Mariage et bien-être de l'épouse en Afrique de l'Ouest

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PSL UNIVERSITÉ PARIS

THÈSE DE DOCTORAT
DE L'UNIVERSITÉ PSL

Préparée à l'Ecole des hautes études en sciences sociales

Mariage et bien-être des femmes en Afrique de l'Ouest

Soutenue par
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Le 21 mai 2019

Ecole doctorale n° 465
Economie Panthéon Sorbonne

Spécialité
Sciences Economiques

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L'ECOLE DES HAUTES ETUDES EN SCIENCES SOCIALES

ÉCOLE DES HAUTES ÉTUDES EN SCIENCES SOCIALES

THÈSE POUR L'OBTENTION DU TITRE DE DOCTEUR EN SCIENCES ECONOMIQUES

Marriage and Women's Welfare in West Africa

Thèse présentée et soutenue publiquement le 21 Mai 2019 par

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Remerciements-Acknowledgement

Je remercie d'abord ma directrice de thèse Sylvie Lambert, pour m'avoir fait connaître l'économie du développement en master et pour avoir facilité ma découverte de ce champs. Ta passion et ton enthousiasme, ainsi que tes multiples idées, m'ont donné goût à la recherche et ont orienté mes choix professionnels. Je te remercie aussi pour ta rigueur et ta précision, aussi bien sur le fonds, que sur la forme, qui m'ont fait progresser à ces deux niveaux. J'admire plus généralement ton engagement désintéressé dans la recherche. Le fait notamment que tu ne réfléchisses pas en termes de choix payants ou peu risqués, mais que tu orientes ta recherche en fonction de problèmes qui te semblent majeurs, quelqu'en soit le risque. Merci aussi pour l'accès aux données PSF. Je te remercie aussi enfin beaucoup pour ton soutien dans les moments de découragement.

Je remercie aussi Luc Behaghel, qui a suivi mon travail au cours de ces années, pour ses suggestions, ses conseils et son accompagnement.

Je remercie aussi Richard Akresh et Catherine Gurkinger pour leurs précieux commentaires qui m'ont permis d'améliorer le contenu, et pour leur regard extérieur. Merci aussi à Roberta Ziparo d'avoir accepté de faire partie de ce jury, j'en suis enchantée.

Plus largement, je tiens à remercier tous les chercheurs, juniors et seniors, qui ont assisté aux séminaires et nous ont donné des suggestions. Je remercie plus particulièrement le groupe développement de PSE et Andrew Clark, Denis Cogneau, Philippe de Vreyer, Fabrice Ettile, Laurent Gobillon, Marc Gurgand, Marie Laclau, Marion Leturcq, David Margolis et Liam Wren-Lewis. Je remercie aussi les chercheurs rencontrés lors de séminaires à l'extérieur ainsi que Wendy Janssens qui m'a invitée à la Vrije Universität à Amsterdam.

Merci à mes coauteures (autres que Sylvie, que j'ai déjà remerciée). Je pense en premier lieu à Karine avec qui j'ai arpenté Dakar et certaines de ses banlieues. Merci Karine de m'avoir fait intégrer tant de projets si intéressants, de m'avoir accompagnée pendant tous ces séjours sur le terrain. Plus généralement, tes nombreuses idées et ta passion provoquent l'admiration et sont communicatives. J'ai énormément appris en travaillant avec toi, en termes d'entretiens qualitatifs, mais aussi beaucoup au cours du travail quantitatif, en analyse de données et en rédaction, étant très débutante au début de notre collaboration. Je remercie aussi les enquêteurs qui ont travaillé avec nous au Sénégal, et notamment Ablaye et Astou. Je remercie aussi Sarah. Merci à toi encore pour tes idées, ta précision et ta rédaction. C'était un plaisir d'échanger avec toi sur ce papier, et j'espère que nous aurons l'occasion de travailler à nouveau ensemble. Enfin, même si nos travaux communs ne font pas partie de cette thèse (et ne sont d'ailleurs pas finis), merci à Juliette, pour son engagement, son sérieux, sa rigueur et ses idées. Merci d'avoir continué à travailler sur l'article, alors même que j'étais très occupée en cette fin de thèse.

