, changing the cutoff and category groupings. Again, we find no differential impact of relative income on the incidence of violence or emotional abuse irrespective of how we combine the educational groups. We show the detailed estimation results in online Appendix Tables D-1 and D-2.

When we estimate models with more detailed age groupings, female breadwinning has a slightly larger effect in the 30-40 age group compared to other ages. However, these differences are not robust to relatively small changes in the age ranges that we use. They are also not robust to how we control for age overall in the model. For emotional abuse, we find that female breadwinning produces a larger effect in the under 20 age group, but we only find this for prospective income, not reported income. Over the 2 years where we have a continuous measure of income (2005 and 2016), there are only about 105 people in this group so we view these results with caution. These detailed regression results are shown in online Appendix Table D-3.

Sample sizes may prevent us from identifying differences in the effect of women out-earning men on domestic violence and emotional abuse for some demographic groups. But we can rule out that the estimated effects are driven by one sub-group of the data. This also provides evidence against a reporting explanation. Any reporting bias would have to be independent of overall income, age and education and operate solely through relative incomes. This seems far-fetched.

Previous research has shown an impact of home country gender inequality on the incidence of domestic abuse for migrants (González and Rodríguez-Planas 2020). We thus re-estimated the models dropping those not born in Australia. This results in a 30% decrease in sample size, but the headline coefficient results of Tables 3 and 4 are unchanged. The results are not driven by those born outside of Australia (see columns 1 and 6 in online Appendix Table H-1).

Our data are based upon a population-wide survey that incorporates a broad sample of people representative of Australia. Studies such as Tur-Prats (2021) and Ericsson (2020) have examined the whole population in high-income countries, as we do. However, many other studies evaluating domestic violence target people with relatively less advantaged backgrounds (Aizer 2010; Bobonis et al. 2013; Anderberg et al. 2015; Hidrobo et al. 2016). Overall, our results are complementary to previous research focusing on more disadvantaged groups and reveal that domestic abuse driven by women out-earning men appears to be just as severe for couples from higher education and income groups. While we can not rule out reporting unequivocally, the results in this section strongly suggest that our findings are not driven by reporting.

6.6 Alternative clustering schemes

Adao et al. (2019) suggest that residuals from regressions involving shift-share design may be correlated over districts which are similar in their sectoral composition. Without considering this, standard errors could be biased. Drawing on work by Finger and Kreinin (1979), recent literature (Campante et al. 2019; Dai et al. 2021; Erten and Keskin 2021b) has proposed an alternative clustering scheme to adjust standard errors,

Table 8 Robustness checks- - - alternative clustering schemes

	(1)	(2)	(3)	(4)
Panel A. Partner violence				
Standard errors:				
clustered by SA4	(0.0058)**	(0.0059)***	(0.0038)***	(0.0037)***
clustered by SA4 pairs based upon similarity index	(0.0060)**	(0.0061)**	(0.0040)***	(0.0039)***
Panel B. Emotional Abuse				
Standard errors:				
clustered by SA4	(0.0055)***	(0.0055)***	(0.0040)***	(0.0040)***
clustered by SA4 pairs based upon similarity index	(0.0056)***	(0.0057)***	(0.0040)***	(0.0040)***
Source of income	*Reported*		*Prospective*	
Year and SA4 fixed effects	Yes	Yes	Yes	Yes
Demographic variables	Yes	Yes	Yes	Yes
Current partner controls	Yes	Yes	Yes	Yes
Childhood abuse	No	Yes	No	Yes
Previous partner violence	No	Yes	No	Yes
SA4 unemployment rate	No	Yes	No	Yes

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
This table shows standard errors with one-way clustering at the SA4 level in the first row and two-way clustering based upon paired SA4s with the highest similarity index in the second row
Panel A shows the standard errors for the outcome of partner violence and Panel B shows those for the outcome of partner emotional abuse
SA4 indicates Statistical Area Level 4 in the Australian Statistical Geography Standard

using a similarity index across districts. The index is calculated as:

$$SI_{ij} = \sum_d min\{EmpShare_{id}, EmpShare_{jd}\},$$

We calculate the employment share (*EmpShare*) in industry d in each SA4 in 2016 and then compare all pairs of SA4s. By construction, this index ranges from 0 to 1. If the employment share for a pair of SA4s is completely different, this index will take the value of 0; if the two locations in a pair being compared is identical, this value will be 1. In the two-way clustering scheme, we form clusters by taking pairs of SA4 which are most similar to each other based upon the index.

In Table 8, we show the one-way standard errors clustered at the SA4 level, as opposed to the state/territory/year level clustering which we use in all other tables, in the first row of each panel. We report the standard errors of the two-way clustering in the second row of each panel. The only differences in the standard errors are in the fourth decimal place, so this issue does not affect our standard errors or the conclusions that we draw about statistical significance.

6.7 Other robustness checks

We undertake a variety of other robustness checks, many of which were suggested by referees. Online Appendix I.2 presents results from a propensity score matching approach where we match women above and below the 50% cut off of relative income. Online Appendix I.3 uses inverse-probability weighting regression adjustment to examine the role of other sources of within-couple differences that could explain our results (education, age, labor force status, country of birth and first language spoken). We explore the role of cultural background in online Appendix H by splitting couples into groups based on common birth country or common first language. We investigate alternative ways of constructing prospective income in online Appendix F by looking at dis-aggregated groupings using other demographic characteristics (age and education). Our results are robust to all of these manipulations in estimation. Due to space limitations, the detailed estimation tables and analyses are reported in the online supplemental material.

