Women's Empowerment and Wellbeing: Evidence from Africa*

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Abstract

We use household survey data from Senegal to model the effects of empowerment within the home on married women's wellbeing. The estimated effects of empowerment are at least as large as more conventional development indicators, such as household consumption. The size of the empowerment effect is robust to alternative estimation techniques, including an Instrumental Variables estimator.

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* There are no financial or personal relationships between the authors and others that might bias their work. The results presented in this study are based on analysis of publicly available data that was already published, and no ethical committee approval was sought for this work. The dataset and code used in the paper are available on request from the corresponding author.

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1. INTRODUCTION

There is strong evidence from cross-country studies for a positive correlation between measures of women's empowerment and other dimensions of human development (McGillivray, 2005), a correlation that is driven by causal effects in both directions (Doepke *et al*., 2012).[1] In this sense, the empowerment of women is an integral part of the development process. Correspondingly, one of the Millennium Development Goals is to 'promote gender equality and empower women,' while one of the Sustainable Development Goals is to 'achieve gender equality and empower all women and girls.' However, progress towards these goals has been slow: according to the United Nations, 'Gender inequality persists and women continue to face discrimination in access to education, work and economic assets' (www.un.org/millenniumgoals/gender.shtml).

Rappaport (1984) observes that, 'Empowerment is viewed as process: the mechanism by which people… gain mastery over their lives. However, the content of the process is of infinite variety.' While cross-country studies provide evidence for broad trends, country-specific studies can do justice to the variety to which Rappaport alludes. In this paper, we use survey data from rural Senegal to model the effects on married women's wellbeing of their level of empowerment. Our key measure of empowerment is motivated by ethnographic research which implies that for women in Senegal, empowerment is closely tied to the opportunity to spend time outside the home. Our data reveal substantial variation in the empowerment of women,[2] and we find the effect of this variation on women's wellbeing to be large when compared with the direct effects of more

[1] This positive correlation is not a foregone conclusion. For example, the economic empowerment of wives may give husbands an incentive to step up the use of domestic violence in order to retain the balance of power in the household; see for example Chin (2012).

[2] This variation is consistent with the finding that although Senegal has a legal code that is intended to enhance women's empowerment, Senegalese husbands often ignore formal legal prescriptions relating to marriage contracts (Aldashev *et al*., 2012).

traditional development indicators such as household income. On average, the probability of poor wellbeing outcomes for the least empowered women is about 30 percentage points higher than the probability for the most empowered. This result suggests that women's empowerment is important not only in its own right but also as a determinant of other development outcomes, and that the effect of development policy will depend crucially on the interaction of empowerment with other dimensions of development. The next section reviews the literature on women's empowerment and wellbeing; this is followed by a discussion of the data, and then the statistical model.

2. LITERATURE REVIEW

The existing literature on women's empowerment and wellbeing comprises several different types of study that use different measures of empowerment and different empirical methods. Firstly, some studies (which we designate 'type-1') use household survey data to measure the effect of natural experiments involving shocks that ought to raise the proportion of household income or wealth that is under women's control, or to raise their degree of control. Here, the key dimension of empowerment is control over economic resources, and the key dimensions of wellbeing are the consumption, health and education of the women or their children, there being some evidence that women value children's consumption more highly than do men. Examples of such natural experiments include changes in marriage or inheritance laws (Deininger *et al*., 2013; Rangel, 2006) and shocks to gender-specific income (Duflo, 2003; Qian, 2008); all of these authors find results implying that empowerment improves outcomes for women and/or children. Other authors find similar results by using Instrumental Variables estimators to analyze changes in conditions which affect control over resources but which might not be exogenous (Doss, 2001; Duflo and Udry, 2004). Correspondingly, field studies involving gender-specific cash transfer programs show that transfers to women are more beneficial to children, on average, than are transfers to men (Behrman

and Hoddinott, 2005; Bobonis, 2009; Lim *et al*., 2010; Maluccio and Flores, 2005).

In type-1 studies, empowerment is viewed in terms of control over economic resources, and changes in the level of control are not observed directly, but assumed to be correlated with a certain type of economic shock. There is another type of study (which we designate 'type-2') in which empowerment is viewed more broadly (not just in terms of economic resources) and measured more directly. Such studies use survey data on women's decision-making power within the home in order to estimate the effect of empowerment. In the surveys, respondents – either husbands or wives, or both – indicate who has a say in a range of household choices, for example decisions about household purchases, or whether the wife goes to seek formal healthcare, or whether she is allowed to make visits to her relatives. Women are taken to be most empowered when they make these decisions alone, and least empowered when their husband makes these decisions alone. Several authors (for example Allendorf, 2007, 2010; Furuta and Salway, 2006; Lépine and Ströbl, 2013; Maitra, 2004; Mistry *et al*., 2009) report evidence that these indicators of empowerment are positively correlated with health outcomes such as access to antenatal care, delivery of children in hospital, child nutrition, or vaccination against common infectious diseases. A related literature ('type-3') incorporates a wider range of outcomes but focuses on a particular correlate of empowerment: the incidence of domestic violence. Here, there is strong evidence that violence leads to poor outcomes, whether the outcome is a specific physical health characteristic (Dunkle *et al*., 2004; Miner *et al*., 2011) or mental health and subjective wellbeing (see the survey by Golding, 1999).

In addition to these quantitative studies, there is also an ethnographic literature on women's empowerment. Of particular relevance to this paper is Perry (2005), who reports the results of fieldwork in rural Senegal. Perry documents a trend towards greater empowerment resulting from

the Senegalese structural adjustment programs of the 1980s and 1990s. Structural adjustment led to a removal of agricultural subsidies received by male household heads. This reduced their income relative to that of women in the household who were entitled to farm a certain amount of land independently, but who never received any subsidies. The subsequent rise in many women's intra-household bargaining power was used to secure the right to travel alone to local markets and trade independently, raising women's income and bargaining power even further. Conversations with both men and women suggest that the women benefitting most from this process have been those with the poorest husbands, and there is substantial inter-household variation in the degree of women's self-perceived empowerment.

In this paper we investigate the effects of women's empowerment in rural Senegal using a method similar to that of the type-2 studies, with an analysis of household survey data that includes both measures of empowerment and other characteristics of the women surveyed. However, our study incorporates the following novel characteristics.

(i) Our dependant variables are measures of self-reported wellbeing which are broader in scope than the specific epidemiological variables used in type-2 studies. (These broader outcomes do sometimes feature in type-3 studies, but type-3 studies focus exclusively on domestic violence.)

(ii) Among our explanatory variables, we compare measures of empowerment typical of type-2 studies with a simple alternative measure that can be interpreted in terms of the Senegal-specific observations of Perry (2005). We also compare these measures with another alternative that is not based on the woman's self-reported level of empowerment.

(iii) Almost all type-2 studies assume that empowerment is independent of wellbeing; we

investigate whether our results are robust to the relaxation of this assumption.

The next section discusses the data used to construct our empowerment and wellbeing measures.

3. THE DATA

Our data come from the Senegalese household survey documented by Lépine (2009) and Lépine and Ströbl (2013). This survey, conducted in May 2009 by a team of trained local interviewers speaking the local languages (Wolof and Fula), incorporates 990 men and 1,158 women living in 505 subsistence farming households in 39 villages located in the Senegal River valley in the north of the country. (The age of majority in Senegal is 18. Girls are allowed to marry at the age of 16, and the survey also includes 105 girls of marriageable age; boys of this age cannot marry.) The number of adults in each household ranges from two to 13; the households were randomly selected, but all adults and married girls in the selected households were surveyed. Many households constitute an extended family group of three generations, including both single adults and those who are married. Many marriages are polygamous – husbands have up to three wives – so the sample of married women has a nested structure: individuals within marital units (women with the same husband) within households within villages.

873 women and girls in the sample are married; our hypotheses concern the population of wives, so our data analysis excludes the unmarried women and unmarried girls of marriageable age. Of these 390 unmarried individuals, 89 are widows (of whom only six are below the age of 50) and 271 are never-married. The average age of those who are never-married is 21, and only six women over the age of 40 are never-married: while marriage can be delayed, it is virtually inevitable. 28 women are divorced or separated, and two women did not report their marital status. The sample villages are located in the same general area as the villages sampled by Gaspart and

Platteau (2010) in order to study the economics of bride-price.[3] In their sample, 20% of marriages end in divorce (usually instigated by the woman, who returns to her parents), while in the sample used here only 3% of ever-married women are unmarried and divorced at the time of the survey. This suggests that while divorcing one's husband is a realistic option (at least for some women), is it very rare for a divorcee to remain single.

Our main results pertain to the wives in the sample who are married and living either with their husband, or, if the husband is not living at home – for example, if he is working in the city – with a household head who is a male blood relative of the husband and who stands in the husband's place while he is away from home. (There are 691 such wives, of whom 627 gave answers to all of the relevant survey questions, a response rate of 91%.) However, the online appendix includes robustness tests using a sample that incorporates the other wives, who are living with their own blood relatives. 58% of wives in the sample are Wolof and 40% are Fula; all of the women in each household are of a single ethnicity. There are some ethnically mixed marriages, but these account for only 1% of the wives in the sample. There is also a high degree of religious homogeneity: 95% of the wives are Tijani, with the remaining 5% split equally between Mourides and Qadiris. These percentages also apply to the sample of all adults.[4,5]

[3] The payment of bride-price is ubiquitous in this part of Senegal. In the Gaspart-Platteau sample, the average bride-price is FCFA 40,000, while in the sample used here the geometric mean of annual per capita household income is FCFA 100,000, so the price of the average bride is neither trivial nor astronomical. The bride-price is returned to the husband in the event of divorce. Roughly half of the marriages in the Gaspart-Platteau sample are arranged by the parents and half are love matches.

