

The effect of leaving sex work on well-being: A causal mediation analysis

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Abstract

BACKGROUND: The existing literature linking sex work to poor well-being and mental health mainly focuses on high-income countries contexts and highlights the strong correlation between sex work and depression. However, existing studies are cross-sectional and fail to account for the fact that women could have low well-being before entering sex work. For instance, it is documented that women abused during childhood are more likely to start sex work and to have low level of well-being. In addition to the unclear causal relationship between sex work and well-being, there is currently no evidence regarding the channels through which sex work may deteriorate well-being. Identifying those factors could allow developing effective interventions to improve well-being of sex workers. We investigate such question in Senegal, where sex work is regulated by a public health but where the majority of sex workers prefer to stay illegal since sex work is morally condemned by society members.

OBJECTIVE: The main objective of the paper is to estimate the effect of leaving sex work on well-being and to identify transmission channels.

METHOD: We use a unique longitudinal data set from 441 sex workers surveyed in 2015 and 2017. Between those two waves, 14% of sex workers ($n = 62$) left sex work. We use a matched difference-in-differences controlling for sex workers fixed effects to estimate the effect of quitting sex work on well-being. We control for shocks that occurred in the last two years and that are likely to influence both the probability of quitting sex work and well-being. We then perform a causal mediation analysis to investigate the direct and indirect effects of quitting sex work on subjective well-being by using linear structural equation modeling. Given that the identification strategy is based on the sequential ignorability assumption, we further test the robustness of our results by implementing a sensitivity analysis.

RESULTS: We find that quitting sex work significantly increases subjective well-being. Sub-groups analysis shows that women who benefit the most from leaving sex work are those who have a longer experience in sex work, suffered from client violence, had a lot of clients, had occasional clients, were not registered and fear discrimination from relatives because of their sex work activity. Causal mediation analysis shows that the increase in well-being is mainly explained by an increase in self-esteem and not by a reduction in violence exposure.

CONCLUSION: Our study confirms the negative effect of sex work on well-being and highlights the importance to reduce time spent in sex work by developing interventions to quit sex work. It also highlights the need for psychological services for sex workers.

KEY WORDS: well-being, Senegal, sex work, causal mediation analysis

JEL CODES: I3, C0.

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1 Introduction

With a HIV prevalence in the general population of 0.7%, Senegal is one of the African countries with the lowest HIV prevalence. Female sex workers (FSWs) in Senegal are 9 times more likely to be infected with HIV/AIDS than the general population with an HIV/AIDS prevalence of 6.6% (APAPS and IRESSEF, 2015). However, such prevalence is low if compared to the prevalence of female sex workers in other low prevalent African countries (24.2% in Mali and 17% in Niger). There is evidence supporting that this low HIV prevalence results from the registration policy for sex workers (Ito et al., 2018).

Since 1969, Senegalese female sex workers aged more than 21 years old have been compelled to register with a health centre and to attend routine health visits in order to be tested and treated for STIs and to receive free condoms (Chersich et al., 2013). An official registration card is issued (called “*carnet sanitaire*”) to keep a record of the visits made to the appointed health centre. If sex workers are tested positive for any STI, with the exception of HIV, the card is kept at the health centre during the whole course of treatment. Sex workers who fail to present an up-to-date registration card (either because they are not registered, do not comply to routine visits or are currently being treated for STI), may incur a prison sentence of between two and six months (cf. Code pénal articles 319/ 325). Despite its legal status, prostitution is morally condemned by society members in Senegal and keeping sex work secret is a central preoccupation of Senegalese sex workers. Becoming a registered sex worker increases the probability that the sex work activity will be discovered mainly because sex workers need to carry and hide their concealed registration card while at home. As a result, there is evidence that registration leads to low subjective well-being and that overall well-being and mental health of sex workers in such setting is low (Ito et al., 2018).

In addition to improving well-being, developing interventions that help sex workers to quit sex workers can have a significant impact on HIV transmission in concentrated epidemics. It is widely acknowledged that the time spent in sex work is strongly associated with HIV infection (Scorgie et al., 2012), justifying that in Senegal oldest registered sex workers are found more likely to be infected than younger ones (Wang et al., 2007).

There is extensive literature linking sex work to poor well-being and mental health. Most studies focus on high-income countries and show that sex work is associated with high rate of depression, post-traumatic stress disorder and high suicide rate (Farley and Barkan, 1998; Farley et al., 2004; Rössler et al., 2010; Roxburgh et al., 2006; Yuen et al., 2016). There is less evidence of relationship between sex work and mental health in low and middle countries. In Liuzhou, China, 39% of respondents were severely or extremely severely depressed, and 26.8% had attempted suicide in the past 6 months (Gu et al., 2014). There is evidence in the literature that sex work deteriorates self-image (Brewis and Linstead, 2000), self-identity (Brewis and Linstead, 2000) and that sex workers feel helplessness, entrapment and insecure (Wong et al.,

2006). In addition, sex work increases strongly the risk of experiencing violence (from clients and police officers). Sex workers experience various forms of violence such as physical assault or sexual violence (Farley and Barkan, 1998). This element explains that street sex workers often have lower mental health and well-being than sex workers operating in brothels.

The main limitation of those studies is that they are cross-sectional and fail to account for the fact that sex workers might have had low level of subjective well-being before entering sex work. It is documented for instance that a considerable proportion of female sex workers have experienced abuse during childhood (Ulibarri et al., 2009, 2013). A cohort study of drug-using youth reported that youths who were sexually abused during childhood were 3.7 times more likely to see sex later on and those who were emotionally abused were 2.2 times more likely to sell sex (Stoltz et al., 2007). Since childhood maltreatment have long lasting impact (Danese et al., 2008), comparing well-being of sex workers and non sex workers cannot provide robust evidence of the causal effect of sex work on well-being. In addition to abuse during childhood, other traumatic events can lead to sex work entry. In Senegal, most sex workers enter sex worker as a result of divorce, which can lead to a direct decrease in mental health level, especially in a country where women rely on marriage to achieve economic security. Similar fact is also observed in high-income countries. In Australia for instance, 99% of sex workers surveyed had experienced at least one traumatic event before entering sex work.

Another issue is that the decision to leave sex work cannot be considered exogenous. Sex workers with higher level of well-being may be in a better position to exit sex work. This simultaneous relationship between well-being and sex work exit may lead to overestimating the effect of leaving sex work on well-being.

In addition to the unclear causal relationship between sex work and well-being, there is currently no evidence regarding the channels through which sex work deteriorates well-being. Identifying those factors would allow to develop effective interventions to improve well-being of sex workers.

The paper aims to contribute to this literature by generating the first causal relationship between sex work and well-being. It uses a unique longitudinal data set from 441 sex workers followed over two years. Over this period, 14% of sex workers ($n = 62$) left sex work. We studied the determinants of quitting sex work, estimate the effect of leaving sex work on well-being and identify any transmission channels. We find that the main causes for leaving sex work are fear of discrimination and marriage. Based on a difference-in-differences estimation, we find that leaving sex work leads to a high increase in subjective well-being. Using causal mediation analysis, we find that this increase in well-being is not explained by changes in violence or in economic conditions but is partially explained by an increase in self-esteem.

The paper is organised as follows. Section 2 presents the theoretical framework while section 3 explains the empirical strategy used to study the determinants and effects of leaving sex work on individuals' well-being and the causal mediation analysis to investigate the potential channels.

Section 3 presents the data collected and descriptive statistics. Results on heterogenous effect of quitting sex work and of the causal mediation analysis are displayed in section 4. Finally, section 5 discusses the implications for public policies.

