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Julie Brun Bjørkheim
Institute for Social Research
Odd E. Nygård
odd.erik.nygard@ssb.no
Statistics Norway

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Gender Differences in Tax Evasion: Evidence from Norwegian Administrative Data

Julie Brun Bjørkheim* Odd E. Nygård†

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Abstract

Using the expenditure approach and administrative data on third-party reported donations, we estimate tax evasion by gender. While men are more prone to risk-taking, we find no evidence of this affecting income underreporting among the self-employed in Norway. Instead, self-employed women evade more than men. This holds when controlling for sector and using household fixed effects and event study equivalents. We find that self-employed women face lower chances of penalty taxes and lighter penalties when caught, possibly due to biased predictive models, which may explain their higher evasion rates.

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*Institute of Social Research. Email: j.b.bjorkheim@samfunnforskning.no

†Research Department, Statistics Norway. Email: odd.erik.nygard@ssb.no

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Keywords: Tax Evasion; Gender; Self-Employed; Charity; Norway

1 Introduction

Men are imprisoned around 15 times more than women and generally show a larger preference for risk.[1][2] Despite this tendency, we know little about how this translates to tax evasion, a white-collar crime. The absence of evidence might not be surprising, considering the data challenges estimating tax evasion. Nevertheless, awareness of gender differences in tax evasion could improve the efficiency of tax enforcement since the tax authorities can allocate their resources more efficiently by targeting specific groups. Reducing the direct cost related to tax administration and enforcement could benefit all law-abiding citizens, for instance, by lowering tax rates or increasing public goods provision (Slemrod, 2019).

This paper asks a simple question: Who evades taxes more, men or women?

While there is some knowledge about gender differences in tax evasion, most of the existing studies rely on survey or experimental data and predominantly show a higher tendency for men to engage in tax evasion.[3] Two competing theories explain these gender differences: one suggests that women are inherently different either due to biology or experiences that shape their compliance, while the other proposes that women have fewer opportunities to evade taxes due to limited access to formal labor markets (Torgler and Valev, 2010). With access to Norwegian register data covering the entire population, we can examine dimensions of tax evasion more granularly and estimate real evasion rather than relying on stated preferences.

To estimate evasion rates, we follow a framework proposed by Pissarides and Weber (1989) (PW), which uses information on food consumption to infer how much income is underreported. Because of the effectiveness of third-party reported information as an en-

[1] Crime statistics for Norway show that men were imprisoned at around 15 times more than women in 2016, and this trend is persistent from 2002-2020, see https://www.ssb.no/statbank/table/10530/ for more information.

[2] Croson and Gneezy (2009) look at gender differences in preferences and find that women as less risk-taking and competitive but not more socially oriented than men. However, circumstances affect women's social preferences to a more substantial degree.

[3] See for instance Alm and Malézieux (2021); Baldry et al. (1987); Torgler and Schaltegger (2005); Alm et al. (2006); Torgler and Valev (2010); Kastlunger et al. (2010); Casal et al. (2016); Nygård et al. (2019); D'attoma et al. (2017).

forcement tool, wage earners cannot underreport their income as their employers declare it to the tax authorities.[4] In contrast, self-employed individuals may underreport their income since they are their own employers. PW used this idea to estimate income tax evasion by comparing the self-employed's reported income to their actual income, inferred from their food consumption patterns, with wage earners' consumption levels as a benchmark.

Since the first paper by PW, a vast literature has emerged using the 'traces of true income'-approach. The method has become more viable with the development of more and better data and is advocated by Slemrod and Weber (2012), discussing the credibility revolution within the tax evasion literature.[5] These studies, despite substantial differences in tax systems, enforcement regimes, culture, and sample inclusion, by and large, show that the self-employed, on average, underreport income.[6] However, we still need to learn more about what characterizes these individuals.

We use information on charitable donations to infer gender differences in tax evasion, a consumption item earlier used by Feldman and Slemrod (2007). The novelty is that we use a panel of third-party reported donations connected to other administrative data sources from 2012 to 2016 for the whole population of Norwegian taxpayers. Thus we observe the actual consumption of charitable giving and not self-reported donations, which individuals can overstate for tax deduction purposes or even underreport to hide suspicious consumption. The work by Cabral et al. (2021) and Hurst et al. (2014) show that survey data systematically underperform compared to register data.[7] The availability of comprehensive administrative data also gives us the statistical power to analyze what characterizes evaders more fully than

[4]Effectiveness of third party reporting is widely known and empirically supported by Kleven et al. (2011), among others.

[5]An inventive study applying the PW-logic used bank loans provided to self-employed in Greece showed that banks provide loans much larger than reported income permits (Artavanis et al., 2016). They also find support for high evasion rates among professions with high education, hinting at the ability gradient of tax evasion, but document no tax evasion heterogeneity across wealth distribution or urban vs. rural areas.

[6]See, for instance, Bradbury (1997); Lyssiotou et al. (2004); Johansson et al. (2005); Torero et al. (2006); Feldman and Slemrod (2007); Davutyan (2008); Engström and Holmlund (2009); Martinez-Lopez (2013); Hurst et al. (2014); Kukk and Staehr (2014); Paulus (2015); Engström and Hagen (2017); Kim et al. (2017); Nygård et al. (2019); Nygård and Thoresen (2023); Cabral et al. (2021).

[7]Cabral et al. (2021) find that survey data only captures half of the underreported income by self-employed compared to register data.

in earlier studies. We can thus examine gender differences in tax evasion while exploring potential avenues such as sectoral affiliation of the self-employed, education level, and income level. Knowing more about the anatomy of tax evasion has implications for tax enforcement strategies, where gender is one dimension easily available for tax administrations.

We estimate that the average self-employed household underreports 11% of their income. This magnitude corresponds to earlier estimates of income underreporting of the self-employed in Norway using food consumption and donations to infer actual income, see Nygård et al. (2019) and Nygård and Thoresen (2023).[8] However, we find no clear evidence that men underreport more than women. On the contrary, the general tendency is that households with self-employed women underreport more than households with self-employed men. In our preferred specification, self-employed women evade about 20% of their household income, while self-employed men underreport only about 5% of theirs. This impression continues to hold when exploiting our data's panel dimension by introducing household fixed effects, where the evasion estimate comes from families that change self-employment status during the sample period. Therefore, the cross-sectional result is not driven by innate differences in prosocial behavior between self-employed and wage earners but instead seems to reflect income tax evasion. Further, we demonstrate that this deviation in evasion rate seems not to be driven by differences in income or education level of the household, nor does it seem to be driven by which sector the self-employed works in or how large part of the income that comes from self-employment. Our results suggest that there is indeed a real gap in evasion between self-employed men and women, in contrast to other statistics where men are found to do about two-thirds of crimes (Campaniello and Gavrilova, 2018).[9]

Our findings reveal an unexpected trend: higher instances of tax evasion among self-employed women than men. This outcome suggests a need to consider factors beyond the

[8]Our preferred estimate of tax evasion corresponds to column 2 in Table 3, with k = 1.12. Percentage underreporting, p, is calculated as $p = (1 - 1/k) \times 100$. Hence income is underreported by 10.71 percent using our preferred estimate.

[9]We recognize that this question inherently depends on the binary understanding of gender. As the paper relies on administrative data, gender is defined as the legal gender a person is registered with. Non-binary people and those registered with the wrong legal gender will be misclassified in this study.

willingness to evade taxes. Notably, despite their higher evasion rates found in our data, women encounter fewer tax-related penalties. This pattern may not indicate lower evasion among women but rather reflects differences in enforcement dynamics. Historically, women have faced more leniency in the justice system, which may influence current tax enforcement strategies. Furthermore, if predictive algorithms used by tax authorities are trained on data reflecting such leniency, these algorithms may reflect historical biases. This intersection of historical biases and contemporary technological practices provides an explanation for the observed discrepancy in penalty rates, pointing to the influence of systemic factors rather than individual decisions in tax evasion behavior.