[4] If one includes dummy variables for mixed marriages and religious affiliation in the regression equations discussed below, the corresponding coefficients are never significantly different from zero.

[5] In Senegal as a whole, 43% of the population are Wolof and 24% are Fula; 60% of the population are Tijani, 28% are Mouride, and 6% are Qadiri. Given the under-representation of minority groups in the sample, our

A distinctive characteristic of the survey is that it includes both questions about women's empowerment and questions about subjective wellbeing. This permits the construction of the following variables.

(i) *Subjective measures of wellbeing*. In the pilot study on which the survey was based, two health issues were especially salient for farmers. Firstly, they raised the issue of bodily pain (and more specifically back pain). Secondly, there were high reported levels of stress and anxiety relating to uncertainty about the success of harvests and the need to take out loans to buy agricultural inputs. Consequently, all wives in the survey were asked the following two questions about their wellbeing: *Do you feel anxious or depressed? Do you suffer from bodily pains?* The possible responses to these questions are: 'often' / 'rarely' / 'never'. The proportion of wives answering 'never' to these questions is only about 10%, so for each wife we construct two binary variables as follows:

- ***Anxiety*** equals one if the response to the anxiety question is 'often', and zero otherwise.
- ***Pain*** equals one if the response to the physical pain question is 'often', and zero otherwise.

The ***anxiety*** question is similar to question 6 in the Center for Epidemiologic Studies Depression Questionnaire (CES-D), and to the second of the two questions in the Patient Health Questionnaire (PHQ-2), which has been validated in a rural African context similar ours (Monahan *et al*., 2007).[6] In other parts of Africa, responses to questions about bodily pain in longitudinal samples have been shown to be strongly correlated over time with a range of physical health outcomes, including

results should be seen as describing the characteristics of the two main ethnic groups (i.e. the Wolof and Fula) and the main religious group (i.e. the Tijanis).

[6] Further, Wilk and Bolton (2002) provide evidence that the concept of depression is salient in an African context.

fatigue and nausea (Fox *et al*., 2010; Rosen *et al*., 2014); there is a similarly strong cross-sectional correlation (Tolla, 2006). We therefore have some confidence that in our sample the responses to the ***anxiety*** and ***pain*** questions capture a large part of the variation in wives' mental and physical wellbeing. Nevertheless, we will compare our results for ***anxiety*** and ***pain*** with results using a third wellbeing measure based on responses to a question asking wives to rate their own general health on a 1-10 scale, with 10 representing the best health. The use of a visual analog scale is a common technique in evaluating health status, and is employed in standardized health status instruments such as EQ-5D. Moreover, Macia *et al*. (2012, 2015) show that in another Senegalese sample, responses based on a five-point scale for general health are strongly correlated with responses to other health questions, and to questions about general life satisfaction.[7] The third wellbeing measure, designated ***health-score***, is a transformation of wives' responses to the general health question so that a score of 10 represents the poorest health: in this way, all three measures are decreasing in the wellbeing of the respondent.

Table I reports descriptive statistics for the three wellbeing outcomes: the mean and standard deviation of ***health-score*** and the fraction of ***anxiety*** and ***pain*** responses equal to one. These statistics are reported for the sample of 627 cohabiting wives for whom both the wellbeing outcomes and the covariates discussed below are reported,[8] and separately for the wives for whom only the wellbeing variables (and not the covariates) are reported. It can be seen that the wives in the sample are roughly evenly split between those who are often anxious or depressed (***anxiety*** =

[7] In addition, the meta-analysis of Subramanian *et al*. (2010) indicates that the visual analog scale performs well in studies similar to ours. As shown in the online appendix, subjective wellbeing in our sample is strongly correlated with objective health characteristics.

[8] Two wives answered all of the relevant survey questions except those corresponding to ***anxiety*** and ***pain***, so for ***health-score*** the sample is 629.

1) and those who are not, and between those who often experience bodily pain (***pain*** = 1) and those who are not; the standard deviation of ***health-score*** is about twice as large as its mean. In this sense, there is substantial variation in the level of wives' wellbeing. The table also reports statistics for the larger sample of wives, including those not cohabiting. There do not appear to be any substantial differences in the descriptive statistics across the different samples. Table II reports Spearman rank-order correlations coefficients and ordinary correlations for the different wellbeing outcomes.[9] These are large and significantly greater than zero, but also significantly less than one, so the three outcomes seem to represent connected but distinct dimensions of the wives' wellbeing.

(ii) *Measures of empowerment*. Our first survey question relating to empowerment is motivated by the ethnographic observations of Perry (2005), which stress the significance of a wife's ability to engage in separate, gendered spheres of production: cultivating land allocated specifically to her and taking the crops to market. Even if a wife does have such land, her independence depends on the ability to leave the home when necessary.[10] The first empowerment question we use is: *Can you go out without the permission of your husband?* The possible responses to this question are: 'yes' / 'it depends' / 'no'. Only 7% of women answered 'yes', so we aggregate the first two categories as follows:

• ***Freedom*** equals one if the response is 'yes' or 'it depends', and zero otherwise.

Our second survey measure utilizes a series of questions which were based on those of

[9] These are for the sample of cohabiting wives.

[10] An alternative measure might be the total amount of time the wife spends cultivating and marketing her own crops. However, we contend that empowerment depends on *when* the wife is able to leave the home, and not just on the total amount of time she is permitted to spend away. The simple ***freedom*** question captures her ability to make an economically important decision.

Allendorf (2007): *Who makes decisions concerning your health? Who makes decisions concerning daily expenditures? Who makes decisions concerning large expenditures? Who makes decisions concerning family visits?* The alternative responses to this question are: 'me' / 'my husband' / 'me and my husband' / 'someone else'. The correlations between the responses to these questions are very high. If one constructs a set of binary variables equal to one if the response is 'me' and equal to zero otherwise, the first principal component of the four variables (with weights of 0.55, 0.56, 0.50 and 0.35) explains 50% of their overall variation. Performing the same exercise for the response 'me and my husband', the first principal component of the four variables (with weights of 0.51, 0.52, 0.50 and 0.47) explains 47% of their overall variation. Therefore, we summarize the four sets of responses by adding together the four binary variables for 'me' and the four binary variables for 'me and my husband'. The resulting empowerment measures, designated ***decisions-1*** and ***decisions-2*** respectively, have a maximum value of four and a minimum value of zero. The questions on which the ***decisions*** variables are based are common in the type-2 studies discussed above, and Lépine and Ströbl (2013) find that an empowerment index incorporating responses to such questions is a significant predictor of child nutrition in Senegal. Unlike ***freedom***, the ***decisions*** variables lack a direct interpretation connected to Senegalese ethnography, but we include them in order to see whether their significance in type-2 studies (including Lépine and Ströbl) can be replicated in our study of broader measures of wellbeing.

Both the ***freedom*** and ***decisions*** variables are based on the wife's own responses to the interviewer's questions. Given the concern that these responses might be influenced by the husband (or other male relative, if the husband was not living at home), the interviewer recorded the husband's (or other relative's) role and demeanour during the wife's interview. One use for this record, in addition to exploring the candour of the wives' responses, is as a direct measure of

empowerment. The interviewer asked to speak to the wife alone, and in some cases the husband agreed to this. In other cases the husband insisted on being present at the interview but remained passive. Finally, there were some cases in which the husband verbally intervened in the interview. This final category constitutes only 10% of cases, so we construct a bivalent variable as follows:

• ***Absent*** equals one if the husband (or other male relative) was absent from the interview, and zero otherwise.

Absent is an alternative measure of the incidence of independent action by the wife.[11] Results using a trivalent variable are available on request, and are similar to those reported below. We take a higher value of ***absent*** to indicate that the husband (or other relative) is less inclined to monitor and control the wife's behaviour.

Descriptive statistics for the empowerment variables appear in Table I, which shows that the sample is roughly equally divided between those who have some freedom to leave the home (***freedom*** = 1) and those who do not, and that about two thirds of husbands were absent from the interview (***absent*** = 1). As shown in Table II, the ***freedom*** and ***decisions*** variables are quite highly correlated: the Spearman rank-order correlation coefficients are large and significantly greater than zero. However, these variables are not strongly correlated with ***absent***: the Spearman rank-order correlation coefficients all close to zero and statistically insignificant. One possible explanation

[11] One reason why there could be some measurement error in ***absent*** is that the opportunity cost of the husband's time varies across households. Some husbands may just be too busy to attend the interview. However, adding an interaction term between ***absent*** and the husband's level of education or household income does not produce a significant coefficient in our regression equations, so such measurement error is unlikely to be a major concern. It is also possible that the husband's behaviour affects the wife's responses to the questions on which the variables ***freedom*** and ***decisions*** are based. If this is this case, and if empowerment affects wellbeing, then we should find that the interaction terms ***absent*** × ***freedom*** and ***absent*** × ***decisions*** are significant explanatory variables in the wellbeing regressions. This turns out not to be the case.

for the lack of correlation is that that ***absent*** = 1 indicates a high level of trust between husband and wife that is consistent either with gender equality or with a reliably submissive wife. Table II also shows that there are significant negative correlations between all of the (inverse) wellbeing measures and all of the empowerment measures, except for an insignificant correlation between ***health-score*** and ***absent***. It remains to be seen whether this positive association between wellbeing and empowerment remains when we control for other determinants of wellbeing.