Pour le financement de la thèse, merci à l'ENS Lyon, l'EHESS et Paris Sorbonne. Merci à Claudia Senik pour m'avoir donné l'opportunité d'enseigner auprès d'elle. Merci au personnel administratif, et plus particulièrement à Radja Aroquiaradja, Stephane Brice, Marie Font, Sébastien Font, Véronique Guillotin, Béatrice Havet, Eliane Madeleine et José Sastre.

Merci à Kenneth et Yannick, pour leur soutien et leur aide en ce début de thèse qui était difficile. Merci à Marie et Pauline. Un grand merci à Paola, pour tous tes conseils et ton aide en matière de recherche, pour toutes tes relectures: j'ai aussi beaucoup appris grâce à toi! Merci aussi de m'avoir constamment soutenue et rassurée, et d'avoir éclairé mon quotidien. Merci à Adrien, Christina, Laura et Marco. Mes remerciements vont surtout au bureau R6-01, dont beaucoup de membres ont déjà été citées, mais pas encore Lisa. Merci pour toutes vos suggestions de recherche, pour toute votre aide quant aux mails à envoyer en anglais (et en français) et pour les lettres de motivation. Merci plus généralement pour m'avoir soutenue dans cette dernière année particulièrement pénible et de m'avoir fait prendre confiance en moi. Yasmine, merci de m'avoir fait entrer dans ce nouveau domaine qu'est l'économie de l'éducation. Un grand merci aussi pour m'avoir appris à affronter les problèmes plutôt qu'à les subir. Merci d'avoir travaillé avec moi l'économie, mais aussi l'arabe et la danse... Une des grandes joies de cette thèse réside dans le fait de t'avoir rencontrée. Je tiens aussi à remercier Cyril et Melissa, pour avoir apporté un souffle d'air frais dans les locaux de PSE, loin de considerations économétriques en tout genre. Merci enfin à tous mes amis de PSE (et j'en oublie sûrement, je suis désolée par avance): Andrea, Alessandro, Alexandre, Asma, Aurélie, Bassirou, Brice, Clara, Clément, Cristina, Elias, Fanny, Hélène, Juni, Léo, Malka, Marianne, Marco R., Marion, Mattea, Nathalie, Nolwenn, Oscar, Paul B., Paul D., Pepe, Quentin, Sasha, Simon B., Simon R. et Thomas...

Je tiens à remercier ma famille. Merci à mes parents, dont la curiosité intellectuelle n'est pas pour rien dans la voie que j'ai choisie. Je remercie aussi ma grand-mère. Merci à Edern, Wen et Loeïza pour leur humour et leur constant soutien. Merci aussi à Isabelle et Frédéric.

Je remercie mes amis de lycée, de prépa, de master, de Lyon, d'Istanbul et d'ailleurs. Un merci plus particulier à Bao, Blandine, Flore et Raphaël. Merci à Alicia, Ivan et Guillaume. Merci à Gwenaëlle, Emmy-Lou et Marie. Et évidemment, merci à Léa, Bénédicte, Sophie et Myriam. Une pensée spéciale pour Charlotte et son suivi hebdomadaire.

Enfin, bien sûr merci à Kévin qui maintenant, connaît parfaitement la différence entre cousins croisés et cousins parallèles. Merci de m'avoir soutenue et encouragée pendant cette thèse. Merci pour tes relectures. Merci surtout pour ta générosité.

Abstract

En Afrique de l'Ouest, le mariage est une institution sociale majeure. Au Sénégal par exemple, en 2006, près de 90% des femmes de plus de 25 ans ont un jour été mariées. C'est aussi un bouleversement important dans la vie quotidienne, surtout pour la mariée qui, dans la plupart des cas, quitte le foyer dans lequel elle a grandi. Une autre caractéristique importante du mariage en Afrique de l'Ouest est qu'il implique un grand nombre d'acteurs : non seulement le couple mais aussi leurs parents et la famille étendue. La cérémonie se caractérise en outre par d'importants échanges financiers, entre différentes personnes : les époux eux-mêmes, mais aussi leurs familles respectives. Ces différentes caractéristiques peuvent être étudiées en regard de leur lien avec le bien-être des femmes au sein de leur ménage. L'objectif de cette thèse est d'ajouter à l'étude du sujet.