2 Theoretical framework

2.1 Determinants of quitting sex work

In this paper we investigate the determinants of quitting sex work. To do so, we consider the following explanatory variables: (i) sociodemographic information collected in 2015 (age, education, number of children, household size, never married, self-esteem, fatalism), (ii) individual preferences (big five (agreeableness), preference for the future, risk aversion), (iii) family pressure in 2015 (fear of being discriminated, father still alive), (iv) past individual experience (sexually abuse as a child), (v) sex work experience as of 2015 (months in sex work in Dakar, registered with authorities, number of clients per week, anal/oral sex with last client, violence from a client) and (vi) exogenous shock experienced between the two survey waves (family rupture, death of a family member, negative income shock, marriage, negative health shock, start new activity).

All these dimensions represents either barriers or facilitators to exit prostitution and are summarised in Figure 1.

2.2 Direct and indirect effects of quitting sex work on well-being

In a second step, we want to investigate the impact of quitting sex work on well-being. Several channels may play a role in this process. On one hand, an improvement of well-being may occur following the decision to quit sex work through an improvement of self-esteem or a lower exposure to violence from either clients or police officers. However, on the other hand, if sex work revenues are not replaced by other sources of income, quitting sex work may deteriorate the individual's well-being. These potential channels are presented in Figure 1 and will be investigated in the empirical analysis.

[Insert Figure 1 here]

3 Methods

3.1 Identifying the (heterogenous) effect of quitting sex work

We study the effect of quitting sex work on well-being (life satisfaction in general and happiness) through two different approaches.

1. *Propensity score matching (PSM) analysis*: we matched women who quit sex work with still active FSWs based on pre-treatment characteristics collected in 2015 and investigate the impact of quitting sex work on both the level and the variation of well-being observed.

2. *First difference (FD) analysis*: we take advantage of the two survey waves to study the effect of quitting sex work (Q_i) on the variation of well-being ($\Delta y_{it} = y_{i2017} - y_{i2015}$) controlling for shocks that occurred in the last two years (S_i) and that are likely to influence both the probability of quitting sex work and the individual well-being. This methodology enables us to control for any time-invariant characteristics which could bias our estimate of interest given that these variables disappear once we compute first differences. β_1 is our coefficient of interest.

$$\Delta y_{it} = \beta_0 + \beta_1 Q_i + \beta_2 S_i + \Delta \varepsilon_{it} \quad (1)$$

In addition, we investigate potential heterogenous effects by running the same specification by sub-groups and studying whether the coefficients obtained are significantly different from one another.

3.2 Causal mediation analysis

3.2.1 Identifying causal mediation effect

The causal mechanisms is defined by Imai (2011) as “a process whereby one variable T causally affects another variable Y through an intermediate variable or a mediator that operationalizes the hypothesized mechanism”.

In our study, if we consider as potential channel self-esteem, this would mean that the individual’s self-esteem represents the mediator (M) through which the fact of quitting sex work (T) causally affects the individual’s well-being (Y). The later refers to the causal mediation effect or the indirect effect. Other causal mechanisms, such as exposure to violence or level of revenues, may also play a role and will be identified globally in the direct effect.

Formally,

- let $M_i(t)$ stands for the potential value of individual’s self-esteem for unit i under the treatment status $T_i = t$
- let $Y_i(t, m)$ stands for the potential outcome that would result if the treatment and mediating variables equal t and m

Adopting a counterfactual approach, the unit treatment, indirect and direct effects as well as the average direct and average indirect effect are defined as:

- total unit treatment effect: $\tau_i \equiv Y_i(1, M_i(1)) - Y_i(0, M_i(0))$
- indirect effect or causal mediation effect: $\delta_i(t) \equiv Y_i(t, M_i(1)) - Y_i(t, M_i(0))$ for each treatment status $t = 0, 1$
- In our case, i is a FSW. The indirect effect $\delta_i(1)$ corresponds to the difference between the observed well-being ($Y_i(1, M_i(1))$) and the counterfactual well-being $Y_i(1, M_i(0))$.

In other words, the FSW's well-being would have experienced if she had self-esteem level she would have had if not quitting sex work.

- direct effect (all other mechanisms) : $\zeta_i(t) \equiv Y_i(1, M_i(t)) - Y_i(0, M_i(t))$
 - In our case, $\zeta_i(1)$ corresponds to the difference in the well-being of FSW i when quitting and remaining in the sex work holding the level of self-esteem that would be realised if the FSW has quit sex work.
- average causal mediation effect (ACME) : $\bar{\delta}(t) \equiv E(\delta_i(t)) = E\{Y_i(t, M_i(1)) - Y_i(t, M_i(0))\}$
- average direct effect (ADE) : $\bar{\zeta}(t)$

The standard approach to estimate mediating effects, when the outcome and mediator variables are continuous, is based on a set of linear equations (Imai, 2011; Imai et al., 2010a,b). We adapt the linear structural equation model to first difference estimations.

$$\Delta Y_i = \alpha_1 + \beta_1 Q_i + \xi_1^T S_i + \Delta \varepsilon_{i1} \quad (2)$$

$$\Delta M_i = \alpha_2 + \beta_2 Q_i + \xi_2^T S_i + \Delta \varepsilon_{i2} \quad (3)$$

$$\Delta Y_i = \alpha_3 + \beta_3 Q_i + \gamma \Delta M_i + \xi_3^T S_i + \Delta \varepsilon_{i3} \quad (4)$$

ΔY_i refers to a change in subjective well-being, Q_i indicates whether the FSW quit sex work or not, ΔM_i refers to the change in self-esteem and S_i to any shock experienced between 2015 and 2017 that could impact both the treatment and outcome variables.

3.2.2 Sensitivity analysis

The causal mediation analysis is based on the sequential ignorability assumption (Imai et al., 2010b) presented below.

$$\{Y_i(t', m), M_i(t)\} \perp T_i | X_i = x, \quad (5)$$

$$Y_i(t', m) \perp M_i(t) | T_i = t, X_i = x, \quad (6)$$

Equation 5, called the exogeneity assumption, means that treatment is independent of outcomes and mediators. This assumption is verified in observational studies if one can assume that treatment is random after controlling for pre-treatment confounders. In our case study, this means that we must assume that quitting sex work is random once we adjust for pre-treatment covariates.

The second part of the sequential ignorability assumption (equation 6) means that observed mediator is independent of outcomes given the actual treatment status and pre-treatment confounders. However, this assumption is not directly testable. In order to bypass this issue,

Imai et al. (2010b) and Imai et al. (2010a) propose a sensitivity analysis based on the correlation between $\Delta\varepsilon_{i2}$, the error for the mediator model (equation 3) and $\Delta\varepsilon_{i3}$ the error for the outcome model (equation 4). They denote ρ the correlation between the two error terms. If the sequential ignorability assumption holds all relevant pre-treatment confounders have been conditioned on and ρ equals zero. Therefore, non-zero values of ρ imply departures from the sequential ignorability assumption. In other words, there exist some hidden confounders that are biasing the estimation of the average causal mediated effect (ACME). ρ can serve as a sensitivity parameter, i.e. larger values (in absolute terms) of ρ represent larger violation of the sequential ignorability assumption. The interpretation of the magnitude of this correlation may be difficult. An alternative approach proposed by Hicks and Tingley (2011) is to express the ACME as a function of the coefficients of determination (R^2) of the mediator and outcome models which will capture how important a confounder must be to explain the mediator or outcome variable. If there is an omitted confounder U_i then the error term will be a function of this confounder yielding a decomposition of the error term $\Delta\varepsilon_{i2} = \lambda_2 U_i + \epsilon'_{i2}$ for the mediator model and $\Delta\varepsilon_{i3} = \lambda_3 U_i + \epsilon'_{i3}$ for the outcome model.