(iii) *Other individual-specific covariates of wellbeing*. Wellbeing could also depend on a wife's age, education or ethnicity, on whether she is in a polygamous marriage, or on whether she is married to the household head.[12] From responses to other survey questions we construct the following variables:

- ***Age*** is the wife's age in years.
- ***Writing*** equals one if the woman can write a letter in French (the business language of Senegal), and zero otherwise. There are also data on the woman's highest level of school enrolment, and it makes little difference which of the two measures of education is used.
- ***Polygamous*** equals one if the wife is in a polygamous marriage, and zero otherwise.
- ***In-law*** equals one if the woman is married to a male relative of the household head, and zero if she is married to the household head.
- ***Fula*** equals one if the woman Fula (39% of the sample), and equals zero otherwise.
- ***Other*** equals one if the woman is neither Wolof nor Fula (2% of the sample), and equals zero otherwise.

[12] There is also information about the seniority of each wife in the polygamous marriages, but adding a seniority variable to the wellbeing regression does not produce a significant coefficient, and has no noticeable effect on the size or significance levels of the other variables.

Since 99% of households are ethnically homogeneous, the ethnicity variables could also be regarded as household characteristics. Further analysis in the online appendix shows that the results for empowerment and wellbeing discussed below are robust to the inclusion of a larger set of individual-specific covariates.

(iv) *Household- and village-level covariates of wellbeing*.

Besides the individual responses, the survey also contains information about household characteristics provided by the household head. This allows us to measure household size and income, both of which have been found to affect individual wellbeing in other developing countries (Das *et al*., 2008). It is also possible that wellbeing depends on the ease of access to informal social support networks and formal medical services, and these can be measured at the village level. Therefore, our model also includes the following covariates:

- ***Income*** is the log of total annual household income per adult, measured in CFA Francs.
- ***Adults*** equals the number of adults in the household.
- ***Dist-hospital*** is the distance from the village to the nearest hospital, measured in kilometres.
- ***Social*** is a village-level measure of a woman's access to informal support networks. Every woman in the survey is asked how her last healthcare expenditure was financed. For just over half of the women, the household is wealthy enough or the expenditure is small enough so that the expenditure can be financed out of pocket (or, in a few cases, by health insurance). However, for some women the health expenditure is a source of financial distress, in the sense that they have to rely on the financial support of friends or family outside the household (5% of the sample) or of a community group or tontine (8% of the sample). In the absence of such support, the healthcare expenditure is financed by the sale

of property (29% of the sample). Our measure of the strength of village-level social support networks is the ratio of the number of cases in which financial support is provided to the total number of cases of distress (with either financial support or the sale of property). This second measure is denoted ***social***.[13]

Sample statistics for all of the covariates appear in Table I.

[Tables I-II here]

4. MODELLING THE DETERMINANTS OF SUBJECTIVE WELLBEING

The data have a nested structure (individuals within marital units within households within villages), so one can in principle fit hierarchical models of wellbeing with parameters that capture the magnitude of the unobserved heterogeneity at each level of aggregation. However, preliminary estimation of hierarchical models indicates that the only significant unobserved heterogeneity is at the household level, so the results presented below are based on random-effects regressions for individuals within households.

For the binary wellbeing measures ***anxiety*** and ***pain*** our estimates are based on probit models of the following form:

$$\mathrm{P}\left(anxiety_i = 1\right) = \Phi\left(\sum_k \beta_k \cdot x_{ik} + \varepsilon_j\right), \quad i \in j, \quad \varepsilon_j \sim \mathrm{N}\left(\mu_\varepsilon, \sigma_\varepsilon^2\right) \tag{1}$$

[13] One potential concern about ***social*** is that it could be correlated with the size of healthcare expenses, which may also be correlated with the dependant variables. The survey includes data on the size of the last healthcare expenditure in CFA Francs, so it is possible to address this concern directly. It turns out that healthcare cost is significantly correlated with ***social***. However, conditional on the other explanatory variables in the model, healthcare cost is not significantly correlated with the dependent variables. (In a large proportion of cases, the illness in question is not the woman's illness, and even when it is, the cost of travel, consultation and medicine appears not to be strongly correlated with the severity of the illness.)

$$\mathrm{P}\left(pain_i = 1\right) = \Phi\left(\sum_k \gamma_k \cdot x_{ik} + \eta_j\right), \quad i \in j, \quad \eta_j \sim \mathrm{N}\left(\mu_\eta, \sigma_\eta^2\right) \tag{2}$$

For the ***health-score*** our estimates are based on a tobit model:

$$y_i = \sum_k \delta_k \cdot x_{ik} + \theta_j + \varphi_i, \quad i \in j, \quad \theta_j \sim \mathrm{N}\left(\mu_\theta, \sigma_\theta^2\right), \quad \varphi_i \sim \mathrm{N}\left(0, \sigma_\varphi^2\right) \tag{3}$$

$$health\ score_i = \max\left(1, \min\left(10, y_i\right)\right)$$

Here, $\Phi(.)$ is the cumulative normal density function, the β, γ and δ terms are parameters to be estimated, and x_{ik} is the value of the k^{th} explanatory variable for the i^{th} woman. The terms ε_j, η_j and θ_j capture unobserved heterogeneity in the j^{th} household.

Panel A(i) of Table III includes the estimated values of the β parameters in equation (1), panel A(ii) includes the estimated values of the γ parameters in equation (2), and panel A(iii) includes the estimated values of the δ parameters in equation (3). Each panel includes estimates of the within-household error correlation (ρ). The table also shows the implied marginal effects for unit changes in x ($\Delta P/\Delta x \mid \Delta x = 1$), evaluated at the mean value of P, along with the relevant t-ratios. The three panels show some similarity in the estimated effects of the empowerment variables across the three wellbeing measures. In particular, there is a significant association with ***freedom***, but the only significant ***decisions*** effect is with ***decisions-1*** in the ***health-score*** model.[14] Because of the high correlation between ***freedom*** and ***decisions***, the t-ratio on the ***decisions*** coefficients could be biased downwards. For this reason, Table III also includes versions of each model in which either ***freedom*** or the ***decisions*** variables are excluded: these are reported in the B and C panels. It turns out that the exclusion the ***decisions*** variables does not make a large difference

[14] This result is unchanged if the ***decisions*** variables are replaced by their four component indicators.

to the coefficient and t-ratio on ***freedom***. However, the exclusion of ***freedom*** substantially increases the size of the estimated ***decisions-1*** effects in the ***anxiety*** and ***health-score*** models, and in the ***anxiety*** model the effect is now significant at the 5% level.

The negative and significant coefficients on ***freedom*** indicate that more freedom to leave the home is associated with greater wellbeing. When ***freedom*** = 1, the probability of a wife often feeling anxious or depressed is about 12 percentage points lower than when ***freedom*** = 0. The probability of her often having bodily pains is about 16 percentage points lower, and the ***health-score*** variable is improved by about half a point (in other words, by one third of a standard deviation). When ***freedom*** is excluded from the model, the estimated ***decisions-1*** coefficients imply that a one point improvement in this variable on its four-point scale reduces the probability of a wife often feeling anxious or depressed by about seven percentage points, and improves the ***health-score*** variable by about 0.3 points. Overall, there is some evidence that ***freedom*** is a better measure of empowerment in the models of ***anxiety*** and ***pain***. Nevertheless, the significance of ***decisions-1*** in some of the Table III models suggests that the dimensions of empowerment which predict specific health outcomes in type-2 studies are also relevant to more general measures of wellbeing.

Table III also shows that ***absent*** is a significant correlate of wellbeing as measured by ***anxiety*** and ***pain*** (but not by ***health-score***). As noted above, ***absent*** represents a dimension of women's empowerment that is quite distinct from ***freedom*** and ***decisions***. If the husband was absent from the interview then the probability of the wife often feeling anxious or depressed is about 18 percentage points lower and the probability of her often having bodily pains is about 16 percentage points lower. Since ***freedom*** and ***absent*** are not highly correlated, there are many cases in which ***freedom*** = ***absent*** = 1, and others in which ***freedom*** = ***absent*** = 0. The coefficients in

Table III imply that in the latter case the probability of often feeling anxious or depressed (or of often feeling bodily pains) is around 30 percentage points higher than in the former.

Among the other explanatory variables, ***income***, ***writing***, ***adults***, ***in-law*** and ***social*** are never significant at the 5% level. However, ***age*** has a consistent effect across all three models: an extra year of age adds about one percentage point to the probability of feeling anxious or depressed, or of feeling bodily pains, and worsens the health score by about 0.04 points.[15] The positive and significant coefficients on the ***Fula*** ethnicity variable suggest that Fula women have lower levels of wellbeing, on average, than Wolof women. An extra kilometre of distance between the village and the nearest hospital increases the probability of a woman often having bodily pains by about half a percentage point, but has no significant effect on the other two wellbeing variables. The probability of often having bodily pains is about 11 percentage points lower for wives in polygamous marriages, but polygamy has no significant effect on the other two wellbeing variables.

When all other covariates are excluded from the regression equations, the estimated coefficients on ***freedom*** and ***absent*** are very similar to the ones reported in Table III. This suggests that the effect of empowerment on wellbeing is not through these other covariates.