The paper is organized as follows. Section 2 describes the data source, descriptive statistics, and how charitable giving is treated in the Norwegian tax system. Section 3 describes the empirical framework, followed by the results discussed in section 4 and the conclusion in section 5.

2 Data

2.1 Data and descriptive statistics

By matching third-party reported data on charitable contributions to the income register from Statistics Norway (SSB), we attain a rich data set covering the Norwegian population from 2012 to 2016. Information on tax-deductible donations is reported in full to the tax authorities by the receiving organizations. Each year approximately 350,000 households (or about 25% of the population) donate to these charities, and the number is slightly increasing over time. There is over 400 tax-deductible charitable organization, which covers the most common receivers of donations. However, our data does not show to which organizations individuals donate.[10]

[10]Not all charitable giving is tax-deductible in Norway. To be tax-deductible, the donor must register their personal security number, and the organization needs to be registered for tax deductions. Thus, we do not have data from organizations that receive donations but are not tax-

Given the aim of studying gender differences in tax evasion, it might be problematic to use the income and donations of the individual as the level of observation. If donations are a joint household decision, there may be a measurement problem if, for instance, the woman makes donations on behalf of the family and we only consider donations made by the self-employed, a man in this example. To address this, we compare couple households consisting of either a self-employed woman or a self-employed man and aggregate both income and donations to a household level. Then the individual donating becomes irrelevant. Hence, by aggregating to the household level, we compare similar households to each other, with the only dimension that differs being the gender of the self-employed. By doing this, we also aim to keep gender differences in altruism constant at the household level.[11] Despite aggregating income and donations to a household level, we keep control variables at the individual level of the primary income earner. We restrict the data set to self-employed and wage earners of working age.[12] The income registry data also contain information about cohabitation, which we use for differentiating single households from couple households.

This paper classifies an individual as self-employed if they earn more than 10 percent of total pre-tax work income from self-employment, i.e., business income.[13] In the literature, the definition of self-employment has varied from self-defining via survey questionnaires or percent of household income coming from self-employment to filing a tax schedule report associated with self-employment on their tax return (Pissarides and Weber, 1989; Feldman and Slemrod, 2007). Our definition differs from the more conventional definition used in

deductible. However, the most common charitable organizations in Norway are tax-deductible. For more information, see the home page of the tax administration about the tax-deductible charitable organization: https://www.skatteetaten.no/person/skatt/hjelp-til-riktig-skatt/gave-og-arv/gave-til-frivillige-organisasjoner/liste/2016/

[11]To compare households with both genders present is an advantage as men and women differ in their charitable inclinations. Both survey and experimental evidence indicate that men and women differ in their demand for charity, and Andreoni and Vesterlund (2001) find that men and women differ substantially in their price elasticity of charity. Experimental evidence from economics and psychology has found that all-male and all-female groups are more altruistic on different occasions (cited in Andreoni and Vesterlund, 2001). For instance, Eckel and Grossman (1998) find that women donate twice as much as men in an experimental setting.

[12]We define working age as strictly between 25 and 62 years old.

[13]Pre-tax work income is the sum of wage income and net income from self-employment earned during the calendar year. For more information, see https://www.ssb.no/a/metadata/conceptvariable/vardok/3318/en.

PW that defines self-employment at the household level, i.e., self-employment income as a share of total household income. Due to ease of comparison with earlier studies, the same definition was applied in Nygård and Thoresen (2023) when using the same donation data. However, since we concentrate on female and male self-employed, it seems natural to define self-employment at the individual level, then aggregating up to the household level. We, therefore, consider a household self-employed if one household member classifies as self-employed.[14] We refer to Table 8 in the Appendix for sensitivity tests concerning the definition of self-employed.

In Table 1, we show the descriptive statistics for the population split between households that never donate to charity and those who donate at least once between 2012 and 2016. Further, we split households between pure wage-earning households and self-employed households either with a female or a male self-employed.[15] From Table 1, we see that among those who give to charity have higher wages and self-employment income. They are slightly older and more educated than non-givers. In addition, households that give to charity tend to be larger and have more children. When looking at the split between female and male self-employed households, we see that self-employed women tend to be in households with higher disposable income. However, on average, their self-employment income is lower than that of households where the man is self-employed. This table also shows that households with self-employed women have the highest charitable giving among the groups and the highest education.

2.2 Charitable giving in Norway

Although Norway has a progressive tax system and different tax treatment of wage income and self-employed income, it is essential to note that the tax benefit from charitable giving

[14]We exclude households where several household members are self-employed as it introduces noise to the estimation of gender differences in tax evasion.

[15]Note that there will always be some misclassification of some self-employed as wage earners, as they can some years have a very low reported income from business due to fluctuations or large misreporting. This will downward bias the estimated income underreporting.

Table 1: Descriptive statistics for households, 2012-2016

	No donations			At least one donation		
	Wage earners	Female SE	Male SE	Wage earners	Female SE	Male SE
Pre-tax inc.	649	786	780	941	1,111	1,120
	(460)	(641)	(683)	(625)	(844)	(1,842)
Self-employment inc.	0,56	309	429	1	400	567
	(5)	(352)	(586)	(10)	(503)	(1,797)
Wage inc.	649	479	353	940	714	554
	(459)	(538)	(380)	(625)	(690)	(457)
Disposable inc.	591	671	667	820	932	924
	(403)	(512)	(595)	(1,035)	(2,111)	(1,391)
Household donations				3,50	3,91	3,69
				(7,91)	(8,42)	(10,18)
Age	41.92	43.16	44.24	44.28	45.10	45.77
	(10.01)	(9.787)	(9.731)	(9.936)	(9.449)	(9.540)
Bachelor Degree	0.324	0.424	0.256	0.533	0.624	0.451
	(0.468)	(0.494)	(0.436)	(0.499)	(0.484)	(0.498)
N. in household	2.41	2.67	2.61	2.83	3.00	3.12
	(1.38)	(1.34)	(1.48)	(1.38)	(1.36)	(1.42)
N. of children	0.708	0.807	0.727	0.863	0.949	0.923
	(1.004)	(1.012)	(1.045)	(1.058)	(1.086)	(1.118)
Observations	3,981,147	79,487	244,178	2,108,769	63,335	139,970

Note: Average measures (sd in parenthesis) for 2012-2016. The first five variables are reported in NOK 1000. Self-employed households are defined as a household containing a self-employed with at least 10% of pre-tax income originating from business income. Age and education come from the main income earner except when the household is self-employed.

is the same for both groups, independent of the marginal tax rate. Charitable gifts are deducted from general income, which is taxed at a flat rate (NOU2014:13).[16] In addition to this flat tax on all income, there is a progressive surtax. Thus, the price of giving to charity is equal for wage earners and the self-employed. The tax-deductible amount increase over the sample period, and we see that the rise in the number of households who donate to charity coincides with the rise in the deductible amount one can subtract from general income, which was capped at NOK 12,000 in 2012, see Table 6 in the Appendix for more details (Skatteetaten, 2016).[17]

In Figure 1, we see the density of household charitable gifts and that it is concentrated yearly around NOK 3,000. This suggests a fundamental feature of the Norwegian donation culture. It corresponds to a monthly contribution of NOK 250, a default amount among many charitable organizations.[18] These contributions are automatically drawn from the bank account each month, a feature which also makes the donations less salient.[19] Most of the gifts in this sample seem to be this type of monthly contribution because, to our knowledge, there is no other reason for the concentration of gifts at that specific amount. Due to the increases in the maximal deductible amount, we should expect bunching at these thresholds. Still, there is only a slight tendency of bunching around these thresholds, supporting that the main driving force of the level of charitable giving is the default preset amounts by charitable organizations.