Dans le premier chapitre, nous nous demandons si les parents sont incités à marier leurs enfants à un membre de la famille afin de mieux s'assurer contre les chocs de revenu idiosyncratiques défavorables. A partir des données originales d'un panel de ménages recueillies au Sénégal en 2006/2007 et 2011/2012, nous constatons que le mariage intrafamilial des filles aide le ménage de leurs parents à mieux lisser la consommation alimentaire lorsqu'un parent est tombé malade, notamment parce que ces ménages reçoivent relativement plus de transferts. Nos résultats indiquent que la demande d'assurance des parents peut expliquer en partie le mariage endogame de leur fille. Ils étendent la littérature sur les liens entre les décisions de mariage et la demande d'assurance. Le deuxième chapitre examine l'impact d'une politique éducative sur le bien-être des femmes au Bénin. Nous analysons l'impact d'une forte augmentation des constructions d'écoles dans les années 1990 dans ce pays sur la fréquentation de l'école primaire, l'âge au mariage et la tolérance à la violence conjugale (VPI). En utilisant une méthode de double différence et un modèle de régression sur "kink", nous constatons que le programme a augmenté la probabilité de fréquenter l'école primaire dans les zones rurales. La politique a également réduit la probabilité de trouver que les coups infligés à l'épouse sont tolérables. Nous montrons que, dans ce contexte, les avantages de l'éducation des filles se sont répercutés sur le bien-être des femmes au-delà de l'objectif initial de la politique. Dans le troisième chapitre, nous examinons la relation entre la compensation matrimoniale et le bien-être de l'épouse dans son ménage. Nous tenons compte de l'existence simultanée de différents paiements maritaux, qui vont dans des directions différentes entre les parties prenantes, et qui sont largement ignorés. Nous utilisons une enquête unique en son genre qui s'interroge séparément sur les différentes prestations matrimoniales. Nous soulignons la force du lien entre ce qui est donné à la mariée elle-même et son bien-être, contrairement au lien ténu avec ce qui est donné à la famille.

In West Africa, marriage is a major social institution. In Senegal, for example, in 2006, nearly 90% of women over 25 years of age were once married. It represents also a major disruption the daily life, especially for the bride, who in most cases leaves the household in which she grew up. Another important feature of marriage in West Africa is that it involves a large set of actors: not only the couple but also their parents and extended family. The ceremony is also characterized by important financial exchanges, between different people: the bride, groom and their families. These stylized facts can be examined in terms of their relationship to women's well-being within their households. The objective of this thesis is to add to the study of the topic.

In the first chapter, we consider whether parents have incentives to marry their children to a member of the kin group in order to better insure against adverse idiosyncratic income shocks. Exploiting original panel data from a household survey collected in Senegal in 2006/2007 and 2011/2012, we find that daughters' within-kin-group marriage helps their parents' household to better smooth food consumption when a parent has fallen ill.This better smoothing is notably driven by the fact that households having married a daughter within the kin group receive relatively more transfers. Our results indicate that parents' demand for insurance can explain part of their demand for marrying within the kin group their daughter. They extend the literature on inter-linkages between marriage decisions and demand for insurance. The second chapter examines the impact of an education policy on women's well-being in Benin. Using a sharp increase in school constructions in the 1990s in this country, we assess the causal impact of a primary education program on primary school attendance, age at marriage and tolerance of intimate partner violence. Using a double difference method, along with a regression kink design, we find that the program increased the probability to attend primary school in rural areas. The policy also decreased the probability to find wife beating tolerable. We show that, in this context, the benefits of girls' education have percolated down to women's well-being beyond the initial goal of the policy. In the third chapter, we investigate the relationship between the bride price and the well-being of the wife in her household. We take into account, the simultaneous existence of other marriage payments, flowing in different directions between the stakeholder, that is largely ignored. To assess the impacts of these marital transfers on the women's well-being in Senegal, we use a unique survey that enquires separately about the different marriage payments. We highlight the strength of the link between what is given to the bride herself and her welfare, contrary to the looseness of the link with what is given to the family.