[Table III here]

One potential concern with the results in Table III is that empowerment, education and income might be endogenous to empowerment. In online appendix we present Instrumental Variables estimates that allow for such endogeneity, using distance to the nearest high school and information on agricultural productivity shocks as instruments for education and income, and

[15] Adding (***age***)^2 to the model produces a coefficient that is insignificantly different from zero.

village-level ethnic diversity variables as instruments for empowerment (following Lépine and Ströbl, 2013). The IV estimates of the effects of ***freedom*** and ***absent*** on the wellbeing variables are almost identical to those in Table III, which suggests that the endogeneity of empowerment is not a serious concern in this context. Moreover, while ***social*** is not a significant determinant of wellbeing (conditional on other individual, household and village characteristics), it *is* a significant determinant of ***absent*** (with a positive effect). This suggests that the strength of village-level social support networks has an indirect effect on a wife's wellbeing.

One question that we have not addressed directly relates to the proximate determinants of wellbeing. If a wife has the freedom to leave the home without her husband's permission, in what ways does her quality of life improve so that she reports a higher level of subjective wellbeing? There are a number of possible channels through which this freedom could influence wellbeing, including (i) a greater control over the household's total resources, and (ii) better treatment by the husband as a consequence of the wife's greater bargaining power (including a lower incidence of domestic violence). The question of domestic violence was too sensitive to raise in the survey, but there is one survey question relating to the wife's control or influence over household resource allocation. The question is: *What share of the household's consumption do you control*? The alternative responses to this question are: 'none' / 'less than half' / 'half' / 'more than half'.[16] From these responses we construct the ordinal variable ***control***, which is measured on a 0-3 scale, the lowest point corresponding to 'none'. Table I includes sample statistics for ***control***, while Table II includes correlation coefficients between this variable and the different measures of empowerment and wellbeing. ***Control*** is significantly positively correlated with ***freedom*** and the ***decisions*** variables: in other words, there is some association between empowerment and the wife's control

[16] No wife answered 'all'.

of resources. However, there is no significant correlation between any of the wellbeing variables and ***control***: in other words, the wife's control of resources is not generally associated with wellbeing as we have measured it. This implies that control of consumption is not the main channel through which empowerment influences wives' wellbeing, and that some other channel (perhaps better general treatment by the husband as a consequence of greater bargaining power) is important.

5. DISCUSSION

Analysis of survey data from rural Senegal indicates that the effects of women's empowerment on their subjective wellbeing are large. A wife's education and the income level of her household have no significant effect on her wellbeing, but a wife who cannot leave the house without her husband's permission, or cannot speak to an interviewer unless he is present, is much more likely to report a poor level of mental and physical health. This evidence complements existing work on the factors that drive variation in levels of empowerment (for example, De Hoop *et al*., 2014), and suggests that empowerment should receive at least as much attention as more traditional development goals.

The significance of empowerment here is consistent with other studies, which show that empowerment is associated with better access to medical care and better health outcomes for their children. The insignificance of household income is more surprising, and one might suspect that this is explained by a low correlation between household income and the resources available to a wife. This would be the case if, for example, few women had any control over household resources and positive shocks to household income were associated only with higher consumption by men. However, it also appears that in our sample, even though the wife's degree of control over household consumption is significantly correlated with our measures of empowerment, it is not

significantly correlated with her self-reported wellbeing. An alternative explanation may lie with the sentiments expressed by Wolof women to Perry (2005):

'Although her husband is the richest man in the village, Ndey proclaimed that she would rather be in her sister's marriage to a poor farmer than in her own to a rich man. Another woman observed, "Those without money [are] the ones who take best care of their wives."'

Perry also notes that low household income is viewed as a legitimate reason for a wife to return to her parents and seek a divorce. These social conventions may mean that there is unobserved heterogeneity in husbands' behaviour which is correlated with household income: higher income is associated with a greater sense of entitlement on the part of the husband and worse treatment of his wife/wives, offsetting any benefit to the wife/wives through higher consumption. In our sample there is no significant correlation between women's empowerment and household income,[17] so the variation in the quality marital relationship would have to be in some dimension other than empowerment. This is a subject for further study.

The evidence presented here stands at odds with the cross-country evidence for a positive correlation between empowerment and per capita income (Doepke *et al*., 2012). One possible explanation for the difference is that the cross-country variation in both income and empowerment is much greater than the within-country variation, and that with sufficiently large changes a positive association can be expected to appear. However, cross-country studies abstract from country-level heterogeneity that may make the association stronger or weaker. It cannot be assumed that economic development (narrowly defined) will inevitably lead to improvements in women's empowerment and wellbeing, and there is some reason to suppose that our findings may

[17] The Spearman rank-order correlation coefficients are 0.01 for ***income*** and ***freedom***, 0.07 for ***income*** and ***decisions-1***, and -0.02 for ***income*** and ***absent***.

apply to a wider range of countries. Senegal is a country in which modernization has led to some challenging of the traditional values that limit female empowerment, but these traditions are still highly persistent, especially in rural areas, leading to substantial inter-household variation in attitudes towards empowerment. Evidence from a wide range of countries points to the persistence of cultural traditions alongside modernization (Inglehart and Baker, 2000), so the patterns observed in Senegal may well appear elsewhere. In this case, the effective development policy will require robust individual-level measures of empowerment and wellbeing independently from economic outcomes, with policy interventions targeted explicitly at these outcomes.

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TABLE I

Descriptive statistics

continuous and count variables	*cohabiting wives (covariates reported)*			*all wives (covariates reported)*			*cohabiting wives (covariates not reported)*		
	N	*mean*	*s.d.*	*N*	*mean*	*s.d.*	*N*	*mean*	*s.d.*
health-score	629	3.09	1.60	756	3.17	1.63	47	3.09	1.43
decisions-1	629	0.57	0.90	756	0.67	1.03			
decisions-2	629	1.11	1.18	756	1.05	1.18			
control	614	0.86	0.86	741	0.86	0.90			
age	629	37.9	11.3	756	38.1	12.1			
income	629	11.5	0.93	756	11.5	0.95			
adults	629	5.05	2.35	756	5.11	2.38			
dist-hospital	629	20.1	11.2	756	20.0	11.2			
social	629	0.34	0.23	756	0.35	0.24			

binary variables	*cohabiting wives (covariates reported)*		*all wives (covariates reported)*		*cohabiting wives (covariates not reported)*	
	N	*proportion = 1*	*N*	*proportion = 1*	*N*	*proportion = 1*
anxiety	627	0.41	752	0.41	46	0.43
pain	627	0.46	751	0.46	45	0.42
freedom	629	0.49	756	0.49		
absent	629	0.69	756	0.73		
writing	629	0.22	756	0.23		
polygamous	629	0.32	756	0.27		
in-law	629	0.23	756	0.19		
Fula	629	0.40	756	0.40		
other	629	0.02	756	0.02		
jewel	629	0.50	756	0.49		

TABLE II

Correlation coefficients

Spearman rank-order correlations

	health-score	*anxiety*	*pain*	*freedom*	*absent*	*decisions-1*	*decisions-2*	*control*
anxiety	0.30***							
pain	0.38***	0.49***						
freedom	-0.18***	-0.13***	-0.18***					
absent	-0.05	-0.22***	-0.18***	0.07				
decisions-1	-0.14***	-0.11**	-0.09**	0.40***	-0.02			
decisions-2	-0.04	0.01	-0.03	0.31***	0.02	0.01		
control	-0.01	-0.03	-0.03	0.15***	0.01	0.24***	0.25***	

Simple correlations

	health-score	*anxiety*	*pain*	*freedom*	*absent*	*decisions-1*	*decisions-2*	*control*
anxiety	0.30***							
pain	0.39***	0.49***						
freedom	-0.16***	-0.13***	-0.18***					
absent	-0.05	-0.22***	-0.18***	0.07				
decisions-1	-0.13***	-0.09**	-0.05	0.38***	0.01			
decisions-2	-0.02	0.01	-0.03	0.27***	0.05	-0.07		
control	0.01	-0.02	-0.01	0.08*	-0.02	0.21***	0.15***	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