[16]The general income was taxed at a flat rate of 28% in 2013 and decreased gradually to 25% in 2016.

[17]The average exchange rate in 2012 was USD 1 = NOK 5.8, such that the US dollar equivalent of the deduction was about USD 2000. For 2016, the average exchange rate was USD 1 = NOK 8.5.

[18]NOK 250 is the standard minimum required monthly giving at many organizations, while it is also possible to give larger amounts. For instance, Red Cross Norway offers the option of contributions at either NOK 250, NOK 500, NOK 750, or NOK 1000, in addition to a self-set amount.

[19]The typical organizations that receive and have monthly donations plans include the Norwegian affiliations of SOS Children's Village, Plan International and Medicines Sans Frontiers.

3 Empirical Framework

3.1 Estimation strategy

The expenditure approach by Pissarides and Weber (1989) starts out with a log-log Engel function

$$\ln C_{it} = \alpha \mathbf{X}_{it} + \beta \ln Y_{it}^{*} \tag{1}$$

where C_{it} is consumption (donations) of household i in year t, Y_i^* is permanent income, and $\mathbf{X}$ is a set of time-varying controls. Further one assumes that $Y_i^* = kY_i'$, where Y_i' is the reported income and k is a factor that *reported* income must be multiplied by to reach the true income.[20]

It follows that

$$\ln C_{it} = \alpha \mathbf{X}_{it} + \beta_1 \ln Y_{it}' + \beta_2 \ln k_{it} \tag{2}$$

By introducing a dummy variable, SE, to indicate self-employment, we can specify this empirically as

$$\ln C_{it} = \alpha \mathbf{X}_{it} + \beta_1 \ln Y_{it}' + \gamma SE_{it} + \epsilon_{it} \tag{3}$$

and resulting from equation (2) and equation (3) that we can calculate the evasion indicator k:

$$\ln k = \frac{\gamma}{\beta} \rightarrow k = e^{\frac{\gamma}{\beta}} \tag{4}$$

In other words, a shift in the Engel curve caused by employment status is attributed to underreporting, and we can estimate equation (3) by running a standard OLS regression. However, since permanent income is not observable, instrumental variables are often applied

[20] See, for instance, Engström and Holmlund (2009),Hurst et al. (2014), Engström and Hagen (2017) and Nygård et al. (2019) for more details and other applications of this method.

to address the endogeneity problem that arises when using annual income. Further, k is also assumed stochastic in Pissarides and Weber (1989)'s seminal work. Since our primary concern is how k depends on gender, this is less important, and we neglect these details (as in Engström et al. (2021)). We will use annual income and treat k as a constant.

Moreover, as in Nygård and Thoresen (2023), we will use a fixed effect approach and need to rely on income variation over time within each household, i.e., annual income. However, we will present a standard regression with an average income over five years to test robustness, which is meant to proxy permanent income (Engström and Hagen, 2017). To investigate how k depends on gender, we introduce an extra dummy variable in equation (3), indicating whether the self-employed is also a male. In further robustness tests, we consider the transition into self-employment as an event, employing the CSDID package by Callaway and Sant'Anna (2021) to conduct event studies. Additionally, we interact with sector dummies to test gender effects within employment sectors.

About 75% of Norwegian households have zero reported charitable giving each year. Therefore, we separate the analysis by first including all households by adding NOK 1 to everyone's charitable giving. Secondly, we run a Tobit model that accounts for the extensive margin of donating. Thirdly, we focus on only households with positive gifts in the cross-sectional regressions. Even though the estimated evasion level changes with this sample inclusion, the tendency of households with self-employed women to underreport the most are persistent across specifications. We also know from current developments in econometric research that log transformations do not recover the true treatment effect and are arbitrarily scale-dependent (Chen and Roth, 2022; Mullahy and Norton, 2022). Hence, our preferred estimates are those with positive charitable giving.

3.2 Identification strategy

The critical identifying assumption to estimate income underreporting in this setting is that the self-employed and wage earners, on average, use an equal fraction of income on charity.

There should be no systematic differences in average giving between self-employed and wage earners. Although there is no statistical way of testing this assumption with the available data, we know that both self-employed and wage earners face the same monetary incentives regarding tax-deductible giving. Additionally, as most people give monthly contributions to an organization of choice, we believe the central tendency is for people to donate per their actual income. However, if the self-employed are more prone to donate than wage earners, we will wrongly attribute their "excess" donations to underreported income. Likewise, if self-employed women are more inclined to donate than the rest of the population, we will consider it higher underreporting.

Although there could be differences in donation preferences between the self-employed and wage earners, it is hard to see how donation behavior for the same household will be affected by employment status, ceteris paribus (Nygård and Thoresen, 2023). Innate preferences for charitable giving are stable for people who shift between self-employment and wage labor. Alternatively, if preferences for charity change based on employment status, this should likely not affect men and women differently, which is crucial in our context. Therefore, one possible remedy to address the concern with differences in preferences for charitable giving is to use a fixed effect approach, using variation in employment status within the same household as a source for identification.

While our fixed effects approach takes care of stable preferences for charitable giving, we discuss some of the main differences between the self-employed and wage earners that can occur due to changes in employment status below.[21] Firstly, if the self-employed are more egoistic than wage earners, this will downward bias the estimate of non-compliance. For instance, Weitzel et al. (2010) find experimental evidence of greater selfishness among entrepreneurs that are talented in business. This suggests that at least some self-employed groups differ in their personality traits from that of wage earners. However, if the self-

[21] Perhaps self-employment is attractive to some people precisely because it is easier to evade taxes. Although this is intriguing, it will not directly bias the estimate of income underreporting in this context. Instead, if evading taxes is a motivation for becoming self-employed, it is not correct to generalize the estimated income underreporting to other people in the absence of third-party reported income.

employed are plainly more egoistic than wage earners, their charitable contributions should be lower than wage earners and not higher, as our analysis shows. This indicates that if the self-employed are more egoistic, the underreporting is larger than estimated by this approach. If such personal traits are stable and not concurrent with changes in self-employment status, our fixed effect approach will eliminate this bias.

Viewed differently, if a person who becomes self-employed is more altruistic than wage earners, then the observed 'over-consumption' of charity cannot be attributed to tax evasion, and the estimate of tax non-compliance is upward biased (Tietz and Parker, 2014). The self-employed might be more charitable due to signaling. Suppose there is a payoff from donating. For instance, if it leads to a good reputation, then there could be a greater incentive for the self-employed to donate as they rely on their reputation for business success. This asymmetric information is typical within the signaling literature (Spence, 1978). However, as we noted from Figure 1, most gifts in Norway are small, monthly donations that are less salient and credible as an object for virtue signaling than some charitable gifts in other countries. Thus the donation data used in this analysis might be more appropriate and less prone to signaling than other consumption goods, as leisure boats used in a recent Swedish study of income underreporting (Engström et al., 2021).

Being asked to donate is one of the strongest predictors of actual donations (Andreoni and Payne, 2013). If the self-employed is a group that is more targeted with requests to donate, this will upward bias the estimate of tax non-compliance. Bittschi et al. (2016) argue that the hypothesis that wage earners and self-employed have the same propensity to donate does not hold precisely because of the frequency of requests to donate. We have no evidence that self-employed individuals are solicited more than wage earners, as the employment status of individuals is non-public information that is not available to the charitable organization from which the data used in this paper was retrieved.