Keywords: Marriage, Women, Sub-Saharan Africa, Kinship, Education, Bride Price.
JEL Classification: O12, J12, J16, I12, I25, O55.

Contents

List of Figures

List of Tables

General Introduction

General Motivation

Marriage is a structuring step in the lives of individuals but is also a central element of the nature of the society in which these individuals live. Understanding the forms of marriage and their impact on the lives of individuals is therefore an important entry point to understand a society. Marriage customs influence the configuration of households, and more generally is the cornerstone of the societal organization. The institution is intrinsically linked to the social expectations that weigh on women and men. In Senegal for instance, the husband is expected to provide for the needs of his family. The marriage defines also with whom the individual lives, often beyond the own partner, since it plays a key role in the formation of a family. It has therefore a vast impact on individual welfare. Family plays important economic roles, especially the ones we think of first, consumption and production. Marriage has consequently a substantial place in the economic literature, essentially since Becker (1991). But marriages in developing countries and more specifically in West Africa present features, such as the substantial involvement of parents and the exchange of marital payments that have been more scarcely studied. These stylized facts of the West African marriage markets can be analyzed through their links with the wife's welfare in the household. The question of women's welfare is also of central importance. It has been established as a goal to promote development but also as an aim in itself, by policy-makers but also in the economic literature (Duflo (2012)). Welfare of women (which is a more general notion than empowerment, referring more to autonomy and self-determination) is an issue in many areas of life: on the labor market, but also within the family. In West Africa, the women's welfare within the household is even more critical since their access to labor markets is constrained and female celibacy is stigmatized. This thesis aims to build on the existing literature on the links between marriage and women's welfare, with a special focus on education, marital payments and familial endogamy, meaning in this context in general marriages between cousins. Countries studied are Senegal and Benin.

Context

In West Africa, marriage is firstly a major social institution: social pressure to marry is extremely strong, particularly towards women. As a consequence, in Senegal and Benin, nearly 90% of women over 25 years old were once married. The question of marriage concerns actually all women. It represents also a major disruption in the daily life, especially for the bride, for who the marriage is often the first time that she leaves the household in which she grew up. Patrilocality, the norm according to which the wife comes to live in the household of her husband, is a dominant practice in the area. Sometimes, the woman even coresides with her in-laws (25% of married women in Senegal in 2006).

An other important feature of marriage in West Africa is the existence of polygamy. In 2006 in Senegal, 35% of married women between 15 and 49 years old are in a polygamous union. The frequency varies a lot according to the country considered: for instance in Benin in 2006, 46% of married women between 15 and 49 years old have co-wives. Polygamy has consequences in terms of marriage matching and potentially on women's welfare (Boltz and Chort (2019), Rossi (2018)). The consequences of polygamy are beyond the scope of this PhD dissertation.

An other important characteristic of marriage in West Africa, as in other developing regions, is that it involves a large set of actors, beyond the only couple to be married. The parents have a strong decision power in the choice of the partner of their child, but also in the choice of the timing of the marriage. This is especially true for girls, when the child is married very young, and in case of first marriage (Le Cour Grandmaison (1971)). But other persons than the parents can also be involved, even friends and neighbors. They are also very present during the married life, a fortiori when there is co-residence of diverse generations in the same household.