TABLE III

Random-effects estimates of the determinants of wellbeing (m.e. = marginal effects; t-ratios are in italics)

	dependent variable = anxiety: probit						*dependent variable = pain: probit*						*d.v. = health-score: tobit*		
	A(i)		**B(i)**		**C(i)**		**A(ii)**		**B(ii)**		**C(ii)**		**A(iii)**	**B(iii)**	**C(iii)**
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*coef.*	*coef.*
freedom	**-0.400**	**-0.124**	**-0.475**	**-0.147**			**-0.502**	**-0.158**	**-0.544**	**-0.171**			**-0.421**	**-0.585**	
	-1.82		***-2.36***				***-2.53***		***-3.09***				***-2.62***	***-4.06***	
decisions-1	-0.135	-0.042			**-0.209**	**-0.065**	-0.035	-0.011			-0.130	-0.041	**-0.211**		**-0.289**
	-1.27				***-2.07***		*-0.34*				*-1.37*		***-2.63***		***-3.86***
decisions-2	0.009	0.003			-0.037	-0.011	-0.036	-0.011			-0.097	-0.031	-0.041		-0.090
	0.12				*-0.50*		*-0.52*				*-1.45*		*-0.70*		*-1.60*
absent	**-0.587**	**-0.182**	**-0.591**	**-0.183**	**-0.591**	**-0.184**	**-0.489**	**-0.154**	**-0.494**	**-0.156**	**-0.505**	**-0.160**	0.101	0.101	0.091
	-3.08		***-3.05***		***-3.06***		***-2.71***		***-2.73***		***-2.74***		*0.69*	*0.69*	*0.62*
age	**0.033**	**0.010**	**0.032**	**0.010**	**0.033**	**0.010**	**0.042**	**0.013**	**0.042**	**0.013**	**0.043**	**0.014**	**0.042**	**0.040**	**0.043**
	3.57		***3.50***		***3.55***		***4.93***		***4.97***		***4.92***		***6.51***	***6.20***	***6.57***
income	-0.083	-0.026	-0.091	-0.028	-0.065	-0.020	0.084	0.027	0.084	0.027	0.108	0.034	-0.011	-0.027	0.007
	-0.82		*-0.89*		*-0.64*		*0.89*		*0.89*		*1.12*		*-0.14*	*-0.33*	*0.09*
writing	0.098	0.030	0.101	0.031	0.073	0.023	0.056	0.018	0.055	0.017	0.028	0.009	-0.107	-0.101	-0.134
	0.48		*0.49*		*0.35*		*0.29*		*0.28*		*0.14*		*-0.69*	*-0.65*	*-0.86*
adults	-0.045	-0.014	-0.045	-0.014	-0.035	-0.011	-0.029	-0.009	-0.030	-0.009	-0.017	-0.005	0.023	0.023	0.032
	-0.90		*-0.88*		*-0.70*		*-0.63*		*-0.65*		*-0.37*		*0.64*	*0.64*	*0.87*
polygamous	-0.027	-0.008	-0.020	-0.006	-0.051	-0.016	**-0.341**	**-0.107**	**-0.336**	**-0.106**	**-0.373**	**-0.118**	-0.189	-0.179	-0.208
	-0.13		*-0.09*		*-0.24*		***-1.80***		***-1.78***		***-1.92***		*-1.17*	*-1.11*	*-1.28*
in-law	-0.363	-0.112	-0.361	-0.112	-0.365	-0.114	-0.183	-0.058	-0.154	-0.048	-0.189	-0.060	-0.264	-0.261	-0.250
	-1.47		*-1.44*		*-1.47*		*-0.79*		*-0.67*		*-0.80*		*-1.37*	*-1.36*	*-1.30*
Fula	**0.412**	**0.128**	**0.442**	**0.137**	**0.541**	**0.169**	**0.438**	**0.138**	**0.438**	**0.138**	**0.606**	**0.192**	**0.421**	**0.416**	**0.552**
	1.85		***1.95***		***2.53***		***2.26***		***2.27***		***3.09***		***2.66***	***2.64***	***3.62***
other	-0.381	-0.118	-0.391	-0.121	-0.416	-0.130	-0.491	-0.154	-0.487	-0.153	-0.536	-0.170	**-1.467**	**-1.468**	**-1.497**
	-0.53		*-0.53*		*-0.58*		*-0.84*		*-0.82*		*-0.91*		***-2.62***	***-2.61***	***-2.63***
social	-0.342	-0.106	-0.355	-0.110	-0.333	-0.104	0.051	0.016	0.039	0.012	0.052	0.017	**-0.525**	**-0.548**	-0.515
	-0.82		*-0.83*		*-0.78*		*0.14*		*0.11*		*0.14*		***-1.69***	***-1.76***	*-1.63*
dist-hospital	0.004	0.001	0.005	0.001	0.008	0.003	**0.018**	**0.006**	**0.018**	**0.006**	**0.023**	**0.007**	-0.004	-0.005	0.000
	0.47		*0.48*		*0.88*		***1.91***		***1.90***		***2.43***		*-0.61*	*-0.66*	*-0.06*
ρ	**0.578**	**0.179**	**0.595**	**0.184**	**0.590**	**0.184**	**0.509**	**0.160**	**0.513**	**0.162**	**0.529**	**0.168**	**0.312**	**0.308**	**0.338**
	6.23		***6.52***		***6.38***		***5.22***		***5.34***		***5.50***		***5.01***	***4.89***	***5.60***

ONLINE APPENDIX

Appendix 1: Fitting the Wellbeing Models to the Sample of All Wives

Table A1 shows the results of fitting the models of ***anxiety***, ***pain*** and ***health-score*** to the full sample of wives, including those who are not cohabiting. (The relevant descriptive statistics for the full sample appear in Table I of the main text.) There is one additional explanatory variable: ***wife-of-head*** = 1 if the wife is married to the household head, and zero otherwise. Comparing Table A1 with Table III of the main text, it can be seen that including wives who are not cohabiting in the sample makes little difference to the results. The estimated effects of ***freedom*** in the ***anxiety*** and ***pain*** models, of ***absent*** in the ***pain*** model, and of ***decisions-1*** in the ***health-score*** model are all slightly smaller in Table A1 than in Table III, but still all significant at the 5% level. Other effects of empowerment are virtually identical in the two tables.

Appendix 2: Allowing for the Endogeneity of Empowerment, Consumption and Education

It is possible that consumption and education are endogenous to wellbeing, because wellbeing affects a woman's cognitive ability and labour productivity. It is also possible that the level of empowerment is endogenous. Wellbeing might affect a woman's ability to negotiate with her husband; it might also affect her choice of husband and therefore the magnitude of the difference between spouse preferences and the extent to which the husband feels the need to impose his will on her. In order to control for endogeneity, we can fit a first-stage model of the empowerment, consumption and education variables conditional on a set of instruments excluded from the second-stage wellbeing model. We will discuss the first-stage model, and then explain how controlling for endogeneity changes the results of the wellbeing model. The following results are based on a model corresponding to the B columns in Table III, excluding the ***decisions*** variables.

Instruments for empowerment, income and education

The instruments for empowerment are based on previous work in Senegal which suggests a link between ethnic diversity at the village level and a lower prevalence of traditional social attitudes (Bernard *et al*., 2008; Lépine and Ströbl, 2013).[18] First of all, we note that there is substantial variation in the ethnic composition of the villages in the sample: seven are entirely Wolof, 20 are entirely Fula, and twelve are mixed. (Ten out of the twelve mixed villages have a Wolof majority; the two with a Fula majority are very small. Wolof villages tend to be larger on average, and Wolof women make up 60% of the total sample.[19]) This variation in the level of ethnic diversity arises from the migration patterns of Fula nomads in the eighteenth and nineteenth centuries – until then, the Senegal River valley was populated only by Wolof. Some of the immigrant Fula created their own new villages, but others were welcomed into existing Wolof villages. Since then, there has been virtually no inter-village migration, and all of the Fula household heads in the survey stated that their land had been in the family for several generations. For this reason, the ethnic composition of each village can be treated as an exogenous variable.

Secondly, building on Lépine and Ströbl (2013), we note that Fula women living in Wolof-majority villages may have a higher level of empowerment than women in Fula-only villages, because women who are part of an ethnic minority are less influenced by the social norms associated with their traditional culture. In this case, Fula women in Wolof-majority villages should exhibit higher levels of ***freedom*** on average, so our first variable is constructed as follows:

- ***Fula-minority*** equals one if the woman is Fula (or of other non-Wolof ethnicity) and living in a Wolof-majority village, and equals zero otherwise.

[18] This correlation is consistent with evidence from natural experiments that exposure to ethnic diversity leads to more favourable attitudes towards women's empowerment (Clingingsmith *et al*., 2009).

[19] Village size is not a significant determinant of wellbeing.

Possibly Fula women in Fula-majority villages also differ from those in Fula-only villages, but the Fula-majority sample is too small to test this.

Finally, we construct a variable to capture the effect of the ethnic mix of the village on the extent of traditional social pressure on Wolof women. It is very rare for a married Wolof woman to live in a Fula-majority village, and the second variable reflects this asymmetry. We hypothesize that Wolof women in villages with some Fula presence are less subject to traditional social pressure, and construct the following measure:

- ***Wolof-share*** equals the fraction of Fula in the village if the woman is Wolof, and equals zero otherwise.[20]

Descriptive statistics for ***Fula-minority*** and ***Wolof-share*** appear in Table A2. We anticipate that larger values of either variable will both be associated with a higher probability of ***freedom*** = 1. However, they may also be associated with a lower probability of ***absent*** = 1, because a husband might tend to trust his wife less if she is under less outside pressure to conform to traditional social norms.[21]

Using ***Fula-minority*** and ***Wolof-share*** as instruments implies an exclusion restriction: conditional on the other variables in the wellbeing model, the ethnic composition of a woman's village is assumed to have no direct impact on her wellbeing. In this context, it is important to remember that the wellbeing model includes variables that capture both the woman's own ethnicity (***Fula*** and ***other***) and the level of social support for women of that ethnicity in the village (***social***).

[20] The upper 95th percentile of the distribution of this fraction is 0.25. There are just a handful of observations between 0.25 and 0.99 (reflecting the rarity mentioned in the previous paragraph), but these observations make the distribution highly skewed. The ***Wolof-share*** measure used in the results reported here is trimmed at 0.25.

[21] ***Fula-minority*** and ***Wolof-share*** are not very highly correlated: the Spearman rank order correlation coefficient is –0.24.

In fact, both ***Fula-minority*** and ***Wolof-share*** are significantly correlated with ***social*** ($p < 0.01$), but this does not mean that the exclusion restriction is violated, even if wellbeing does depend directly on the level of social support, because ***social*** is included in the second-stage model.