In addition to these core assumptions about wage earners and self-employed preferences for charitable giving, there are a few other threats to identifying the real evasion rate. If wage

earners underreport income, our estimate of self-employed underreporting will be biased. One possibility for wage earners to evade taxes, despite third-party reporting, is collusion between the employer and the employee, where both can benefit. Employer-employee collusion is empirically supported by Bjørneby et al. (2021) and Kumler et al. (2020). Additionally, some professions can easily supply extra hours in the informal economy. For instance, an employed lawyer can give legal advice after hours and take a discounted price, or a plumber can use their leisure hours in the hidden economy, as shown by (Nygård et al., 2019). Besides, wage earners can also evade taxes by overstating self-reported deductions. Even if wage earners potentially evade some income tax, it is still the case that it is easier for the self-employed to evade taxes due to the lack of third-party reporting of income. The difference in evasion possibilities implies that the estimated tax evasion is relative tax evasion between the groups, as pointed out by Martinez-Lopez (2013). Therefore, if wage earners evade taxes, the estimated k is less than absolute evasion. However, as our primary interest is in gender differences in underreporting, we find this critique less relevant in our context.

As mentioned, we have data on charitable gifts given to organizations registered as tax deductible, including gifts above the deduction threshold. This sample selection could bias the estimate of tax non-compliance if the self-employed give more to tax-deductible organizations than wage earners. The self-employed might know more about tax-deductible organizations because they are generally more involved with the tax system. This knowledge effect could lead to a higher fraction of donations of the self-employed, compared with wage earners, to go to tax-deductible organizations. While this is plausible, the main incentive for choosing tax-deductible organizations is the same for both self-employed and wage earners.

One potential pitfall when comparing tax evasion by gender is that occupational choices are closely linked with gender. Sector or occupation might also be closely related to evasion. For instance, one can imagine more considerable evasion among self-employed construction workers than self-employed dentists, perhaps due to a higher need for paper trail in medical procedures. In that case, the estimate of tax non-compliance would not be driven by gender

differences per se but rather by occupational differences. This motivates exploration of the gender differences in specific sectors, and we find that this does not drive our result, see Table 7.

Adding household fixed effects removes some of the selection problem, where the estimated coefficient on self-employment comes from the households that shift into and out of self-employed status. Therefore, we can tease out the innate differences in inclinations for charitable gifts between the two occupational groups, such as egoism or altruism. Nevertheless, this thus does not control for preferences linked to being self-employed, such as signaling. However, as discussed above, this is less of a threat in the Norwegian case, where donations are small, primarily monthly, and not salient to customers or business partners of the self-employed.

4 Results

In Table 2, we have pooled the data for 2012 to 2016 cross-sectionally and report estimates under different sample restrictions. The first column presents estimates when considering the whole sample without any restriction. Although our focus here is on differences between male and female underreporting, we also report our population-wide estimate of the adjustment factor k.[22] We estimate k to be 1.24, i.e., somewhat high compared to Nygård et al. (2019) using food consumption data, however, more in line with Nygård and Thoresen (2023) using a different definition of self-employed households on donation data. Regarding the gender dimension, the estimates are very different, with males under-reporting far less than females (k = 1.73 vs. 1.09).

However, our data contains a lot of zero-value observations since only a fraction of households are observed with positive donations each year. Thus, we run two additional regressions: One Tobit regression and one in which we exclude observations with zero-value dona-

[22]Remember that the adjustment factor k is what you need to multipy reported income with to arrive at true disposable income.

tions. As we see, the overall k-estimate for this sample drops to 1.13 and 1.08, respectively, more in line with the estimates found in Nygård et al. (2019). Moreover, the estimates for males and females get closer. Still, women underreport significantly more. When excluding zero-value observations, we get an estimate for women of 1.17, while the estimate for males drops to 1.04. We also run a regression using permanent income defined as the average income for the five years, but the change in estimates of doing this is almost negligible.

As our focus is primarily on gender, examining households consisting of only one adult member seems natural to avoid gender preferences for charity and evasion. Therefore, we restrict the sample to positive donations and single adult households in the last two columns. Further, we include a dummy for gender to control for gender differences in preferences for donations. From this, we still estimate a higher k value among females. However, k below one might indicate a correlation between self-employment and preferences for giving among single adult households. When we measure this 'overreporting', it could be due to the single self-employed being less willing to donate at a given income level than their wage-earning counterparts due to fluctuating income. Additionally, Slemrod (2007) reports that married people have a higher level of non-compliance, which is also consistent with our results.

Since we have access to large-scale administrative data covering the whole population each year, we can construct a panel and employ fixed effect estimation to deal with heterogeneity in preferences. This way, we can control for time-invariant variables and utilize that individuals change from wage-earners to self-employment or vice versa during the period. If a change in employment status shifts the level of donations, it indicates income underreporting.

In Table 3, we report the results from a fixed effect approach. We get estimates in the same ballpark as the pooled version when using the whole sample or including only those households with at least one positive donation during the years. Moreover, we get reasonable estimates even for a sample of only one-adult household, with an overall k-estimate of 1.08, similar to Nygård and Thoresen (2023). More of interest from our perspective is that in all the different sample restrictions, the dummy for male self-employed is negative, suggesting

Table 2: Association between Self-Employment and Charitable Gifts, Pooled Cross-Section

	(1)	(2)	(3)	(4)	(5)	(6)
	All				Single	
	Annual inc.			Permanent inc.	Annual inc.	Permanent inc.
	No gift conditioning	Tobit	Positive gifts	Positive gifts	Positive gifts	Positive gifts
Log household income	0.777***	4.68***	0.170***	0.176***	0.193***	0.149***
	(0.004)	(0.017)	(0.002)	(0.003)	(0.004)	(0.004)
Self-employed	0.427***	1.45***	0.027***	0.027***	–0.026***	–0.032***
	(0.010)	(0.032)	(0.005)	(0.005)	(0.010)	(0.010)
Male self-employed	–0.358***	–1.24***	–0.020***	–0.021***	–0.012	–0.015
	(0.011)	(0.038)	(0.006)	(0.006)	(0.014)	(0.014)
Female					0.094***	0.091***
					(0.004)	(0.004)
k female	1.73	1.36	1.17	1.17	0.872	0.809
	(0.022)	(0.009)	(0.033)	(0.032)	(0.047)	(0.056)
k male	1.09	1.04	1.04	1.04	0.821	0.733
	(0.008)	(0.005)	(0.021)	(0.020)	(0.043)	(0.051)
pval test $k_f = k_m$	0.000	0.000	0.001	0.000	0.420	0.313
k all	1.24	1.13	1.08	1.08	0.844	0.766
	(0.008)	(0.004)	(0.018)	(0.018)	(0.032)	(0.038)
pval test $k = 1$	0.000	0.000	0.000	0.000	0.000	0.000
Controls	YES	YES	YES	YES	YES	YES
N of female self-employed	142,822	142,822	48,117	48,117	9,551	9,551
N of male self-employed	384,148	384,148	101,021	101,021	12,269	12,269
N	6,562,565	6,562,565	1,642,645	1,643,596	355,411	355,651
R^2	0.102	0.000	0.0478	0.0477	0.0317	0.0288

Note: Additional control variables are number of children below 18 years old, age, age squared, dummy for attained bachelor degree, number of household members, and dummies for year and county. */**/*** indicates significance at the 10/5/1% level.

that the shift in employment status among females affects donating behavior more than among male self-employed. Apart from the one-adult households, these effects are even significant. In other words, when using a fixed effect approach, it continues to hold that those households where the woman is self-employed seem to underreport more than when the self-employed are male. Our preferred estimate is column 2 of Table 3, which shows that self-employed women underreport 20% of the household income, while men underreport about 5%.[23]

Since the degree of underreporting might depend on more than gender, it is likely that the relationship we find above reflects underlying differences concerning other dimensions. For instance, if self-employed women work in more tax evasion-ridden sectors, the gender differences we find will be caused by differences in sector affiliation. In Table 4, we go further and show results from a regression including nine sector dummies interacted with the self-employment and male self-employment dummies. This way, we can study how the shifts depend on sector affiliation.