The involvement of multiple actors in the marriage translates into the system of marital transfers. Marriage is also characterized by important financial exchanges, between different stakeholders: families of the bride, groom and neighbors. Bride price, a payment from the family of the groom to the family of the bride, is almost mandatory in numerous contexts: in Senegal for instance, a bride price was paid in 80% of current marriages in 2006. Reality is nevertheless far more complex than this only payment. For instance, in Senegal, the mother of the daughter will redistribute some of the acquired bride price to specific persons, who had a key role in the education of their daughter (*ndeye* in wolof). An other related custom is the exchange of gifts,

called *ndawtals*, at the ceremony: the mother and the bride herself receive from family, friends and neighbors amounts of money, recorded in a notebook (Buggenhagen (2012)).

General Research Question

If we suppose that the utility of the child is not necessarily similar to the one of the parents, a natural question would be at which extent the marriage benefits to the parents or to the child himself. This is particularly relevant in a context where the involvement of the parents in the marriage of the children is strong. More generally, how does women's welfare and parental welfare vary with marriage entry conditions? I will provide some answers to this question in this PhD dissertation. I will exploit some specificities of the West-African marriage markets: marriage within the family and exchange of marital payments, among others. I will also investigate two key moments in the marriage process: the match and the subsequent married life. On these topics, I will present first a global conceptual framework, and then a more specific empirical literature.

Conceptual Framework

In the theoretical literature, Becker (1991) is one of the first to analyze marriage from an economic point of view. He wants to explain the matching process, and how labor decisions are taken within the household. According to his theory, marriages are formed in order to optimize the production of household commodities. For a match to constitute an equilibrium, a groom or a bride should not wish to be married with another groom or bride. Under some hypotheses, we should observe assortative matching according to physical and human capital such as education. Of course, in practice, other characteristics are taken into account by the agents. Yet, empirically, there is a wide support of the theory of assortative matching (Fafchamps and Quisumbing (2007)). This phenomenon has high impacts in terms of transmission and amplification of inequalities between generations. This model has other implications, among which the fact that higher education allows to match with a higher educated partner and gives access to a higher household consumption. His model allows to look at the impact of specific factors on the demand or on the supply side. According to the model of Becker, in regions where polygyny is a frequent custom, polygyny should improve the welfare of women, on the ground that if a woman is satisfied in a monogamous union, she has no reason to enter a polygynous marriage. He makes the strong hypothesis that the wife choose who she marries, that has been further criticized (Fafchamps and Quisumbing (2007)). In this seminal model also, the bride

price is seen as the compensation of a loss of a productive asset (supply curve) and as a payment from the groom for services that he expects from the wife (demand curve) (Grossbard (1980)). This theory is compatible with two facts: bride price are higher when women input in agricultural production is high and in context of polygyny. For this reason, bride price should be correlated positively with the welfare of the wife. But since the model is unitary, it does not take into account potential welfare differences within the household. The relative consumption of each member within the household is not at the heart of the interest. This is especially problematic in a context of extended households.

The unitary model has proven to be too simplistic in many respects: Becker assumes that the household behaves as a single individual. Yet, spouses have not always the same interest. A daughter can also have different interests than her parents. Among other, the influence of the origin of the income on consumption choices within the household has highlighted the necessity to build other models, such as the collective model or the bargaining model (Donni and Ponthieux (2011)). In these models, members of the same household have different functions and levels of utility, which is compatible with a context of potential inequalities between spouses and more generally within the household. Many elements can drive the share obtained by each spouse: preference factors (impacted by education) and distribution factors, such as sex ratio, origin of the income (often correlated with education), prevalence of polygyny in the area and norms. The collective model is the most used in the current economic literature. It is built on the assumption that every negotiations lead to pareto-efficient allocation: the utility of one person can not be increased without decreasing the utility of another. This assumption has been criticized, particularly in the analysis of developing countries (Udry (1996), Baland and Ziparo (2018)). Some models of bargaining do not assume the efficiency of the allocation. In these models, agents can threat to stop the bargaining process and reduce subsequently the utility of everyone. Considering a bargaining within the couple, the utility at the threat point has been originally assumed to be the utility in case of divorce. Lundberg and Pollack (1993) consider that this threat is too strong since leaving the household means losing the gains from household participation. They suggest a minimalist participation (non-cooperation within the household) as threat point. Education will often induce a higher and more credible threat point and therefore a higher bargaining power. To model the intra-household allocation in the context of extended households is even more difficult, but promising research exists in this field (Baland and Ziparo (2018)). In a context, where the involvement of the parents is very important and where their interest is not necessary the one of their daughter, it would be also interesting to integrate a multi-agent component in matching models, and not consider, as Becker,

that parents and the bride have the same interest.