Household consumption may also be endogenous to wellbeing, because consumption depends on income, income depends on the wife's labour productivity, and productivity depends on wellbeing. Our instrument for ***income*** is based on an income shock that occurred in the year of the survey. Civil engineering work in the area of the survey led to salt contamination in the water used to irrigate some farms, and these farms suffered unusually low productivity levels in the survey year. Our instrument is as follows:

- ***Salt*** equals one if the farm was affected by salt contamination, and zero otherwise.

Our instrument for ***writing*** is based on the proximity of the village to the nearest high school. High school education has been an option for the youngest women in the survey, but distances to the school range between zero (when there is a school in the village) and 50km. The instrument is as follows:

- ***Dist-lycee*** is the distance from the village to the nearest high school, measured in kilometres, if the woman is aged 25 or under, and equals zero otherwise.[22]

Identification of the effect of ***writing*** on wellbeing relies on an exclusion restriction: conditional on the other variables in the wellbeing model, distance to the nearest high school affects wellbeing only through its effect on education. Distance to the high school is correlated with distance to other amenities, but recall that the second-stage model also includes ***dist-hospital***. Conditional on the

[22] It does not matter whether the model also includes an indicator variable for whether the woman is aged 25 or under. In both the wellbeing models and the ***writing*** model, the point estimate of the coefficient on this indicator variable is very close to zero, and the corresponding t-ratio is less than 0.1.

distance to healthcare amenities, it is unlikely that the distance to school has a direct effect on wellbeing.[23]

In order to show that the variables ***Fula-minority***, ***Wolof-share***, ***salt*** and ***dist-lycee*** are strong instruments, Table A3 includes reduced-form models of the four endogenous regressors. For ***freedom***, ***absent*** and ***writing***, these are random-effects probit models:[24]

$$\mathrm{P}\left(\mathit{freedom}_i = 1\right) = \Phi\left(\sum_k \zeta_k \cdot z_{ik} + \upsilon_j\right), \quad i \in j, \quad \upsilon_j \sim \mathrm{N}\left(\mu_\upsilon, \sigma_\upsilon^2\right) \tag{A1}$$

$$\mathrm{P}\left(\mathit{intervene}_i = 1\right) = \Phi\left(\sum_k \xi_k \cdot z_{ik} + \omega_j\right), \quad i \in j, \quad \omega_j \sim \mathrm{N}\left(\mu_\omega, \sigma_\omega^2\right) \tag{A2}$$

$$\mathrm{P}\left(\mathit{writing}_i = 1\right) = \Phi\left(\sum_k \pi_k \cdot z_{ik} + \psi_j\right), \quad i \in j, \quad \psi_j \sim \mathrm{N}\left(\mu_\psi, \sigma_\psi^2\right) \tag{A3}$$

Here, the ζ, ξ and π terms are parameters to be estimated, and z_{ik} is the value of the k^{th} explanatory variable for the i^{th} woman. The terms υ_j, ω_j and ψ_j capture unobserved heterogeneity in the j^{th} household. For the household-level variable ***income***, a least-squares model is used:

$$\mathit{income}_j = \sum_k \tau_k \cdot z_{jk} + \nu_j \quad \nu_j \sim \mathrm{N}\left(\mu_\nu, \sigma_\nu^2\right) \tag{A4}$$

Here, z_{jk} stands for the household average value of z_{ik} and the τ terms are parameters to be estimated.

The parameter values in Table A3 should be interpreted with some caution, since they represent reduced-form estimates. Nevertheless, we can see that the coefficient on ***Fula-minority*** is significant at the 1% level in the ***freedom*** equation, while the coefficient on ***Wolof-share*** is

[23] Adding a variable capturing the distance to the nearest clinic makes no substantial difference to our results.

[24] Equations (A1-A3) can also be fitted simultaneously using a multivariate probit model. However, the error terms in such a model have correlations that are very close to zero and statistically insignificant.

significant at the 5% level in the ***absent*** equation. As anticipated, the first of these coefficients is positive and the second is negative: ethnic diversity is associated with more cases of ***freedom*** = 1 but fewer cases of ***absent*** = 1. Also as anticipated, there are negative and significant coefficients on ***dist-lycee*** in the ***writing*** equation and on ***salt*** in the ***income*** equation. Across the four equations, the four instruments are jointly significant at the 5% level. Another interesting feature of Table A3 is that higher values of ***social*** are associated with a significantly higher expected of ***absent***. In a village with a maximal value of ***social*** = 1, the probability that ***absent*** = 1 is about 36 percentage points higher than a village in which ***social*** = 0. This suggests that better social support networks are associated with less frequent monitoring of the wife's behaviour by the husband. This is consistent with De Hoop *et al*. (2014), who find that support networks raise empowerment in a sample of Indian women. Even if these networks have no significant direct effect on wellbeing, they can still have an indirect effect.

The wellbeing model

We have three binary endogenous regressors and one continuous endogenous regressor. In order to control for endogeneity in the wellbeing models, we adapt the method outlined in Arendt and Holm (2006). First of all, we fit probit models of ***freedom***, ***absent*** and ***writing***, plus a least-squares model of ***income***. Then the parameters in the probit / tobit models of the wellbeing variables are estimated using the fitted values from the ***income*** equation in place of the observed values of ***income***, and adding the three Inverse Mills ratios from the first-stage probit models (denoted λ

$_{freedom}$, λ_{absent}, and $\lambda_{writing}$).[25] Standard errors on the parameters are estimated using a bootstrap.[26] Table A4 reports the results for each of the three wellbeing models.

The use of instrumental variables does reduce the precision of the parameter estimates in Table A4, and the only explanatory variables associated with significant effects are ***freedom***, ***absent*** and ***age***. Nevertheless, all of the empowerment effects that are significant at the 5% level in Table III remain so in Table A4: ***freedom*** and ***absent*** in the ***anxiety*** and ***pain*** models and ***freedom*** in the ***health-score*** model. The corresponding marginal effects in Table A4 are very similar to those in Table II, showing that greater empowerment leads to a substantial improvement in wellbeing.

Appendix 3: Additional Determinants of Wellbeing

From the results so far, it is unclear whether empowerment influences subjective wellbeing through an effect on the woman's physical health, or rather that empowerment influences subjective wellbeing independently of the woman's physical health. One way to see whether empowerment influences wellbeing through a woman's physical health is to add measures of physical health status to the wellbeing models. If the main channel for the empowerment effect is through physical health, then the addition of these measures should substantially reduce the

[25] If there were significant correlations between the error terms in the first-stage probit models, then the correction for endogeneity here would be rather more complex. However, as noted in footnote 22, these correlations are very close to zero.

[26] There is a concern that in a Heckman-type model, any correlation between the household random effects and the individual-level explanatory variables will lead to inconsistent parameter estimates. However, as suggested by Zabel (1992), conditioning all of the regression equations on the mean values of individual characteristics can remove this correlation and mitigate the biases that would otherwise arise. When these mean values are added to the regression equations, the results are similar to those reported in Tables A3-A4.

coefficients on ***freedom*** and ***absent***. For this reason, Table A5 shows the results from a set of extended models that include the following individual characteristics:

- ***Dif-walk*** equals one if the wife can walk five kilometres (but not easily), and equals zero otherwise.
- ***Not-walk*** equals one if the wife cannot walk five kilometres, and equals zero otherwise.
- ***Illness*** equals one if the wife suffers from a chronic illness, and zero otherwise.
- ***Kids*** indicates how many children (aged under 18) the wife has.[27]

Relevant descriptive statistics for these variables appear in Table A2. The results in Table A5 should be treated with some caution, since we do not have any instruments to control for the endogeneity of these variables. Nevertheless, comparison of Tables III and A5 provide some indication of whether the empowerment effect operates through a physical health channel.

The estimated coefficients on ***freedom*** and ***absent*** in Table A5 are very similar to those in Table III. In other words, the effect of empowerment on subjective wellbeing is not accounted for by an association between empowerment and physical health. Rather, for a given level of physical health, empowerment improves the woman's mental health and her own estimate of her wellbeing. This result is consistent with the fact that ***freedom*** and ***absent*** are not significantly correlated with ***dif-walk***, ***not-walk***, ***illness*** or ***kids***.

Nevertheless, Table A5 shows that better physical health is associated with improvements in all dimensions of subjective wellbeing. There are significant positive coefficients on ***dif-walk***, ***not-walk*** and ***illness*** in all three wellbeing models. If these are interpreted as causal effects, then

[27] It is also possible to include the total number of children in the household as an extra explanatory variable, and ***kids*** interacted with ***in-law*** and ***polygamy***. The coefficients on these variables are never significantly different from zero.

having a chronic illness adds about 20 percentage points to the probability that a woman will often feel anxious or depressed and 15 percentage points to the probability that she often feels bodily pains; it worsens her subjective health score by about one point. The effects of not being able to walk five kilometres (compared with being able to walk this distance easily) are slightly larger. However, the number of children has a significant effect only in the ***pain*** model, an extra child raising the probability that ***pain*** = 1 by about two percentage points. Note also that the marginal effects for ***easily-walk*** and ***illness*** are of a similar magnitude to those for ***freedom*** and ***absent***: roughly speaking, the effect on subjective wellbeing of having a high level of ***freedom*** and ***absent*** is similar to the effect of being able to walk a reasonable distance and being free from chronic illness. Moreover, since the coefficients on ***income*** and ***writing*** are statistically insignificant and close to zero, there is some reason to think that empowerment matters more for wellbeing than income and education.