As our interest is in the gender dimension, we report in Table 4 that only the estimated coefficients associated with the male self-employment dummy interacted with the sector dummy (see Table 7 in the appendix for all estimates). Thus, a negative sign indicates that self-employed men in this sector underreport less than self-employed women working in the same sector. In the first two columns, we see that self-employed women underreport significantly more than men for six sectors. However, three sectors (construction, transport/storage, and accommodation) come up with a positive sign indicating more male underreporting. When we restrict the sample to at least one positive donation during the period, two turns slightly significantly different from zero at the 10% level.

When we restrict the sample even further, turning to households consisting of only one adult, the impression remains mostly the same. Among one-adult households, we find one sector with significantly more underreporting among males: human health and social work

[23]Percentage underreporting is calculated $p = (1 - 1/k) \times 100$.

Table 3: Association between Self-Employment and Charitable Gifts, Fixed Effects

	(1)	(2)	(3)
	All		Single
	No gift conditioning	At least one gift	At least one gift
Log household income	0.197***	1.01***	0.557***
	(0.003)	(0.009)	(0.018)
Self-employed	0.107***	0.223***	0.060
	(0.010)	(0.023)	(0.058)
Male self-employed	–0.083***	–0.170***	–0.034
	(0.012)	(0.029)	(0.078)
k female	1.72	1.25	1.11
	(0.085)	(0.029)	(0.116)
k male	1.13	1.05	1.05
	(0.038)	(0.018)	(0.098)
pval test $k_f = k_m$	0.000	0.000	0.667
k all	1.29	1.12	1.08
	(0.037)	(0.016)	(0.075)
pval test $k = 1$	0.000	0.000	0.301
Controls	YES	YES	YES
Household FE	YES	YES	YES
N of female self-employed	142,822	63,335	13,254
N of male self-employed	384,148	139,970	21,065
N	6,562,565	2,309,224	562,130
R^2	0.0245	0.069	0.0389

Note: Additional control variables are number of children below 18 years old, age, age squared, dummy for attained bachelor degree, number of household members, and dummies for year and county. */**/*** indicates significance at the 10/5/1% level.

activities. However, note that the sign is reversed compared to the estimates for this sector using the less restricted samples. Hence, when exploring the potential driver of the difference in underreporting depending on sector affiliation, we still find support for higher underreporting among female self-employed, even within most sectors.

In Figure 5 we present event study equivalent to our fixed effects estimations based on Callaway and Sant'Anna (2021) estimator for staggered treatment assignment. Here we see clearly the same tendency that self-employed women when turning into self-employment drive the results.

Finally, we explore different sample restrictions in Table 9 to see if our impression of the relationship between gender and underreporting still holds. Here we divide the whole sample into four sub-samples depending on the education of the primary income earner (or the self-employed person, if it is a self-employed household) and household income level. Then we carry out separate fixed effects regressions for these sub-samples. Still, we are faced with estimates implying more underreporting of females than males, and these effects are significant in all sub-samples. Therefore, the results seem driven by something other than education level or household income.

Table 4: Association between Self-Employment and Charitable Gifts by Sector

	(1)	(2)	(3)
	All		Single
	No gift conditioning	At least one gift	At least one gift
Log household income	0.199***	0.987***	0.123***
	(0.003)	(0.009)	(0.005)
Male SE x Agriculture	–0.111**	–0.247*	–0.114
	(0.050)	(0.130)	(0.080)
Male SE x Industrial sector	–0.170***	–0.405***	0.002
	(0.045)	(0.112)	(0.078)
Male SE x Construction	0.086	0.201	0.115
	(0.058)	(0.167)	(0.125)
Male SE x Wholesale and retail	–0.105***	–0.309***	–0.199***
	(0.031)	(0.082)	(0.059)
Male SEx Transport and storage	0.092	0.292*	–0.063
	(0.059)	(0.163)	(0.091)
Male SE x Accomodation and food service activites	0.081	0.298*	–0.068
	(0.053)	(0.161)	(0.092)
Male SE x Professional services	–0.070***	–0.152***	–0.022
	(0.016)	(0.039)	(0.023)
Male SE x Human health and social work activites	–0.060**	–0.100*	0.064*
	(0.024)	(0.057)	(0.036)
Male SE x Arts, entertainment and recreation	–0.122***	–0.211**	0.043
	(0.039)	(0.089)	(0.045)
Controls	YES	YES	YES
Household FE	YES	YES	YES
N	6,750,704	2,389,815	362,852
R^2	0.0245	0.0685	0.021

Note: Additional control variables are number of children below 18 years old, age, age squared, dummy for attained bachelor degree, number of household members, and dummies for year and county. */**/*** indicates significance at the 10/5/1% level.

5 Mechanism

In the standard Allingham and Sandmo (1972) model of tax evasion, for two groups to have different evasion rates, they must face different detection probability or penalty rates, and hence different expected utility from evasion. As the decision of how much to evade is based on the expected utility, the taxpayers must weigh the benefit (extra income) against costs (risk of being caught times the penalty rate). Table 5 demonstrates that self-employed women indeed experience lower penalty probabilities on both an annual and cumulative basis by little more than half that of men. The penalty they face, as a percentage of their business income, is also lower than that of men.

Unfortunately, we do not have access to audit information, and cannot confirm if self-employed women are audited less. If women are audited equally much as men they could of course have lower penalty rates if they evade less than men or if they evade in ways that are less easily detected in the controls done by the tax administration. Therefore, information about audit rates is not necessarily enough information to know if women evade less than men and our indirect measure of income, through measuring consumption, approaches the problem in a different manner and hence can provide additional information. As we find a lower penalty probability for self-employed women, this suggests that, even if the propensity to evade taxes is similar across groups, they encounter different expected utility levels from engaging in actual evasion. Therefore, this finding is consistent with our observation of a higher evasion rate among self-employed women. Interestingly, Hebous et al. (2023) finds using random audits of Norwegian taxpayers that women are more likely to be found non-compliant of their self-reported deductions. This substantiates our finding that women are not unlikely to evade taxes.

One could argue that women have a stronger risk aversion than men and we would therefore expect them to have a lower tax evasion rate. Although this is generally true in the broader population, it is less evident if this transfers to self-employed women.[24] Since

[24]See for instance, Croson and Gneezy (2009) for a review of gender differences risk preference.

Table 5: Tax Penalties by Gender and Employment Type

	(1) SE Female	(2) SE Male	(3) WE
Got Penalty, Yearly	0.0110	0.0254	0.0010
	(0.104)	(0.157)	(0.031)
Got Penalty, 2012-2016	0.0246	0.0539	0.0050
	(0.155)	(0.226)	(0.070)
Penalty Tax, NOK	25,628	30,403	6,652
	(36,748)	(53,691)	(15,912)
Penalty Tax/Business Inc.	0.082	0.103	12.760
	(0.052)	(1.807)	(248)
Observations	142,822	384,148	6,089,916

mean coefficients; sd in parentheses

Note: This table presents the comparison of tax penalty incidences and amounts between self-employed (SE) females, self-employed (SE) males, and wage earners (WE) in Norway. It is divided into four key metrics: the yearly likelihood of receiving a penalty, the likelihood of receiving a penalty over a five-year period (2012-2016), the average penalty amount in Norwegian Kroner (NOK), and the ratio of penalty tax to business income. Standard deviations are provided in parentheses below each mean coefficient. The data illustrates notable differences in penalty occurrences and amounts across genders and employment types.

self-employment also involves substantial risk, individuals who opt for it must possess a certain level of risk tolerance. While fewer women pursue self-employment, those who do are not necessarily less inclined to take risks compared to their male counterparts. The lower number of women entering self-employment supports the idea that there is a more significant self-selection process within this population. Hence, it is likely that self-employed women are equally inclined to evade taxes as self-employed men.