In this set-up ρ is either:

1. Proportion of residuals variance explained by U_i

$$R_M^{2\star} \equiv \frac{Var(\epsilon'_{i2})}{Var(\Delta\varepsilon_{i2})} \text{ and } R_Y^{2\star} \equiv \frac{Var(\epsilon'_{i3})}{Var(\Delta\varepsilon_{i3})}$$

2. Proportion of total variance explained by U_i

$$\tilde{R}_M^2 \equiv \frac{Var(\Delta\varepsilon_{i2}) - Var(\epsilon'_{i2})}{Var(M_i)} \text{ and } \tilde{R}_Y^2 \equiv \frac{Var(\Delta\varepsilon_{i3}) - Var(\epsilon'_{i3})}{Var(Y_i)}$$

The relationship between ACME and R^2 parameters can then be expressed as the product of R^2 parameters for the mediator and outcome variables.

4 Sample and descriptive statistics

4.1 Data collected

A survey among female sex workers (FSWs) working in the region of Dakar has been implemented in 2015 and 2017 with the collaboration of the Senegalese Ministry of Health leading to the construction of a unique panel dataset of 441 FSWs. Information on sociodemographic characteristics, sex work activity (registration status, intensity of sex work activity, revenues, exposure to violence) as well as self-esteem and subjective well-being data were gathered in both survey waves.

Wave 1 took place in June 2015. At that time, we collected information on 651 FSWs. In August 2017, roughly two years after the first survey wave, we attempted to follow-up all participants. We were able to re-interview 441 sex workers (67% of participants from Wave 1) out of which 62 respondents have quit sex work in the meantime.

4.2 Descriptive statistics

In 2015, 441 active FSWs were interviewed in the region of Dakar. They were reinterviewed in 2017 and 62 of them managed to quit sex work between these two survey waves.

Among women who left sex work, 36 women stopped this activity more than a year before Wave 2, 15 more than six months before it and 11 less than six months before they were re-interviewed. 20 women exit prostitution after (re)marriage and 16 others declare they started a new activity. In addition, 10% of these former FSWs declare they still consider themselves as a sex worker and 16% declare they will or may come back to sex work one day.

Among FSWs who were still active in 2017, 32% of them declare they have tried to quit the sex work business in the past two years.

We will investigate the impact of quitting sex work on two subjective well-being variables: happiness (measured on a 5-level scale) and life satisfaction in general (measured on a 4-level scale). Figure 2 displays the variation in subjective well-being separately for quitters and still active FSWs. It seems from this figure that subjective well-being has improved more among FSWs who managed to quit sex work.

[Insert Figure 2 here]

Table 1 displays the differences between still active FSWs and FSWs who quit sex work regarding a series of characteristics collected in 2015, in other words, before some FSWs of the sample managed to leave prostitution. We can note that there are no differences in sociodemographics (age, education, children, marital status, household size) between these two groups. However, FSWs who quit sex work had a lower preference in 2015 for the future than still active FSWs. Regarding sex work activity in 2015, FSWs who quit sex work had lower earnings than still active FSWs. Furthermore, the former were working in sex work in Dakar for a longer time, were more likely to have had oral or anal sex with a client in the last paid sex acts but had less clients a week. We can also note that FSWs who quit sex work tend to be more likely to declare that they would be discriminated by their family if they knew about their sex work activity. Unsurprisingly, FSWs who quit sex work got married much more between the two surveys and were less likely to experienced a negative income shock than FSWs who are still active in 2017.

[Insert Table 1 here]

5 Results

5.1 Determinants of quitting sex work

Table 2 presents the determinants of quitting sex work. Among pre-treatment characteristics (information collected in 2015 or assumed to be invariant if collected in 2017), we can note that

having a husband or partner decreases the likelihood of quitting sex work. FSWs with a higher self-esteem and more fatalistic are less likely to quit sex work. As noted previously, getting married is strongly associated with the probability to leave prostitution while experiencing a negative income shock reduce the probability to quit this business.

[Insert Table 2 here]

5.2 (Heterogenous) effect of quitting sex work on FSWs' well-being

5.2.1 Propensity score matching analysis

In order to perform the propensity score analysis, we consider pre-treatment characteristics (information collected in 2015 or if collected in 2017 considered as invariant). We investigate the impact of quitting sex work on the level and variation in well-being.

The identification assumption behind the propensity score analysis is to say that women who manage to leave sex work are similar to the still active FSWs who have the same probability to leave sex work based on pre-treatment characteristics. The difference observed in either the level of well-being in 2017 or the variation in well-being is thus assumed to be due to the cessation of the prostitution activity.

[Insert Figure 3 here]

[Insert Table 3 here]

5.2.2 First difference analysis

We perform first difference analysis to investigate the within impact of quitting sex work on well-being.

We also study the intensity of the effect by looking at the duration since exit. We recall that out of the 441 FSWs interviewed, 26 (5.90%) left prostitution less than a year before the interview and 36 (8.16%) leave sex work more than a year before August 2017. We expect that the impact on well-being is greater the more time since leaving sex work.

We note from Table 4 that life satisfaction in general increased following the cessation of prostitution and that this effect is driven by FSWs who left sex work more than a year ago.

[Insert Table 4 here]

5.2.3 Heterogenous effect analysis

We investigate whether the impact of quitting sex work varies among different subgroups. From Table 5, we note that FSWs who seem to be the most affected (larger increase in life satisfaction) are FSWs who spent more than 100 months in the sex work business (p-value=0.007), FSWs

who had anal or oral sex in 2015 - based on information collected in 2015 on the last four paid intercourses (p-value = 0.033), FSWs who have occasional clients - clients they do not know before the sex act (p-value=0.133) and clandestine FSWs (p-value=0.045).

[Insert Table 5 here]

While we did not detect any significant effect of leaving sex work on happiness variation, the subgroup analysis presented in Table 6 confirms some of the results obtained with the life satisfaction in general outcome. In particular the effect of quitting sex work on happiness is significant and larger for FSWs who spent more than 100 months in the sex work business and unregistered FSWs. We also find that the impact of quitting sex work on happiness is larger for FSWs who feared to be discriminated by their family.

[Insert Table 6 here]

5.3 Causal mediation analysis

5.3.1 Causal indirect effect of self-esteem

Based on the causal mediation analysis method presented in section 3.2.1, note that the identification strategy for causal mediation can be decomposed in the following steps:

Step 1: Estimating the impact of treatment on outcome : Equation (2)

Step 2: Identifying potential mediators : Equation (3)

Step 3: Identifying direct and indirect causal effects : Equation (4)

Step 4: Performing the sensitivity analysis

We run first difference estimations of steps 1 to 3 (cf. Table 7).²

We first consider only one potential mediator: self-esteem. Results are presented in Table 7. We can note that the direct effect of leaving sex work decreases when introducing the self-esteem mediator in the analysis of the impact of leaving sex work on life satisfaction.

[Insert Table 7 here]

5.3.2 Alternative channels

We investigate alternative channels to explain the effect of leaving sex work on

[Insert Table 8 here]

We note from Table 9 that there seems to be no interaction between mediators, given that the coefficient of each mediator remain identical whenever the other mediators are introduced in the analysis.

[Insert Table 9 here]

²The same results are obtained using the `medeff` STATA command developed by Hicks and Tingley (2011).