APPENDIX REFERENCES

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TABLE A1

Random-effects estimates of the determinants of wellbeing including wives not cohabiting (m.e. = marginal effects; t-ratios are in italics)

	dependent variable = anxiety: probit						*dependent variable = pain: probit*						*d.v. = health-score: tobit*		
	A(i)		**B(i)**		**C(i)**		**A(ii)**		**B(ii)**		**C(ii)**		**A(iii)**	**B(iii)**	**C(iii)**
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*coef.*	*coef.*
freedom	**-0.387**	**-0.119**	**-0.445**	**-0.137**			**-0.348**	**-0.110**	**-0.432**	**-0.136**			**-0.432**	**-0.558**	
	-2.00		***-2.52***				***-2.05***		***-2.85***				***-2.95***	***-4.21***	
decisions-1	-0.121	-0.037			**-0.193**	**-0.060**	-0.024	-0.008		0.000	-0.078	-0.025	**-0.129**		**-0.195**
	-1.41				***-2.38***		*-0.31*				*-1.08*		***-1.96***		***-3.15***
decisions-2	-0.005	-0.001			-0.043	-0.013	-0.080	-0.025		0.000	**-0.119**	**-0.038**	-0.058		**-0.105**
	-0.06				*-0.64*		*-1.31*				***-2.04***		*-1.07*		***-2.03***
absent	**-0.602**	**-0.185**	**-0.611**	**-0.188**	**-0.611**	**-0.189**	**-0.416**	**-0.131**	**-0.419**	**-0.131**	**-0.423**	**-0.134**	0.104	0.092	0.091
	-3.31		***-3.33***		***-3.32***		***-2.49***		***-2.53***		***-2.51***		*0.73*	*0.65*	*0.64*
age	**0.036**	**0.011**	**0.035**	**0.011**	**0.036**	**0.011**	**0.045**	**0.014**	**0.046**	**0.014**	**0.046**	**0.014**	**0.049**	**0.047**	**0.049**
	4.70		***4.81***		***4.63***		***6.27***		***6.62***		***6.30***		***9.25***	***9.66***	***9.31***
income	-0.107	-0.033	-0.113	-0.035	-0.093	-0.029	0.031	0.010	0.022	0.007	0.042	0.013	-0.034	-0.020	-0.022
	-1.10		*-1.15*		*-0.95*		*0.36*		*0.26*		*0.48*		*-0.46*	*-0.27*	*-0.30*
writing	0.071	0.022	0.130	0.040	0.049	0.015	-0.022	-0.007	-0.005	-0.002	-0.022	-0.007	-0.204	-0.203	-0.211
	0.40		*0.74*		*0.28*		*-0.13*		*-0.03*		*-0.13*		*-1.45*	*-1.46*	*-1.49*
adults	-0.053	-0.016	-0.046	-0.014	-0.044	-0.014	-0.023	-0.007	-0.030	-0.009	-0.017	-0.005	0.011	0.018	0.019
	-1.19		*-1.02*		*-0.99*		*-0.63*		*-0.82*		*-0.46*		*0.34*	*0.55*	*0.56*
polygamous	-0.054	-0.017	-0.046	-0.014	-0.076	-0.024	**-0.389**	**-0.123**	**-0.371**	**-0.116**	**-0.407**	**-0.129**	-0.197	-0.209	-0.214
	-0.26		*-0.22*		*-0.37*		***-2.12***		***-2.05***		***-2.19***		*-1.24*	*-1.30*	*-1.34*
wife-of-head	-0.093	-0.029	-0.048	-0.015	-0.089	-0.028	-0.017	-0.005	-0.020	-0.006	-0.028	-0.009	-0.381	-0.291	-0.395
	-0.44		*-0.23*		*-0.42*		*-0.08*		*-0.10*		*-0.14*		*-2.19*	*-1.78*	*-2.27*
in-law	-0.390	-0.120	-0.360	-0.111	-0.385	-0.119	-0.146	-0.046	-0.090	-0.028	-0.151	-0.048	**-0.581**	**-0.482**	**-0.582**
	-1.59		*-1.49*		*-1.54*		*-0.62*		*-0.40*		*-0.64*		***-2.96***	***-2.56***	***-2.96***
Fula	**0.442**	**0.136**	**0.429**	**0.132**	**0.549**	**0.170**	**0.533**	**0.168**	**0.521**	**0.163**	**0.643**	**0.204**	**0.379**	**0.382**	**0.509**
	2.20		***2.12***		***2.83***		***3.12***		***3.14***		***3.87***		***2.62***	***2.63***	***3.61***
other	-0.663	-0.204	-0.699	-0.215	-0.678	-0.210	-0.368	-0.116	-0.459	-0.144	-0.373	-0.118	**-1.639**	**-1.811**	**-1.636**
	-0.95		*-0.96*		*-0.97*		*-0.70*		*-0.95*		*-0.71*		***-3.19***	***-3.57***	***-3.13***
social	-0.287	-0.088	-0.345	-0.106	-0.285	-0.088	0.012	0.004	-0.017	-0.005	0.011	0.004	-0.390	-0.358	-0.383
	-0.73		*-0.87*		*-0.71*		*0.04*		*-0.05*		*0.04*		*-1.39*	*-1.26*	*-1.34*
dist-hospital	0.007	0.002	0.006	0.002	0.011	0.003	**0.019**	**0.006**	**0.018**	**0.006**	**0.023**	**0.007**	-0.001	-0.002	0.003
	0.77		*0.65*		*1.21*		***2.31***		***2.29***		***2.80***		*-0.15*	*-0.28*	*0.51*

TABLE A1 (continued)

	dependent variable = anxiety: probit						*dependent variable = pain: probit*						*d.v. = health-score: tobit*		
	A(i)		**B(i)**		**C(i)**		**A(ii)**		**B(ii)**		**C(ii)**		**A(iii)**	**B(iii)**	**C(iii)**
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*coef.*	*coef.*
ρ	**0.587**	**0.181**	**0.601**	**0.185**	**0.599**	**0.185**	**0.478**	**0.151**	**0.468**	**0.147**	**0.485**	**0.154**	**0.289**	**0.319**	**0.315**
	7.59		***8.08***		***7.86***		***5.63***		***5.57***		***5.71***		***5.30***	***6.09***	***5.92***

TABLE A2

Additional descriptive statistics

continuous and count variables	*cohabiting wives (covariates reported)*			*all wives (covariates reported)*		
	N	*mean*	*s.d.*	*N*	*mean*	*s.d.*
Wolof-share	629	0.04	0.09	756	0.05	0.10
dist-lycee	629	3.03	8.38	756	3.27	8.72
kids	629	2.51	1.91	756	2.27	1.90

binary variables	*cohabiting wives (covariates reported)*		*all wives (covariates reported)*	
	N	*proportion = 1*	*N*	*proportion = 1*
Fula-minority	629	0.07	756	0.06
salt	620	0.01	745	0.01
dif-walk	628	0.31	755	0.30
not-walk	628	0.14	755	0.14
illness	626	0.24	753	0.24

TABLE A3

Models of the endogenous regressors (*m.e. = marginal effects; t-ratios are in italics*)

	dependent variable = freedom: probit		*dependent variable = absent: probit*		*dependent variable = writing: probit*		*dependent variable = income: OLS*
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*
age	0.014	0.002	**-0.022**	**-0.005**	**-0.057**	**-0.014**	-0.002
	0.83		***-1.85***		***-5.91***		*-0.48*
adults	-0.116	-0.014	-0.061	-0.012	**0.056**	**0.014**	-0.106
	-1.08		*-0.87*		***1.74***		*-6.51*
polygamous	0.110	0.013	0.169	0.034	-0.211	-0.052	0.001
	0.25		*0.54*		*-1.29*		*0.02*
in-law	-0.003	0.000	**1.582**	**0.320**	0.105	0.026	-0.077
	-0.01		***3.96***		*0.58*		*-0.77*
Fula	**-3.734**	**-0.443**	**-1.179**	**-0.239**	**-0.480**	**-0.118**	-0.459
	-5.62		***-3.02***		***-2.95***		*-5.64*
other	-1.058	-0.126	-0.631	-0.128	-0.166	-0.041	-0.232
	-0.63		*-0.59*		*-0.31*		*-0.80*
social	1.071	0.127	**1.786**	**0.362**	**0.635**	**0.156**	**-0.709**
	1.10		***2.53***		***2.17***		***-4.82***
dist-hospital	**-0.109**	**-0.013**	**-0.037**	**-0.008**	-0.004	-0.001	**0.014**
	-4.44		***-2.53***		*-0.67*		***4.31***
Fula-minority	**3.902**	**0.463**	-0.868	-0.176	-0.278	-0.068	0.080
	3.80		*-1.40*		*-0.81*		*0.51*
Wolof-share	2.888	0.342	**-4.633**	**-0.938**	-0.275	-0.067	-2.755
	0.79		***-1.99***		*-0.26*		*-5.04*
salt	0.929	0.110	0.511	0.103	**0.742**	**0.182**	**-1.674**
	0.67		*0.51*		***1.71***		***-3.98***
dist-lycee	-0.037	-0.004	**-0.026**	**-0.005**	**-0.019**	**-0.005**	-0.003
	-1.65		***-1.89***		***-2.30***		*-0.67*
ρ	**0.923**	**0.109**	**0.797**	**0.161**	0.105	0.026	
	42.54		***13.16***		*0.88*		