Why do self-employed women face a lower probability of a penalty tax? One potential explanation could be the more lenient treatment of women within the judicial system (Starr, 2015; Mustard, 2001). Historically, female participation in the formal labor market has been low. As women increasingly gained access to similar professional spheres as men, they started to encounter similar opportunities for tax evasion. If women had fewer occasions to evade, they should face lower penalty probabilities as they would have been less likely to evade taxes.

Crime research has shown a narrowing gender gap in criminal offenses, following women's increased labor market participation, indicating a relative increase in women's involvement in crime (Beatton et al., 2018). Still, the judicial system has been documented to treat women more leniently, where women face less strict punishment for their criminal involvement when prosecuted (Bindler and Hjalmarsson, 2020).

This favorable treatment might have inadvertently influenced the predictive models used by tax administrations to flag potential tax evaders. A large literature has demonstrated that machine learning algorithms have an inherent bias if the training data includes bias (Obermeyer et al., 2019; Ludwig and Mullainathan, 2021). Since tax authorities frequently use predictive machine learning algorithms trained on historic data to detect errors in tax returns (Smedsvik and Christophersen, 2018; Løyland et al., 2019), these algorithms might incorporate a gender bias. This could imply that the algorithms unintentionally treat women differently, leading to a lower penalty probability for them.

One thing to note is that higher probability of detection leads to lower observed evasion among self-employed men through two channels. Firstly, as more men are caught evading they mechanically have a lower observed evasion in our data as the income data used in our analysis to predict true income is corrected for evasion found in audits (double check this is in fact correct about our disposable income variable). Secondly, the higher chance of getting caught ought effect the perceived likelihood of penalty and therefore influence the choice of evasion.

6 Conclusion

Using a rich administrative data set consisting of information on charitable donations for the Norwegian population, we have used the so-called expenditure approach proposed by Pissarides and Weber (1989) to estimate underreporting of income among self-employed and explored how this depends on gender. We estimate that on average self-employed households

underreport their income by 11%, driven by families with a female self-employed, who underreport 20% of their household income, while male self-employed underreport 5% of household income. In contrast to several other studies using this method, we rely on large-scale administrative data for several years, making it possible to construct panels and use fixed effects regression. The strength of this is that we can control for innate differences preferences for charitable giving between self-employed and wage earners and between the genders (Nygård and Thoresen, 2023). Moreover, by using the information on sector affiliation, we confirm that this holds even within each sector. Hence, it supports the notion that the difference in tax evasion is driven by gender differences and not evasion patterns across a gender divided labor market.

Further, we also carried out tests concerning education and income level. While several studies suggest that males are more lenient towards corruption and tax evasion than females, for instance, explored by Kastlunger et al. (2010), our study does not seem to find evidence to support this. On the contrary, in our study, females are more inclined to underreport income than males in all our spesifications. We substantiate our analysis with information about penalty probability, where we show that self-employed women face lower rates than self-employed men. Self-employed women both face lower probability of paying a penalty tax and lower levels of penalty tax as a fraction of their business income. This could reflect that women are more favorably treated in tax enforcement and potentially explain the pattern of evasion we observe.

Although we cannot definitely answer why this somewhat surprising tendency of higher evasion rates among self-employed women exists, it can have important policy implications for tax enforcement, where women should not be disregarded as potential tax evaders. Tax evasion is costly, and its innate invisibility in official data sources leads to high demands for techniques and methods. Intriguing designs and clever use of data can be the solution to estimating the hidden economy. We support (Slemrod and Weber, 2012), who advocate for a renewed call for creativity in tax evasion, and that social scientists must be inventive in

their search for traces of true income.

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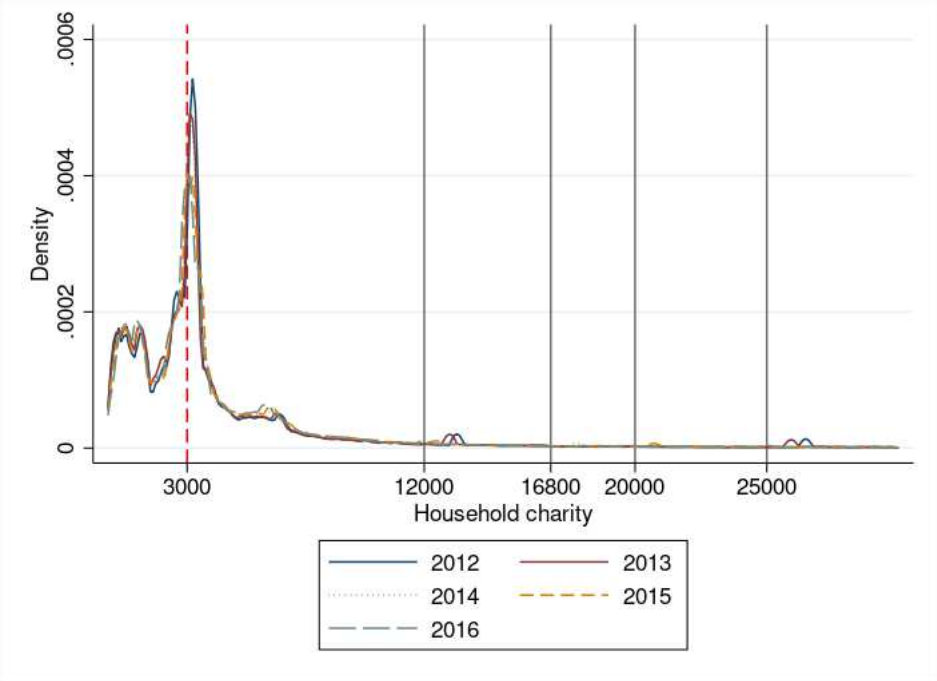
A Appendix

Table 6: Development of maximum charitable deduction

Year	Max deductible amount
2012	NOK 12,000
2013	NOK 12,000
2014	NOK 16,800
2015	NOK 20,000
2016	NOK 25,000