5.3.3 Sensitivity analysis

When considering variation of life satisfaction in general as outcome and variation in self-esteem as mediator, the result of the sensitivity analysis indicates that for the point estimate of the average causal mediated effect to be zero, the correlation between $\Delta\varepsilon_{i2}$ and $\Delta\varepsilon_{i3}$ must be around 0.372. In other words, $ACME > 0$ as long as the correlation between the error terms is less than 0.372 (CI 0.1) (cf. Table 10). Put differently, to assume that the true ACME is not significantly different from zero (which would corresponds to an absence of effect through the channel investigated), we must assume that there exists an unobserved confounder that affects both the variation in self-esteem and the variation in life satisfaction in the same direction (positive correlation) and makes the correlation between the error terms greater than 0.372. The higher the correlation between error terms required to have a ACME equals to zero, the more robust the findings are.³

Alternatively the product of coefficients of determination for the mediator and outcome models on the one hand, and for the residual and total variance on the other hand may be examined. When considering the self-esteem as mediator and life satisfaction in general as outcome, an omitted confounder must explain 50% of the remaining variance in mediator and 28% of the remaining variance in the outcome for the ACME to be zero ($0.5 \times 0.28 = 0.138$). Similarly, an omitted confounder must explain 50% of the total variance in mediator and 23% of the total variance in the outcome for the ACME to be zero ($0.5 \times 0.23 = 0.114$). The share of total variance in mediator and in outcome explained by the unobserved confounder is bounded by one minus the R^2 of the observed models, which represents the proportion of the variance that is not yet explained by the observed predictors of the model. In our case, for life satisfaction as outcome and self-esteem as mediator, these upper bounds are 0.976 for the mediator model ($1 - 0.024$, column 2, Table 7) and 0.847 for the outcome model ($1 - 0.153$, column 3, Table 7). A lower value of these upper bounds indicate a more robust estimate of the ACME because there is less room for an unobserved confounder to bias the result.

[Insert Table 10 here]

[Insert Figure 4 here]

When running similar analysis with other potential mediators, we note that the correlation at which the ACME is equal to zero is much lower.

[Insert Table 11 here]

[Insert Figure 5 here]

³If the confounder were to affect the mediator and the outcome in different directions ($\rho < 0$) then mediation effects would be even more positive. However, given the mediator and outcome considered (life satisfaction and self-esteem) the presence of such a confounder is unlikely.

6 Conclusion

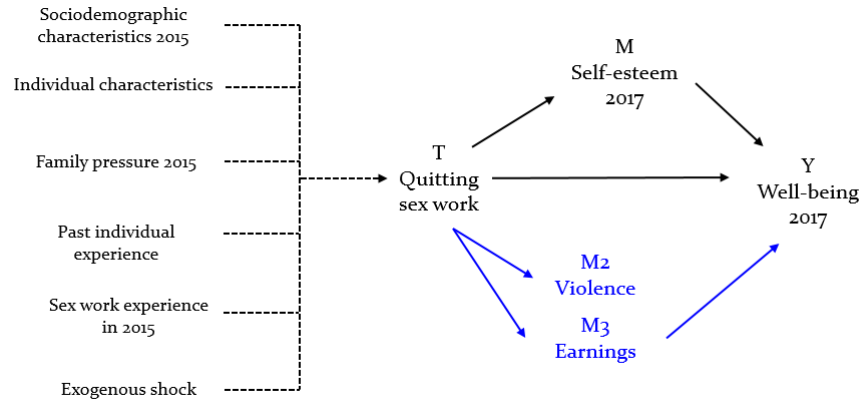
In this paper, we investigate the channels through which leaving sex work impact the subjective well-being of FSWs in Senegal.

We find that leaving sex work significantly increases subjective well-being. Sub-groups analysis shows that women who benefit the most from leaving sex work are those who have a longer experience in sex work, suffered from client violence, had a lot of clients, had occasional clients, were not registered and fear discrimination from relatives because of their sex work activity. Causal mediation analysis shows that the increase in well-being is mainly explained by an increase in self-esteem and not by a reduction in violence exposure.

Our study confirms the negative effect of sex work on well-being and highlights the importance to reduce time spent in sex work by developing interventions to quit sex work. It also highlights the need for psychological services for sex workers.

Tables and figures

Figure 1: Determinants of quitting sex work and potential causal mechanisms at play



Legend: T stands for treatment, M for mediator and Y for outcome.

The dashed lines correspond to the determinants of quitting sex work.

The plain lines refer to the consequences of quitting sex work on well-being.

The treatment causal effect is decomposed into a direct effect and an indirect one that goes through only one mediator (self-esteem). When considering also the blue lines, we assume no interaction between mediators (cf. first part of the sequential ignorability assumption).

Figure 2: Variation in subjective well-being according to sex work status

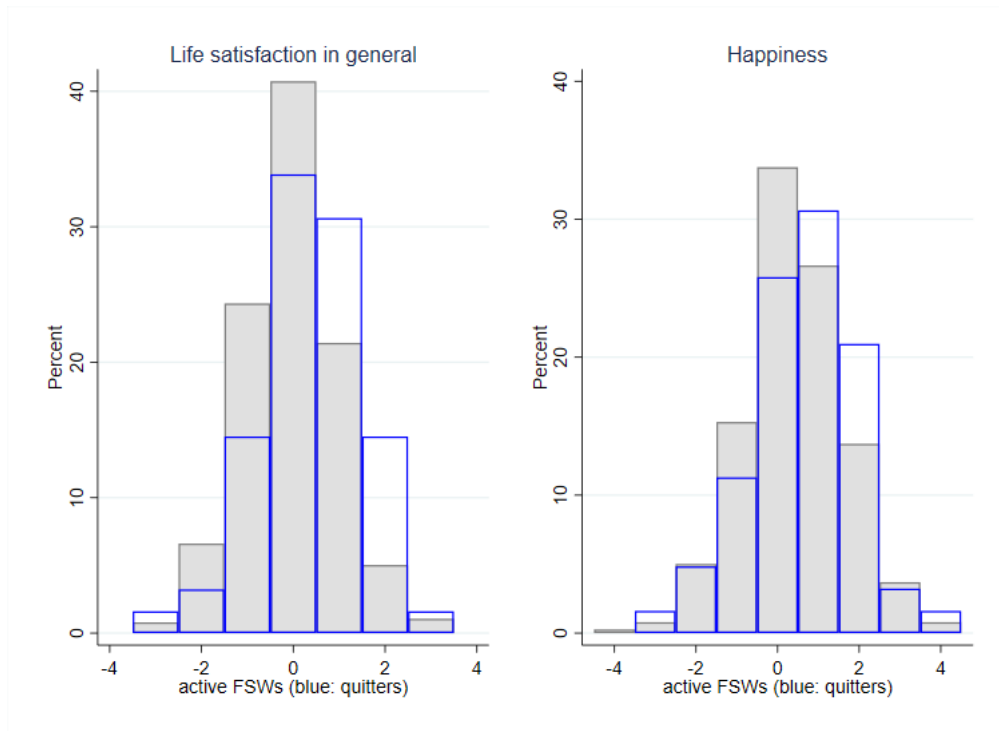


Figure 3: Common support and balance of covariates - pre-treatment characteristics