TABLE A4

Instrumental variable estimates (*m.e. = marginal effects; t-ratios are in italics*)

	dependent variable = anxiety: probit		*dependent variable = pain: probit*		*d.v. = health-score: tobit*
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*
freedom	**-0.461** ***-2.13***	**-0.141**	**-0.542** ***-2.86***	**-0.169**	**-0.498** ***-3.44***
absent	**-0.612** ***-2.77***	**-0.187**	**-0.500** ***-2.53***	**-0.156**	0.127 *0.85*
age	**0.080** ***2.06***	**0.025**	**0.095** ***2.36***	**0.030**	**0.067** ***1.99***
income	0.469 *0.83*	0.143	0.654 *1.00*	0.204	0.288 *0.48*
writing	0.071 *0.31*	0.022	0.077 *0.38*	0.024	-0.106 *-0.60*
adults	-0.054 *-0.51*	-0.017	-0.027 *-0.23*	-0.008	0.000 *0.00*
polygamous	0.207 *0.58*	0.063	-0.163 *-0.44*	-0.051	0.018 *0.06*
in-law	-0.178 *-0.43*	-0.054	-0.072 *-0.18*	-0.022	-0.113 *-0.33*
Fula	0.553 *0.90*	0.169	0.694 *1.11*	0.216	0.144 *0.30*
other	-0.519 *-0.47*	-0.159	0.361 *0.34*	0.112	-1.036 *-1.33*
social	-0.286 *-0.40*	-0.087	0.043 *0.05*	0.013	-0.233 *-0.36*
dist-hospital	-0.017 *-0.68*	-0.005	0.003 *0.11*	0.001	-0.029 *-1.33*
$\lambda_{freedom}$	0.178 *0.82*	0.055	0.147 *0.69*	0.046	0.222 *1.21*
λ_{absent}	0.525 *0.81*	0.161	0.168 *0.28*	0.052	0.564 *1.12*
$\lambda_{writing}$	-1.202 *-1.29*	-0.368	-1.226 *-1.21*	-0.382	-0.690 *-0.79*

TABLE A5

Random-effects estimates of the determinants of wellbeing with additional controls (m.e. = marginal effects; t-ratios are in italics)

	dependent variable = anxiety: probit						*dependent variable = pain: probit*						*d.v. = health-score: tobit*		
	A(i)		**B(i)**		**C(i)**		**A(ii)**		**B(ii)**		**C(ii)**		**A(iii)**	**B(iii)**	**C(iii)**
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*coef.*	*coef.*
freedom	**-0.466**	**-0.133**	**-0.512**	**-0.145**			**-0.518**	**-0.144**	**-0.541**	**-0.151**			**-0.430**	**-0.558**	
	-2.03		***-2.45***				***-2.61***		***-3.18***				***-2.91***	***-4.20***	
decisions-1	-0.113	-0.032			**-0.199**	**-0.058**	-0.010	-0.003			-0.108	-0.031	**-0.174**		**-0.252**
	-1.01				***-1.91***		*-0.10*				*-1.20*		***-2.36***		***-3.64***
decisions-2	0.042	0.012			-0.010	-0.003	-0.034	-0.009			-0.096	-0.027	-0.026		-0.076
	0.52				*-0.14*		*-0.47*				*-1.40*		*-0.48*		*-1.46*
absent	**-0.704**	**-0.200**	**-0.708**	**-0.201**	**-0.704**	**-0.203**	**-0.698**	**-0.195**	**-0.703**	**-0.196**	**-0.703**	**-0.198**	-0.009	-0.011	-0.019
	-3.41		***-3.38***		***-3.41***		***-3.76***		***-3.78***		***-3.73***		*-0.07*	*-0.08*	*-0.14*
age	**0.026**	**0.008**	**0.026**	**0.007**	**0.027**	**0.008**	**0.033**	**0.009**	**0.033**	**0.009**	**0.034**	**0.009**	**0.024**	**0.022**	**0.025**
	2.65		***2.57***		***2.66***		***3.74***		***3.76***		***3.78***		***3.82***	***3.50***	***3.87***
income	-0.075	-0.021	-0.082	-0.023	-0.058	-0.017	0.110	0.031	0.111	0.031	0.132	0.037	0.029	0.016	0.047
	-0.70		*-0.75*		*-0.54*		*1.14*		*1.16*		*1.34*		*0.38*	*0.22*	*0.62*
writing	0.094	0.027	0.098	0.028	0.069	0.020	0.028	0.008	0.027	0.007	0.000	0.000	-0.157	-0.154	-0.183
	0.44		*0.45*		*0.32*		*0.14*		*0.13*		*0.00*		*-1.10*	*-1.07*	*-1.28*
adults	-0.037	-0.011	-0.036	-0.010	-0.027	-0.008	-0.032	-0.009	-0.033	-0.009	-0.020	-0.006	0.025	0.025	0.034
	-0.71		*-0.68*		*-0.52*		*-0.69*		*-0.71*		*-0.45*		*0.74*	*0.75*	*1.00*
polygamous	-0.008	-0.002	-0.008	-0.002	-0.027	-0.008	-0.296	-0.082	-0.292	-0.081	**-0.325**	**-0.092**	-0.182	-0.177	-0.200
	-0.04		*-0.04*		*-0.12*		*-1.56*		*-1.53*		***-1.68***		*-1.22*	*-1.17*	*-1.32*
in-law	-0.286	-0.081	-0.306	-0.087	-0.274	-0.079	-0.017	-0.005	0.010	0.003	-0.017	-0.005	-0.257	-0.261	-0.244
	-1.09		*-1.14*		*-1.04*		*-0.07*		*0.04*		*-0.07*		*-1.40*	*-1.44*	*-1.33*
Fula	0.329	0.094	0.367	0.104	**0.470**	**0.136**	**0.315**	**0.088**	**0.312**	**0.087**	**0.477**	**0.134**	**0.275**	**0.275**	**0.410**
	1.39		*1.52*		***2.09***		***1.68***		***1.68***		***2.57***		***1.85***	***1.86***	***2.86***
other	-0.485	-0.138	-0.502	-0.142	-0.532	-0.154	-0.717	-0.200	-0.709	-0.198	-0.770	-0.217	**-1.696**	**-1.704**	**-1.720**
	-0.59		*-0.59*		*-0.65*		*-1.01*		*-0.99*		*-1.10*		***-3.27***	***-3.27***	***-3.27***
social	-0.538	-0.153	-0.545	-0.155	-0.524	-0.151	-0.054	-0.015	-0.064	-0.018	-0.044	-0.012	**-0.720**	**-0.738**	**-0.705**
	-1.22		*-1.21*		*-1.17*		*-0.15*		*-0.18*		*-0.12*		***-2.49***	***-2.54***	***-2.40***
dist-hospital	0.004	0.001	0.005	0.001	0.008	0.002	**0.020**	**0.006**	**0.020**	**0.005**	**0.025**	**0.007**	-0.004	-0.004	0.000
	0.40		*0.48*		*0.86*		***2.14***		***2.13***		***2.67***		*-0.54*	*-0.54*	*0.07*
dif-walk	**0.357**	**0.102**	**0.364**	**0.103**	**0.363**	**0.105**	**0.982**	**0.274**	**0.979**	**0.273**	**0.997**	**0.280**	**0.670**	**0.671**	**0.678**
	1.83		***1.83***		***1.87***		***5.23***		***5.19***		***5.20***		***5.23***	***5.21***	***5.27***

TABLE A5 (continued)

	dependent variable = anxiety: probit						*dependent variable = pain: probit*						*d.v. = health-score: tobit*		
	A(i)		**B(i)**		**C(i)**		**A(ii)**		**B(ii)**		**C(ii)**		**A(iii)**	**B(iii)**	**C(iii)**
	coef.	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*m.e.*	*coef.*	*coef.*	*coef.*
not-walk	**0.758**	**0.216**	**0.811**	**0.230**	**0.749**	**0.216**	**1.174**	**0.327**	**1.190**	**0.332**	**1.175**	**0.330**	**1.105**	**1.135**	**1.105**
	2.53		***2.67***		***2.52***		***4.21***		***4.29***		***4.19***		***6.23***	***6.42***	***6.20***
illness	**0.679**	**0.193**	**0.680**	**0.193**	**0.661**	**0.191**	**0.578**	**0.161**	**0.577**	**0.161**	**0.564**	**0.159**	**0.949**	**0.953**	**0.934**
	3.20		***3.14***		***3.15***		***3.07***		***3.05***		***3.01***		***6.91***	***6.92***	***6.78***
kids	0.046	0.013	0.047	0.013	0.050	0.014	**0.074**	**0.021**	**0.074**	**0.021**	**0.077**	0.022	-0.005	-0.005	-0.003
	0.94		*0.95*		*1.01*		***1.69***		***1.69***		***1.75***		*-0.17*	*-0.17*	*-0.09*
ρ	**0.606**	**0.172**	**0.623**	**0.177**	**0.607**	**0.175**	**0.460**	**0.128**	**0.461**	**0.129**	**0.476**	**0.134**	**0.345**	**0.349**	**0.367**
	6.26		***6.54***		***6.22***		***4.06***		***4.09***		***4.22***		***5.50***	***5.54***	***6.03***