Note that from the point of view of the collective or bargaining model, the bride price has no reason to be linked in the same way to the well-being of the wife and to the one of her parents (moreover, following the ceremony, they are even in different households). Some authors have highlighted that marital payments have not the only function to clear the marriage market, but also to transmit inheritance to the daughter when patrilocality interferes with the inheritance claiming after the marriage at parental death (Chan and Zhang (1999), Fafchamps and Quisumbing (2007)). They insisted on strategic consideration when fixing the amount of payments (Botticini and Siow (2003), Gaspart and Platteau (2010)). This strategic consideration result for a part from the information asymmetry that characterizes the marriage: future spouses and families do not know how people will behave during the married life. In the model of Do *et al.* (2013), marriage within the family is an alternative to dowry, to avoid that the bride's family free rides, by limiting its investment in the newly married couple, in case of patrilocality.

The theoretical literature provides an interesting global framework. The empirical literature has also investigated the choice of the partner and the exchange of marital payments, testing more specific hypotheses.

The choice of the partner

Families fulfill important economic roles, such as consumption, production, help for job search, transmission of norms. Family can also fulfil a role of insurance, being characterized by a high degree of altruism and by long term interactions (La Ferrara (2010)). In developing countries, where idiosyncratic shocks are frequent, social safety net scarce and market failures acute, the role of the family is even stronger (Fafchamps and Quisumbing (2007), Guirkinger and Platteau (2016)). As a result, decisions are often not taken individually. This is particularly true in the context of West Africa, where families are large (Locoh (1995)) and embedded in a vast network of kins. Marriage is obviously an area where parents have a strong decision power. Parents choose the assets brought to the marriage that depends on inheritance rules, comparative advantages of men and women (Fafchamps and Quisumbing (2007)). They are often involved in the choice of the partner and in the timing of the marriage. Numerous articles have shown that the marriage of the children could be linked to parental interest, even if parents are altruistic. In a seminal paper, Rosenzweig and Stark (1989) show that in rural India, parents tend to marry their daughter far away, to avoid that the new household of the daughter and

their own household are hit by the same climatic shock. Choice of the new household (and thus of the partner) of the child is therefore a way to deal ex ante with shocks. But marriage of the child has also be shown as a way to deal ex post with shocks. Corno *et al.* (2017) highlight for instance that parents tend to marry their daughter earlier in case of drought in areas where bride price are exchanged, whereas it is the contrary in dowries areas. More generally, parents have a high decision power concerning the choice of the partner. They take also other decisions, that have at least an indirect impact on the choice of the partner, such as the education. If the cost of education is reduced, parents can increase the education level of their daughter. This higher education creates a shift in preferences and matching. It can also increase the say of the girl in the choice of her husband. Beyond the choice of the partner, education has been shown to have impacts on age at marriage, fertility, but also on labor market outcomes, all components of wife's welfare. The literature has indeed well documented that entering early into marital life went hand in hand with, for instance, early motherhood, which is known to be detrimental to women's health (Raj *et al.* (2009) and Nour (2006)).

The exchange of marital payments

The importance of parental involvement in the marriage is especially visible in the exchange of marital payments, that occur often between families, beyond the only couple to be married. The question of the links between bride price and parental welfare, but also women's welfare is therefore very important. If the theoretical literature underlines the potential links between the marital payments and the wife's welfare, the empirical literature highlights also the links with parental welfare. In the paper of Corno *et al.* (2017), bride price is clearly beneficial for parents, but potentially harmful for girls since it is an incentive to their early marriage in case of drought. Other works have shown that dowry payments could be harmful for women (Bloch *et al.* (2004)). Of course, parental and wife's welfare are not necessarily antithetic. Ashraf *et al.* (2016) show for example that parents tend to invest more in education in case of school constructions, when the ethnic group is used to paying bride prices. Indeed, a higher level of education goes with a higher bride price. The custom has therefore potential positive impacts for both parents and daughters.