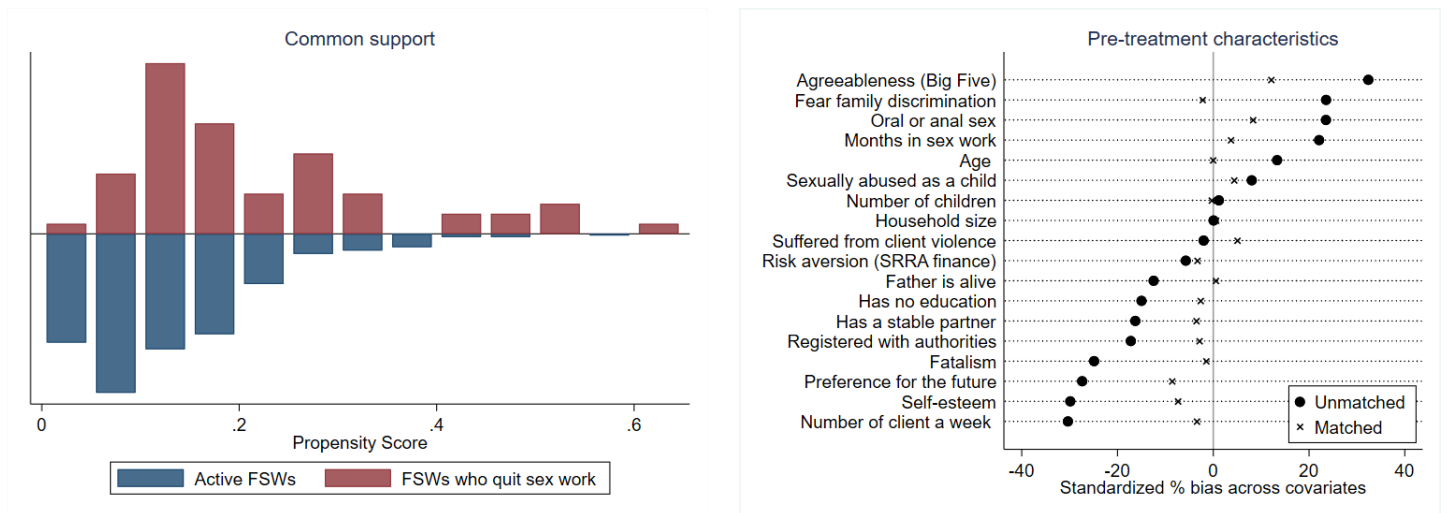


Table 1: Differences between FSWs who quit sex work and those who are still active in 2017

Baseline - Data collected in 2015 survey - <i>pre-treatment characteristics</i>				
Variables	<i>Obs</i>	Active FSWs	Quit sex work	p-value
<i>Individual characteristics</i>				
Age (in years)	441	36.7	38.0	0.294
Number of children	441	2.639	2.661	0.931
Household size	441	7.618	7.613	0.995
Has no education	438	0.274	0.210	0.289
Never married	439	0.223	0.242	0.739
Has a stable boyfriend or a husband	441	0.451	0.371	0.239
<i>Big Five personality traits</i> †				
Extraversion	441	25.161	25.452	0.605
Agreeableness	441	33.591	34.823	0.014
Conscientiousness	441	33.879	34.194	0.581
Neuroticism	441	21.042	21.274	0.686
Openness	441	29.050	29.306	0.713
<i>Individual preferences</i>				
Risk aversion (G&P game)	439	0.753	0.665	0.365
Risk aversion (SRRA in finance)	439	6.111	5.952	0.688
Altruism (out of 1,000 CFAF)	441	272	249	0.506
Preference for future (out of 10)	441	6.9	5.935	0.040
<i>Self-esteem</i>				
“Overall, I am satisfied with myself”	440	2.598	2.484	0.372
“I feel that I have a number of good qualities”	440	3.349	3.258	0.283
“I am able to do things as well as most other people”	441	3.314	3.113	0.025
“I feel that I am a person of worth”	440	3.373	3.306	0.397
“I wish I could have more respect for myself”	438	3.393	3.361	0.708
“All in all, I am inclined to feel that I am a failure”	438	2.626	2.557	0.644
“I take a positive attitude toward myself”	440	3.240	3.213	0.771
<i>Predetermination</i>				
“If someone is meant to have a disease, she will get the disease”	439	1.989	2.115	0.333
“My health is determined by god”	441	3.166	3.016	0.213
“Being in good health is a matter of luck”	439	2.907	2.77	0.287
“How long I will live is a question of luck”	440	3.037	2.823	0.108
“Everything that can go wrong goes wrong with me”	434	2.439	2.2	0.099
“I often feel helpless in dealing with daily issues”	441	3.193	3.177	0.902
<i>Link with family</i>				
Mother alive	441	0.644	0.613	0.639
Father alive	439	0.332	0.274	0.372
Sexually abused as a child	440	0.103	0.129	0.542
Parents live in Dakar	439	0.552	0.581	0.672
<i>Financial support, earnings and savings</i>				
Monthly expenses (CFAF)	441	364,000	357,000	0.880
Monthly expenses per capita (CFAF)	441	95,414	87,095	0.823
Has saved money in the last 30 days	437	0.205	0.097	0.044
Amount saved in the last 30 days (CFAF)	437	16,686	8,710	0.422
Earnings from sex work activity (CFAF)	441	135,000	111,000	0.160
Earnings from other occupation (CFAF)	441	16,453	9,919	0.183
Total earnings (CFAF)	441	151,691	121,210	0.087
Received transfer from migrants in the last 12 months	439	0.286	0.262	0.707
Sent transfer to migrants in the last 12 months	438	0.401	0.328	0.282

Notes: Pre-treatment characteristics (2015 survey). Differences in the number of observations are due to missing data.

† Information collected in 2017 survey, we assume that these characteristics are time-invariant.

Table 1: continued

Baseline - Data collected in 2015 survey - <i>pre-treatment characteristics</i>				
Variables	<i>Obs</i>	Active FSWs	Quit sex work	p-value
<i>Experience in sex work</i>				
Age at first paid sexual intercourse	441	28.319	26.984	0.217
Was introduced to the sex business by a FSW	439	0.255	0.226	0.628
Registered with authorities	440	0.505	0.419	0.211
Months in sex work in Dakar	441	79	101	0.063
Anal sex with last client	436	0.013	0.065	0.009
Oral sex with last client	436	0.048	0.129	0.013
Oral or anal sex in the last 4 sexual acts	437	0.109	0.194	0.060
Number of clients per week	437	6.744	5.032	0.057
Has only regular clients	438	0.338	0.403	0.317
<i>Violence in the past year</i>				
Any violence	441	0.314	0.274	0.531
Client violence	440	0.251	0.242	0.875
Police violence	439	0.064	0.048	0.644
<i>Shame related to sex work activity</i>				
Family knows about the sex work activity	432	0.291	0.311	0.747
Family would discriminate her if knows about her sex work activity	430	0.721	0.820	0.106
Ashamed if a neighbor sees her soliciting	439	0.846	0.806	0.430
Afraid that this person would repeat it	438	0.862	0.871	0.845
<i>Events in the last two years</i>				
Got married	441	0.024	0.290	0.000
Negative income shock	424	0.336	0.230	0.099
Family rupture	441	0.150	0.210	0.237
Death of family member	441	0.507	0.484	0.741
Negative health shock	441	0.314	0.323	0.893
Start new activity	440	0.582	0.645	0.350

Notes: Pre-treatment characteristics (2015 survey). Events in the last two years (2017 survey).