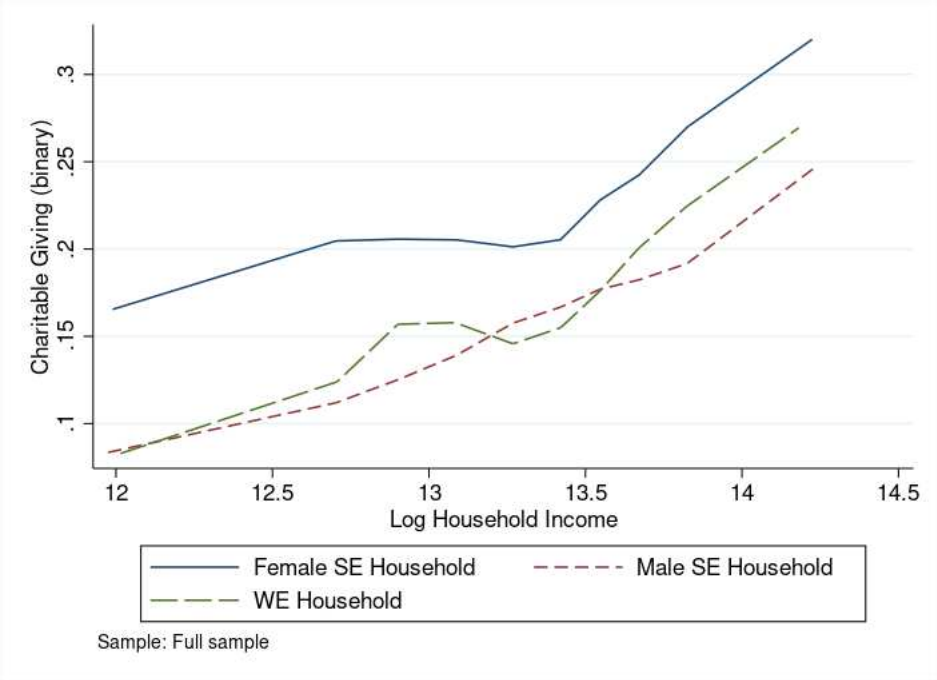
Note: This table shows the development of deductible amounts from general income if giving to charity. Thus the amount given to charity is deducted from personal income before taxes get calculated. The deductibility of charitable giving, consequently, works as a subsidy on giving. The exchange rate at the end of 2013 USD 1 = NOK 6, such that the maximal tax-deductible amount was approximately USD 2000.

Figure 1: Household charitable giving by year, below NOK 30,000



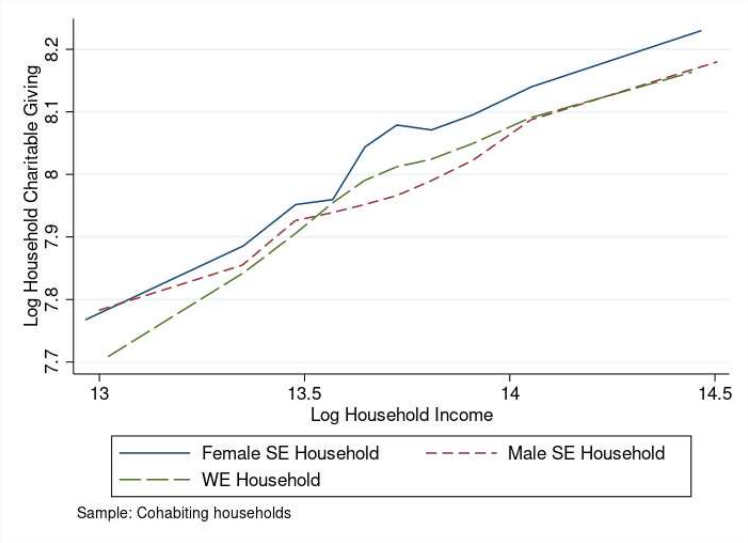
Notes: Density of household charitable giving. Solid vertical lines in gray indicate maximum tax deductible amounts for given years, while dotted red line indicate the largest spike in the data.

Figure 2: Choice of charitable giving and log disposable income, 2012-2016

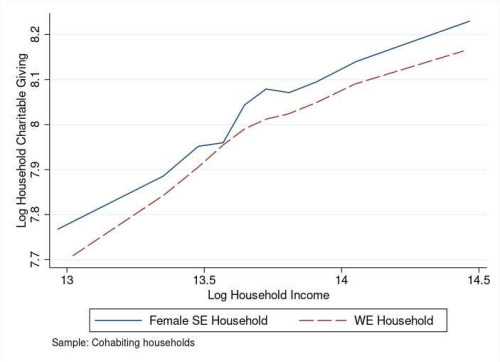


Notes: The figure display the extensive margin of charitable giving along the household income schedule, in logs, broken down into three household categories: Wages earning household, male self-employed households and female self-employed households. From this we see a clear shift upwards for the female self-employed households.

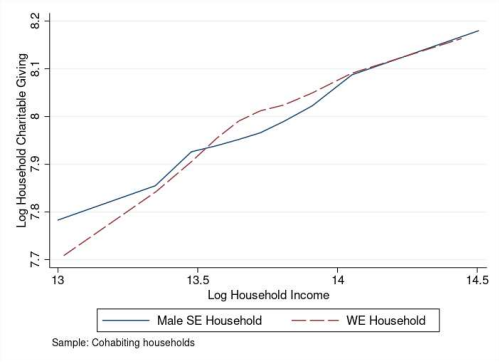
Figure 3: Charitable giving and log disposable income for cohabiting households, 2012-2016



(a) Female SE, male SE and WE households

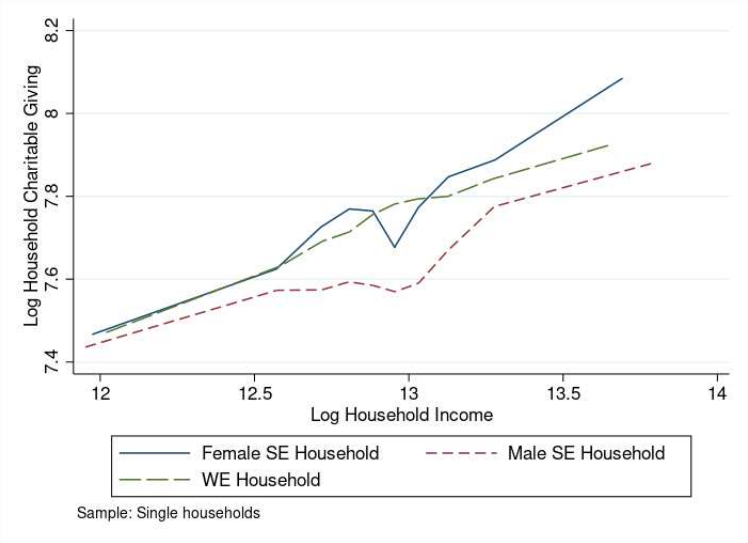


(b) Female SE and WE households

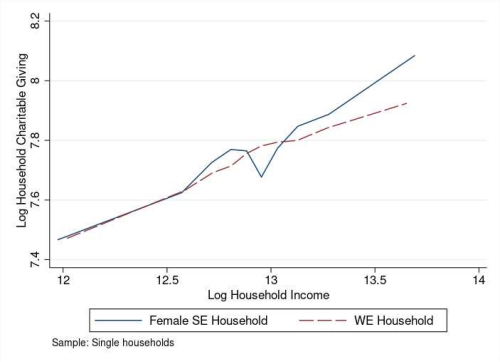


(c) Male SE and WE households

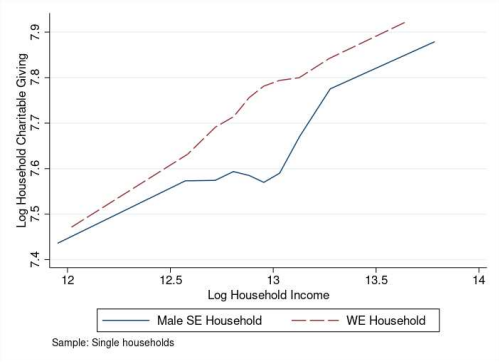
Figure 4: Charitable giving and log disposable income for single households, 2012-2016



(a) Female SE, male SE and WE households



(b) Female SE and WE households



(c) Male SE and WE households

Table 7: Association between self-employment and charitable gifts by sector.