An other important fact to take into account, is that often, the marital payment is not reduced to a bride price going from the groom to the family of the bride. In Senegal, beyond the only bride price going to the parents of the daughters, a gift is given by the groom to the bride. It is an interaction that takes place only within the couple, and where both spouses have a higher margin

of manoeuvre. Just as we do not expect the same correlation between a dowry or a bride price and the parental welfare, we will not expect the same correlation between the wife's welfare and a bride price given to her parents, or a gift given directly to her.

To summarize, various strategic considerations enter in the choice of the partner, and in the exchange of marital payments, for the couple of parents, and for the spouses themselves.

What could influence the choice of the husband?

- From the parental point of view: How does the parental demand of insurance explain the marriage within the family in case of Senegal?

  → Topic of chapter 1, written jointly with Karine Marazyan (IEDES-Paris 1).

- How does the education level of the bride influence husband characteristics in the context of Benin?

  → Addressed partly in chapter 2, written jointly with Sarah Deschênes (INED-PSE).

Are there other elements, characterizing the marriage entry conditions, revealing of the well-being of the wife during the married life?

- Impact of the education level of the bride on the marital well-being in case of Benin:

  → Topic of chapter 2.

- Link between the wife's well-being within her household and the exchange of matrimonial payments in case of Senegal:

  → Topic of chapter 3, written jointly with Sylvie Lambert (INRA-PSE).

The Data

To analyze these questions, detailed data on marital history are essential. This information is provided, among others, in the survey Pauvreté and Structure Familiale (PSF) on Senegal (De Vreyer *et al.* (2008)), that I had the opportunity to use in the first and the third chapters of the dissertation. Every marital compensation exchanged at the time of marriage is precisely recorded. These marital compensations are self-declared and could be submitted to some errors, as in other surveys. For this reason, in the analysis, we rather concentrate on the most

recent marriages (ten years before the survey). The PSF survey presents a precise record of the marital life, which is very rare in this context. These data are crucial since women tend to marry several times, and since widowhood and divorce have been proven to impact on women's welfare (Lambert *et al.* (2019)). An other great aspect of these data is that they provide consumption measure at a sub-level within the household. Using a systematic division that has emerged from qualitative interviews, individuals are recorded in sub-groups that correspond to semi-autonomous budgetary units. The consumption that is common to all the household, shared between specific "cells", and proper to the cell are precisely recorded. This is essential in order to measure the relative welfare of the cell in the household, in a context where households are very large, and where all expenses are not shared between the different members of the household. It is especially true in case of polygamy. In the second chapter of my dissertation, I used also Data Health Survey (DHS) data from Benin, that provide information on tolerance to domestic violence and age at marriage. One substantial advantage of this survey is also that it is representative of the country. I use also historical data on school constructions in Benin, that are recorded at the village level.

To complement the quantitative approach, and provide more insight to the quantitative data, I had the opportunity to do different qualitative surveys. The first one, conducted with Karine Marazyan and Paola Villar in the suburbs of Dakar, focused on marriages and divorces. We have interviewed women of different ages and diverse social backgrounds. We asked them, among other information, how they had met their husband, what was the parental involvement in their marriage and what was their definition of a "good" husband. The second one was conducted also with Karine Marazyan and the main focus was marriage within the family. We have interviewed women already married, but also mothers who had a child at age of marriage. It was extremely interesting to hear the individual logics that lead to the marriages. In the qualitative survey on marital payments, we learned also a lot on the diversity of situations before the marriage and during the marital life.