Table 2: Determinants of quitting sex work

	Quit sex work		
	(1)	(2)	(3)
<i>Pre-treatment characteristics - 2015</i>			
Age (in years)	-0.003 (0.012)		0.008 (0.012)
Number of children	0.010 (0.048)		0.016 (0.049)
Has no education	-0.205 (0.189)		-0.263 (0.196)
Household size	-0.004 (0.016)		-0.006 (0.019)
Has a stable boyfriend or husband	-0.298* (0.168)		-0.343* (0.181)
“I am able to do things as well as most other people”	-0.239** (0.121)		-0.270** (0.128)
“Everything that goes wrong goes wrong with me”	-0.174** (0.072)		-0.196** (0.082)
Agreeableness score (Big five)◊	0.041* (0.023)		0.075*** (0.023)
Preference for the future (out of 10)	-0.026 (0.025)		-0.029 (0.026)
Risk aversion (SRRA in finance)	-0.032 (0.027)		-0.029 (0.031)
Family would discriminate her if knows about her sex work activity †	0.377** (0.191)		0.384* (0.210)
Father alive	-0.129 (0.183)		-0.166 (0.203)
Sexually abused as a child ◊	0.153 (0.236)		-0.022 (0.290)
Months in sex work	0.001 (0.001)		0.001 (0.001)
Registered with authorities	-0.059 (0.167)		-0.002 (0.179)
Number of clients a week	-0.042* (0.025)		-0.048 (0.030)
Oral or anal sex in the last 4 sexual acts	0.291 (0.244)		0.110 (0.271)
Any violence from client	-0.074 (0.182)		-0.008 (0.203)
<i>Events in the last two years</i>			
Got married		1.675*** (0.265)	1.892*** (0.296)
Negative income shock †		-0.201 (0.179)	-0.427** (0.202)
Family rupture		0.210 (0.218)	0.387 (0.240)
Death of family member		-0.187 (0.162)	-0.166 (0.183)
Negative health shock		-0.038 (0.177)	-0.067 (0.197)
Start new activity		0.065 (0.160)	-0.007 (0.167)
Constant	-0.745 (1.027)	-1.142*** (0.146)	-2.157* (1.127)
Observations	424	440	423

Notes: Robust standard errors in parentheses. *** p<0.01; ** p<0.05; * p<0.1.

◊ Information collected in 2017.

† Variables were introduced by category (0, 1, 99) no to loose observations due to missing information.

Table 3: Effect of quitting sex work on well-being (PSM analysis)

Subjective well-being	# of treated	# of controls	ATT	SE	t-stat
<i>Levels</i>					
Life satisfaction in general	59	326	0.163	0.127	1.284
Happiness	59	326	0.293*	0.161	1.814
<i>Variations</i>					
Life satisfaction in general	59	326	0.295*	0.174	1.699
Happiness	59	326	0.087	0.204	0.426

Notes: *** p<0.01; ** p<0.05; * p<0.1. Bootstrapped standard errors are reported.

Table 4: Effect of quitting sex work on variation of subjective well-being

Variation in outcomes Variables	Life satisfaction in general			Happiness		
	(1)	(2)	(3)	(4)	(5)	(6)
Quit sex work	0.435*** (0.155)	0.406*** (0.150)		0.233 (0.180)	0.216 (0.179)	
<i>Reference: Active FSWs</i>						
Quit sex work less than a year ago			0.260 (0.195)			0.274 (0.303)
Quit sex work more than a year ago			0.505** (0.208)			0.177 (0.206)
Got married ‡		0.062 (0.247)	0.081 (0.243)		0.222 (0.306)	0.215 (0.303)
Negative income shock ‡ †		-0.030 (0.110)	-0.029 (0.111)		0.053 (0.134)	0.052 (0.134)
Family rupture ‡		-0.027 (0.149)	-0.030 (0.149)		-0.252 (0.167)	-0.251 (0.167)
Death in the family ‡		0.003 (0.105)	0.001 (0.105)		0.034 (0.123)	0.035 (0.122)
Negative health shock ‡		-0.046 (0.112)	-0.047 (0.112)		-0.072 (0.130)	-0.072 (0.130)
Start a new activity ‡		0.119 (0.105)	0.110 (0.105)		-0.118 (0.126)	-0.114 (0.126)
Constant	-0.048 (0.054)	-0.086 (0.111)	-0.080 (0.111)	0.396*** (0.065)	0.463*** (0.129)	0.461*** (0.129)
Observations	440	439	439	441	440	440
R-squared	0.020	0.025	0.027	0.004	0.020	0.020

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors are reported in parenthesis.

First difference estimators. ‡ All shocks refer to events that occurred between the two surveys.

† Variable was introduced by category (0, 1, 99) not to lose the 17 observations with missing information.

Equation: $\Delta y_{it} = \beta_0 + \beta_1 Q_i + \beta_2 S_i + \Delta \varepsilon_{it}$

Table 5: Heterogenous effects of quitting sex work on life satisfaction in general (variation)

Variables	<i>Sex work experience</i>		<i>Suffered from client violence in 2015</i>		<i>Anal / oral sex in 2015</i>		<i>Number of clients</i>	
	Less than 100 months	More than 100 months	Yes	No	Yes	No	More than 5	Less than 5
Quit sex work	-0.144 (0.220)	0.626*** (0.193)	0.299 (0.272)	0.462** (0.181)	1.151*** (0.385)	0.329** (0.163)	0.541** (0.231)	0.288 (0.201)
Observations	126	313	109	330	52	383	248	187
R-squared	0.024	0.055	0.050	0.035	0.231	0.020	0.034	0.034
<i>Test H0: equality of coefficients</i>								
Prob > chi2	0.007		0.605		0.033		0.399	
Variables	<i>Has only regular clients</i>		<i>Was registered in 2015</i>		<i>Has a friend to be reassured</i>		<i>Fear family discrimination</i>	
	Yes	No	Yes	No	Yes	No	Yes	No
Quit sex work	0.172 (0.227)	0.621*** (0.205)	0.080 (0.209)	0.652*** (0.203)	0.654*** (0.228)	0.181 (0.203)	0.355** (0.173)	0.760*** (0.245)
Observations	152	284	216	222	201	217	314	114
R-squared	0.013	0.051	0.063	0.050	0.069	0.018	0.035	0.085
<i>Test H0: equality of coefficients</i>								
Prob > chi2	0.133		0.045		0.113		0.163	

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses.

First difference estimators. Same shocks as in Table 4 are introduced in the specifications.

Table 6: Heterogenous effects of quitting sex work on happiness (variation)

Variables	<i>Sex work experience</i>		<i>Suffered from client violence in 2015</i>		<i>Anal / oral sex in 2015</i>		<i>Number of clients</i>	
	Less than 100 months	More than 100 months	Yes	No	Yes	No	More than 5	Less than 5
Quit sex work	-0.165 (0.371)	0.394** (0.198)	0.343 (0.318)	0.172 (0.216)	0.399 (0.552)	0.226 (0.185)	0.364 (0.279)	0.085 (0.238)
Observations	126	314	110	330	53	383	248	188
R-squared	0.038	0.042	0.034	0.029	0.198	0.017	0.021	0.047
<i>Test H0: equality of coefficients</i>								
Prob > chi2	0.170		0.646		0.746		0.438	
Variables	<i>Has only regular clients</i>		<i>Was registered in 2015</i>		<i>Has a friend to be reassured</i>		<i>Fear family discrimination</i>	
	Yes	No	Yes	No	Yes	No	Yes	No
Quit sex work	0.115 (0.312)	0.276 (0.224)	-0.191 (0.281)	0.442* (0.232)	0.036 (0.226)	0.338 (0.281)	0.080 (0.203)	0.781** (0.354)
Observations	152	285	217	222	201	218	315	114
R-squared	0.038	0.026	0.047	0.037	0.034	0.046	0.018	0.069
<i>Test H0: equality of coefficients</i>								
Prob > chi2	0.668		0.076		0.393		0.075	

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses.

First difference estimators. Same shocks as in Table 4 are introduced in the specifications.