In the online appendix, we decompose the source of variation in industry that drives our prospective income results following the most recent developments in the shift-share design literature (Goldsmith-Pinkham et al. 2020; Borusyak et al. 2022). The analysis and corresponding results are reported in online Appendix J. The top five instruments account for about 85% of the positive weights which determine the estimator, while the industries that have negative weights form only a small share of the overall weight. This aligns with recent work on applying the shift-share design (Erten and Keskin 2021b). The top five industries which determine our results are retail trade, accommodation and food services, education and training, public administration and safety, and other services.

6.8 Effect sizes in comparison with the literature

It is somewhat difficult for us to compare our effect sizes to the broader literature. Some papers create an index of violence and comparison to their effect sizes will not be meaningful. Because our comparison of individuals above and below the 50% threshold is akin to an estimate of a treatment, it is also not clear how to compare our results to papers that estimate a continuous impact of relative income. We can compare with other studies that compare two groups of women—one which is impacted and one which is not.

We find that the effect sizes of our main findings are relatively close to the modest effects found in the literature. When evaluating the Mexican Oportunidades program, Bobonis et al. (2013) document a roughly 3 percentage point increase in male partners' threats of violence and a 4 percentage point increase in emotional abuse (without physical violence) if their wives received the cash transfer. In our study, we find a 2.7 to 3.3 percentage point increase in emotional abuse by male partners in response to women earning more than half of couple income (using reported income). In Cambodia, Erten and Keskin (2021b) found a change of about 3.5 percentage point in physical violence and a 1.5 percentage point increase in partner-induced injury when comparing women in harder-hit areas with women in less-affected areas following the tariff reduction.

This amounts to about a 2.5 percentage point change, averaging across the two types of physical violence. Our estimates suggest a 1.6 percentage point increase in partner violence, when including both severe assaults and less severe violence.

7 Concluding remarks

We find that when a woman earns more than her male partner, this significantly heightens the incidence of domestic violence and emotional abuse against her. Our estimates suggest women are 1.6 percentage points more likely to suffer from partner violence if they earn more than their male partner. This level of violence is 33% higher than the societal mean. Women who earn more than their male partner are 3 percentage points more likely to suffer from emotional abuse than the statistical mean. This is 20% higher than the societal mean. These estimates are all statistically significant.

When we use a measure of women's earning power based on local age/education/industry-specific earnings potential to remove possible endogeneity of reported income, we find similar effects for violence. We find a smaller, yet still large and statistically significant, effect on the incidence of emotional abuse.

We use a population-wide survey to pick up a wider range of violence and abuse than did previous studies, which focused only on extreme events such as hospitalization. We find no compelling evidence of the relative earnings of heterosexual partners affecting levels of physical and emotional abuse suffered by men.

We present graphical evidence which suggests that, in Australia, a gender norm explanation for physical violence and emotional abuse is stronger than a bargaining story. As women's share of couple income increases, but remains below one-half, there is no change in the experience of physical and emotional abuse. Only when a woman out-earns her male partner do we see an increase in the incidence of physical violence and emotional abuse. It could be that bargaining co-exists with an effect of gender norms, but that the gender norm explanation dominates when women earn more than men.

As in other studies, we document a sharp discontinuity in the distribution of the share of female income at one-half. Many couples report male earnings slightly larger than female earnings whereas relatively few have female earnings just larger than male earnings. Combined with the evidence of the impact of female breadwinning on domestic abuse, this suggests a gender norm of male breadwinning which, when violated, creates negative disruption within the couple. This is consistent with evidence from the World Values Survey.

We find that the impacts on domestic violence and emotional abuse of women earning more than their male partners do not vary by age, income decile, education, or birth country. The effect of women out-earning their male partners is a strong one that seems to operate consistently across a wide range of demographic characteristics.

Our paper adds to the growing literature on the dynamics of couple relationships and the role of relative income shares on those dynamics. As other studies have found, relative income shares appear to influence the experience of domestic violence and abuse. In contrast to one prominent US study (Aizer (2010)), we find that women's increasing economic position does not appear to reduce the probability of experiencing

partner violence. Our study seems to accord better with evidence from Sweden, that women's increasing economic power results in a backlash from men that presents itself as increased violence against women. Similar results are found in some developing country studies.

Three key points that emerge from our study merit highlighting. First, as women's economic power increases, their bargaining power increases. However, when women's income exceeds that of their partners, the violation of a gender norm creates a strong negative effect. We document that effect in terms of physical and emotional abuse. Others have documented it in terms of either relationship quality or time spent on housework. Policy-makers will require country-specific evidence to develop effective policy.

Second, the influence of gender norms may outweigh the impact of increased bargaining power. Policy-makers will need to consider this when evaluating proposals intended to lower abuse against women. Reductions in abuse levels may not occur in line with, nor in proportion to, increases in women's economic power. As our study shows, other factors can trigger an increase in violence even as women's bargaining power grows. Governments may need to instigate cultural change to underwrite the shift in economic power. Economists will need to highlight the importance of social norms when advising on the design of child care, parental leave, and family payments policy. For domestic violence patterns to change, gender norms will need to evolve alongside growing equality in income.

Finally, our work also suggests a need for future research to isolate and test the independent mechanisms of bargaining power and gender norms.

Data Availability The data we use are not publicly available but researchers may apply to the Australian Bureau of Statistics for access to the data. The authors are happy to help interested researchers make contact with the ABS and are happy to share their code with interested researchers

Declarations

Conflict of interest The authors declare no competing interests.

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