	(1)	(2)	(3)
	All		Single
	No gift conditioning	At least one gift	At least one gift
Log household income	0.199***	0.987***	0.123***
	(0.003)	(0.009)	(0.005)
SE x Agriculture	0.084*	0.157	0.024
	(0.046)	(0.120)	(0.068)
Male SE x Agriculture	–0.111**	–0.247*	–0.114
	(0.050)	(0.130)	(0.080)
SE x Industrial sector	0.140***	0.299***	–0.054
	(0.041)	(0.101)	(0.067)
Male SE x Industrial sector	–0.170***	–0.405***	0.002
	(0.045)	(0.112)	(0.078)
SE x Construction	–0.059	–0.119	–0.132
	(0.057)	(0.162)	(0.120)
Male SE x Construction	0.086	0.201	0.115
	(0.058)	(0.167)	(0.125)
SE x Wholesale and retail	0.082***	0.221***	0.089**
	(0.025)	(0.066)	(0.043)
Male SE x Wholesale and retail	–0.105***	–0.309***	–0.199***
	(0.031)	(0.082)	(0.059)
SE x Transport and storage	–0.065	–0.160	0.066
	(0.056)	(0.154)	(0.077)
Male SEx Transport and storage	0.092	0.292*	–0.063
	(0.059)	(0.163)	(0.091)
SE x Accomodation and food service activites	–0.002	0.029	0.020
	(0.041)	(0.124)	(0.062)
Male SE x Accomodation and food service activites	0.081	0.298*	–0.068
	(0.053)	(0.161)	(0.092)
SE x Professional services	0.102***	0.193***	0.013
	(0.013)	(0.031)	(0.016)
Male SE x Professional services	–0.070***	–0.152***	–0.022
	(0.016)	(0.039)	(0.023)
SE x Human health and social work activites	0.114***	0.188***	–0.005
	(0.016)	(0.037)	(0.021)
Male SE x Human health and social work activites	–0.060**	–0.100*	0.064*
	(0.024)	(0.057)	(0.036)
SE x Arts, entertainment and recreation	0.161***	0.300***	0.005
	(0.030)	(0.068)	(0.030)
Male SE x Arts, entertainment and recreation	–0.122***	–0.211**	0.043
	(0.039)	(0.089)	(0.045)
Controls	YES	YES	YES
Household FE	YES	YES	YES
N	6,750,704	2,389,815	362,852
R^2	0.0245	0.0685	0.021

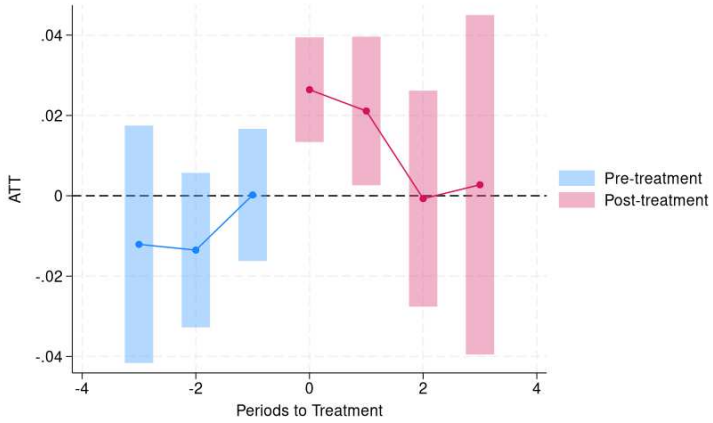
Note: Additional control variables are number of children below 18 years old, age, age squared, dummy for attained bachelor degree, number of household members, and dummies for year and county. */**/*** indicates significance at the 10/5/1% level.

Table 8: Association between self-employment and charitable gifts.

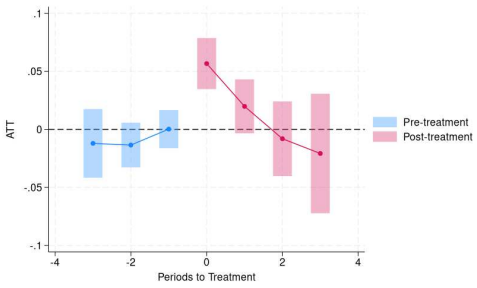
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	10%	25%	30%	40%	50%	60%	70%	80%	90%	100%
k female	1.23	1.26	1.26	1.29	1.29	1.35	1.33	1.34	1.31	1.22
	(0.027)	(0.033)	(0.034)	(0.037)	(0.039)	(0.042)	(0.044)	(0.046)	(0.048)	(0.068)
k male	1.04	1.06	1.05	1.06	1.08	1.10	1.10	1.08	1.09	1.04
	(0.017)	(0.020)	(0.021)	(0.022)	(0.023)	(0.024)	(0.025)	(0.024)	(0.025)	(0.028)
pval test $k_f = k_m$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
k all	1.10	1.12	1.12	1.13	1.14	1.18	1.17	1.15	1.15	1.07
	(0.015)	(0.017)	(0.018)	(0.019)	(0.020)	(0.021)	(0.022)	(0.022)	(0.023)	(0.026)
pval test $k = 1$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Household FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.0685	0.0685	0.0684	0.0685	0.0685	0.0685	0.0685	0.0685	0.0684	0.0684
N	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815	2,389,815

Note: Additional control variables are number of children below 18 years old, age, age squared, dummie for attained bachelor degree, number of household members, and dummies for year and county. Sample: Households with at least one charitable gift during 2012-2016.

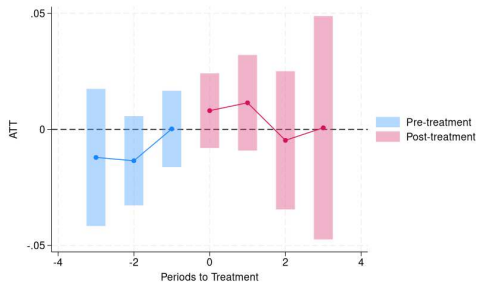
Figure 5: Event Study Estimation using Callaway and Sant'Anna (2021) Estimator



(a) All households



(b) Female SE and WE households



(c) Male SE and WE households

Table 9: Association between Self-Employment and Charitable Gifts.

	(1)	(2)	(3)	(4)
	Education		Household Disp. Inc.	
	Low	High	Low	High
Log household income	0.999***	0.919***	0.866***	0.614***
	(0.015)	(0.012)	(0.016)	(0.016)
Self-employed	0.216***	0.162***	0.273***	0.122***
	(0.047)	(0.029)	(0.047)	(0.028)
Male self-employed	–0.157***	–0.092**	–0.168***	–0.072**
	(0.053)	(0.039)	(0.060)	(0.035)
k female	1.24	1.19	1.37	1.22
	(0.058)	(0.038)	(0.074)	(0.057)
k male	1.06	1.08	1.13	1.08
	(0.029)	(0.030)	(0.049)	(0.037)
pval test $k_f = k_m$	0.005	0.019	0.006	0.044
k all	1.10	1.13	1.22	1.13
	(0.026)	(0.024)	(0.042)	(0.032)
pval test $k = 1$	0.000	0.000	0.000	0.000
Controls	YES	YES	YES	YES
Household FE	YES	YES	YES	YES
N of female self-employed	23,045	40,290	18,997	44,338
N of male self-employed	86,626	53,344	39,334	100,636
N	1,093,441	1,215,783	771,443	1,537,781
R^2	0.0598	0.0718	0.0554	0.0498

Note: Additional control variables are number of children below 18 years old, age, age squared, dummy for attained bachelor degree, number of household members, and dummies for year and county. */**/*** indicates significance at the 10/5/1% level. Sample includes those who give at least one gift during 2012-2016. Education refers to whether the main income earner has a bachelor degree. If the household is self-employed it is the education of the self-employed that dominates. The household income level refers to whether a household have above or below the median disposable income in the sample.