Table 7: Direct and indirect effect of quitting sex work on subjective well-being

Variables	Life satisfaction in general			Happiness		
	(ΔY_i)	(ΔM_i)	(ΔY_i)	(ΔY_i)	(ΔM_i)	(ΔY_i)
	(1)	(2)	(3)	(4)	(5)	(6)
Quit sex work (Q_i)	0.406*** (0.150)	0.374*** (0.139)	0.281* (0.144)	0.216 (0.179)	0.374*** (0.139)	0.027 (0.152)
Self-esteem (ΔM_i)			0.354*** (0.052)			0.521*** (0.051)
Got married	0.062 (0.247)	0.063 (0.227)	0.042 (0.211)	0.222 (0.306)	0.063 (0.227)	0.190 (0.243)
Negative income shock	-0.030 (0.110)	0.008 (0.114)	-0.025 (0.104)	0.053 (0.134)	0.008 (0.114)	0.054 (0.121)
Family rupture	-0.027 (0.149)	-0.102 (0.146)	0.012 (0.141)	-0.252 (0.167)	-0.102 (0.146)	-0.197 (0.147)
Death in the family	0.003 (0.105)	-0.053 (0.108)	0.033 (0.098)	0.034 (0.123)	-0.053 (0.108)	0.069 (0.110)
Negative health shock	-0.046 (0.112)	-0.128 (0.113)	0.000 (0.107)	-0.072 (0.130)	-0.128 (0.113)	-0.001 (0.120)
Start a new activity	0.119 (0.105)	0.004 (0.108)	0.113 (0.098)	-0.118 (0.126)	0.004 (0.108)	-0.126 (0.114)
Constant	-0.086 (0.111)	0.412*** (0.115)	-0.244** (0.108)	0.463*** (0.129)	0.412*** (0.115)	0.241** (0.118)
Observations	439	439	438	440	439	439
R-squared	0.025	0.024	0.153	0.020	0.024	0.217

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses.

First difference estimators. Same shocks as in Table 4 are introduced in the specifications.

Columns (1) and (4) refer to equation (2), columns (2) and (5) to equation (3), columns (3) and (6) refer to equation (4).

Table 8: Direct and indirect effect of quitting sex work on subjective well-being - alternative mediators

Variables	Life satisfaction in general				Happiness	
	(ΔY_i)	(ΔM_i)	(ΔY_i)	(ΔY_i)	(ΔM_i)	(ΔY_i)
	(1)	(2)	(3)	(4)	(5)	(6)
Quit sex work (Q_i)	0.406*** (0.150)	0.374*** (0.139)	0.281* (0.144)	0.216 (0.179)	0.374*** (0.139)	0.027 (0.152)
Self-esteem (ΔM_i)			0.354*** (0.052)			0.521*** (0.051)
Observations	439	439	438	440	439	439
R-squared	0.025	0.024	0.153	0.020	0.024	0.217
Quit sex work (Q_i)	0.406*** (0.150)	-0.057 (0.057)	0.412*** (0.151)	0.216 (0.179)	-0.057 (0.057)	0.202 (0.179)
Client violence (ΔM_i)			0.099 (0.142)			-0.246 (0.155)
Observations	439	440	439	440	440	440
R-squared	0.025	0.020	0.026	0.020	0.018	0.026
Quit sex work (Q_i)	0.406*** (0.150)	-5.191*** (0.635)	0.771*** (0.188)	0.216 (0.179)	-5.191*** (0.635)	0.584** (0.232)
Earnings (in log) (ΔM_i)			0.070*** (0.024)			0.071** (0.030)
Observations	439	440	439	440	440	440
R-squared	0.025	0.464	0.044	0.020	0.464	0.034

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses.

First difference estimators. Same shocks as in Table 4 are introduced in the specifications.

Columns (1) and (4) refer to equation (2), columns (2) and (5) to equation (3), columns (3) and (6) refer to equation (4).

Table 9: Interactions between potential mediators

Variables	Life satisfaction in general (variation)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Quit sex work (Q_i)	0.296*	0.792***	0.419**	0.625***	0.306**	0.797***	0.632***
	(0.152)	(0.205)	(0.163)	(0.191)	(0.152)	(0.205)	(0.191)
Self-esteem	0.363***			0.357***	0.371***		0.365***
	(0.045)			(0.044)	(0.045)		(0.045)
Earnings (in log)		0.073***		0.063***		0.072***	0.062***
		(0.024)		(0.022)		(0.024)	(0.022)
Client violence			0.103		0.208	0.099	0.203
			(0.137)		(0.128)	(0.136)	(0.127)
Observations	421	422	422	421	421	422	421
R-squared	0.158	0.044	0.025	0.174	0.164	0.046	0.179

Notes: *** p<0.01; ** p<0.05; * p<0.1. Robust standard errors in parentheses.

First difference estimators. Same shocks as in Table 4 are introduced in the specifications.

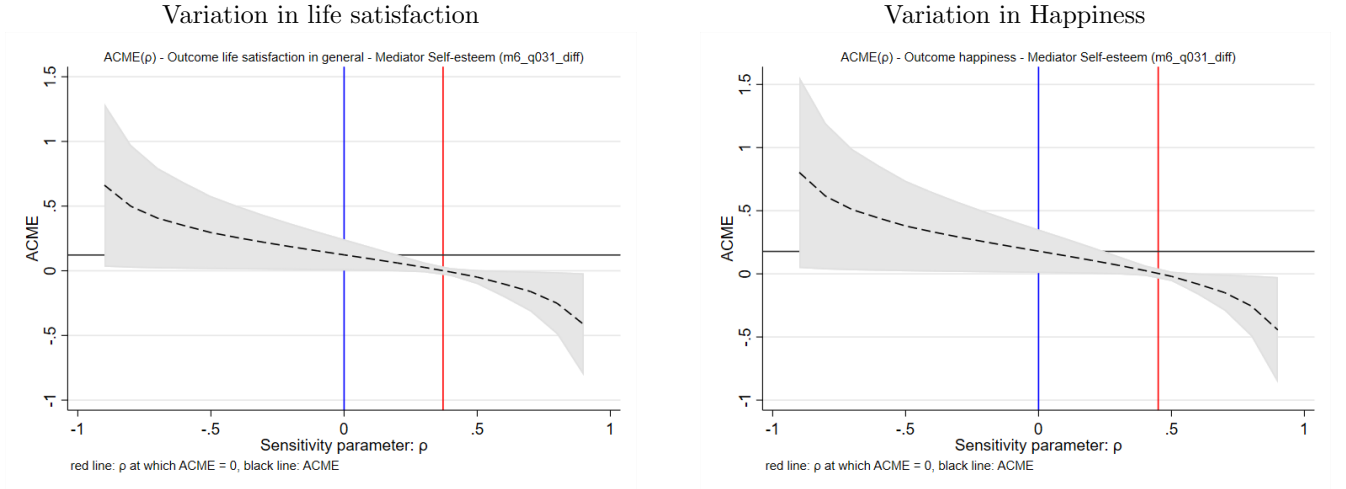
Table 10: Mediated effect and sensitivity analysis

	Mediation analysis		Sensitivity results	
	Mean	95% CI		
<i>Outcome:</i> Variation of life satisfaction in general				
<i>Mediator:</i> Variation in self-esteem				
ACME	0.122	[0.027; 0.228]	Correlation at which ACME = 0	0.372
Direct effect	0.298	[0.001; 0.586]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.138
Total effect	0.420	[0.118; 0.727]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.114
% of total effect mediated	0.289	[0.166; 0.925]		
<i>Outcome:</i> Variation in happiness				
<i>Mediator:</i> Variation in self-esteem				
ACME	0.178	[0.041; 0.317]	Correlation at which ACME = 0	0.450
Direct effect	0.031	[-0.281; 0.333]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.138
Total effect	0.209	[-0.120; 0.545]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.156
% of total effect mediated	0.698	[-6.619; 7.846]		

$R_{M*}^2 \times R_{Y*}^2$: proportions of residual variance in mediator and outcome explained by hypothesized unobserved confounder.

$\tilde{R}_M^2 \times \tilde{R}_Y^2$: proportions of total variance in mediator and outcome explained by hypothesized unobserved confounder.

Figure 4: Sensitivity analysis (variation of self-esteem as mediator)

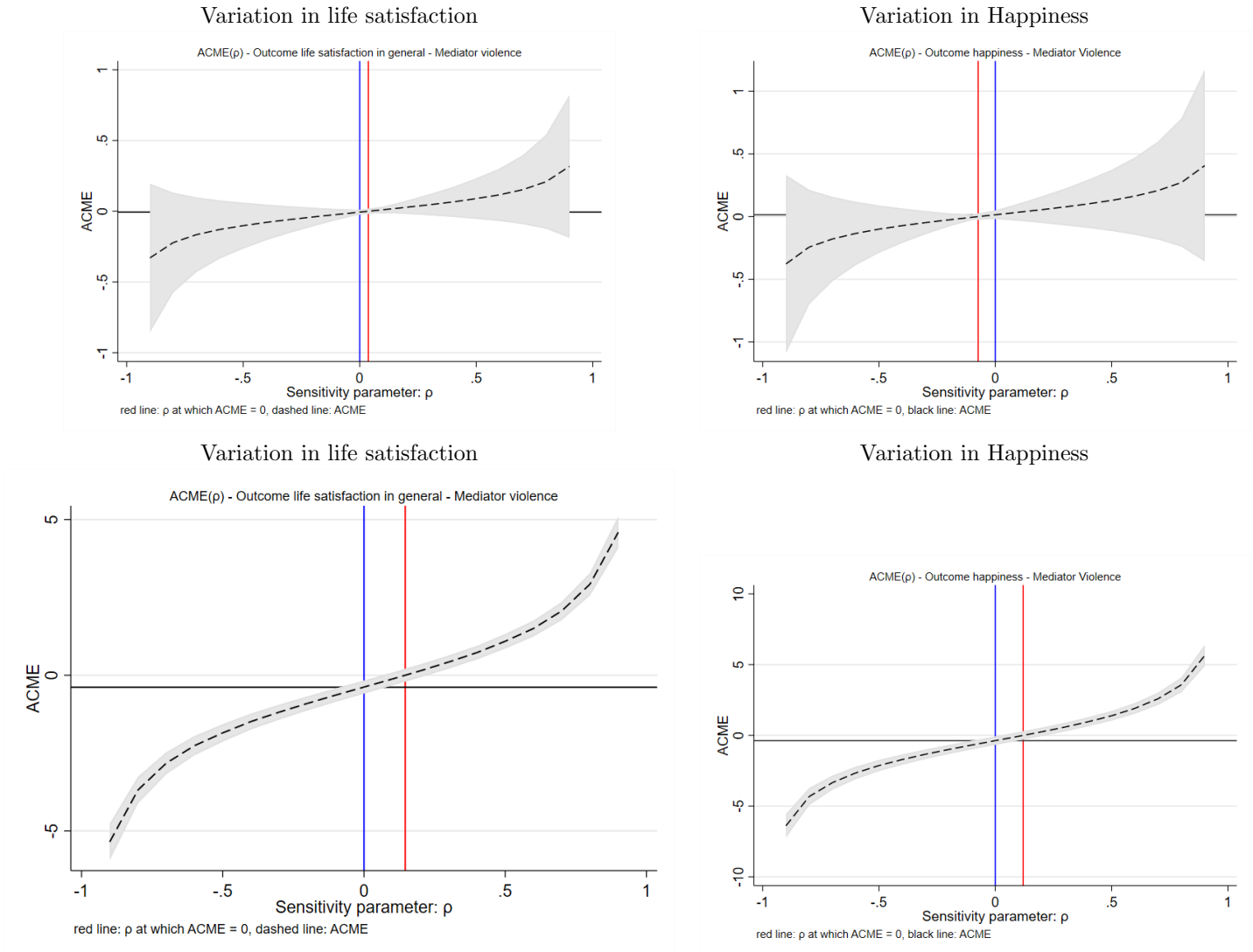


Notes: The solid black line represents the estimated mediation effect for $\rho = 0$. The gray areas represent the 95% confidence interval for the mediation effects at each value of ρ . The dashed line represents the estimated average mediation effect at different values of ρ . The red line indicates the value of ρ at which ACME is equal to zero. We can note that after this value the average causal mediated effect changes sign. ρ indicates the degree and direction of the unobserved confounding factor between self-esteem and wellbeing.

Table 11: Mediated effect and sensitivity analysis - alternative mediators

	Mediation analysis		Sensitivity results	
	Mean	95% CI		
<i>Outcome:</i> Variation of life satisfaction in general				
<i>Mediator:</i> Variation in client violence				
ACME	-0.007	[-0.037; 0.015]	Correlation at which ACME = 0	0.037
Direct effect	0.422	[0.107; 0.726]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.001
Total effect	0.415	[0.098; 0.720]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.001
% of total effect mediated	-0.016	[-0.057; -0.009]		
<i>Outcome:</i> Variation in happiness				
<i>Mediator:</i> Variation in client violence				
ACME	0.015	[-0.015; 0.061]	Correlation at which ACME = 0	-0.074
Direct effect	0.191	[-0.176; 0.546]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.006
Total effect	0.206	[-0.164; 0.563]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.005
% of total effect mediated	0.059	[-0.659; 0.622]		
<i>Outcome:</i> Variation of life satisfaction in general				
<i>Mediator:</i> Variation in earnings				
ACME	-0.385	[-0.644; -0.142]	Correlation at which ACME = 0	0.146
Direct effect	0.795	[0.405; 1.173]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.021
Total effect	0.411	[0.087; 0.697]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.011
% of total effect mediated	-0.920	[-4.182; -0.537]		
<i>Outcome:</i> Variation in happiness				
<i>Mediator:</i> Variation in earnings				
ACME	-0.377	[-0.682; -0.081]	Correlation at which ACME = 0	0.120
Direct effect	0.577	[0.097; 1.042]	$R_{M*}^2 \times R_{Y*}^2$ at which ACME = 0	0.014
Total effect	0.201	[-0.175; 0.534]	$\tilde{R}_M^2 \times \tilde{R}_Y^2$ at which ACME = 0	0.007
% of total effect mediated	-1.422	[-16.088; 13.810]		
$R_{M*}^2 \times R_{Y*}^2$: proportions of residual variance in mediator and outcome explained by hypothesized unobserved confounder.				
$\tilde{R}_M^2 \times \tilde{R}_Y^2$: proportions of total variance in mediator and outcome explained by hypothesized unobserved confounder.				

Figure 5: Sensitivity analysis - alternative mediator



Notes: The solid black line represents the estimated mediation effect for $\rho = 0$. The gray areas represent the 95% confidence interval for the mediation effects at each value of ρ . The dashed line represents the estimated average mediation effect at different values of ρ . The red line indicates the value of ρ at which ACME is equal to zero. We can note that after this value the average causal mediated effect changes sign. ρ indicates the degree and direction of the unobserved confounding factor between self-esteem and wellbeing.

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