Doing qualitative interviews was not easy, since the topics are very sensitive. I have tried to create an atmosphere of trust, who was difficult, being a non specialist of these methods. The researcher's role on these topics is not obvious and sometimes challenged. These are topics that are considered as very private, or linked to cultural practices that are not to be studied. The role of the policy maker could also be tricky. It is sometimes difficult to legislate on what can be considered as a private matter, such as for example age at marriage. The judicial system

can be reluctant to apply the law or citizens be reluctant to commit. Even when not directly addressing private matters, laws, rules and public transfers have impacts on organization of the household, within and between household assistance, inequalities and relative bargaining power, as shown in a large literature (Ravallion (2003)). What is sure is that policy makers have to take into account the existing practices, and the bargaining power of every parts when setting up public policies. For this reason, understanding what happen within a household and within a married couple is essential.

Outline

Chapter 1

This paper is called "Demand for Insurance and Within-Kin-Group Marriage: Evidence from a West-African country" and is co-authored with Karine Marazyan, assistant professor at IEDES-Paris 1. In this paper, we highlight the importance of the involvement of the network in the choice of a partner, looking at the specific custom of marriages within the same family. We use the original data PSF. In Senegal, marriages within the family are very widespread: it concerns half of the marriages. If the anthropological literature has highlighted the practice and suggested some hypothesis to explain this type of marriage, the economic literature on the subject has remained very silent. Yet, one potential rationale is that intra-family marriages act as an insurance device. In Senegal, formal insurance mechanisms are only nascent. Family has been shown to be a natural insurance network, but which needs to be reactivated. Our hypothesis is that by marrying a child within the family, parents could benefit of special help in case of shocks, by reactivating this interpersonal relationship. To test this hypothesis, we leverage the panel structure of our data to compare how parents smooth their consumption in case of shocks according to the type of marriage of the child. To tackle endogeneity concerns, we focus on shocks that are arguably more exogenous than others, namely illness shocks. We provide test about the exogeneity of this type of shock. We find that daughters' within-kin-group marriage helps their parents' household to better smooth food consumption when a parent has fallen ill. This better smoothing is notably driven by the fact that households that have married a daughter within the kin group receive relatively more transfers. Our results indicate that parents' demand for insurance can explain part of their demand for marrying within the kin group their daughter and extend the literature on inter-linkages between marriage decisions and demand for insurance.

Chapter 2

My second paper, co-written with a PhD student, Sarah Deschênes, is entitled: "Assessing the Effects of an Education policy on Women's Wellbeing: Evidence from Benin". We look at how, in this context, the rise in women's education can affect the choice of the partner and the marital life, changing social norms and women's autonomy. There is also a main endogeneity problem since families who marry their daughter early are also families whose parents are less educated. We use the surge in school constructions induced by an education policy in the nineties in Benin, designed to achieve education for all, as a source of exogenous change. We look at the impact on age at marriage and tolerance to intimate partner violence using the DHS data. Our identification strategy relies on a difference and differences framework in which we compare the effect of the program across time and space. We find that the program increased school attendance, delayed age at marriage and decreased the tolerance to intimate partner violence, especially tolerance to violence in case of sex refusal. To back up our results, we complement the difference and difference strategy with a regression kink design, to exploit the continuous dimension of school constructions and compare both strategies. Results are very similar. This paper contributes to the literature on primary education and women's welfare in several ways. First, we document the impact of a program of schools constructions in Benin. Second, we offer causal evidence of the link between education and tolerance of domestic violence in Benin, relying on geocoded data at a rather granular level.

Chapter 3

My third paper is entitled "Marriage Payments and Wife's Welfare: All you need is love". It is co-authored with my supervisor Sylvie Lambert. It approaches the question of the links between the welfare of the wife within the household, and the exchange of marital payments.

In Senegal, marriages are characterized by the exchange of bride prices: the family of the groom gives marital payments to the family of the bride. As explained early, the system is more complex: one marital payment is given to the parents of the bride - the real bride price -, another one to the wife herself (that we call the gift). We develop a conceptual framework that combines determinants of the marriages payments and the wife's welfare outcomes. In conformity with anthropological knowledge and qualitative evidence, we underline the weight of social norms in fixing the bride price and the potential signaling role of the gift of the amity of the groom toward the bride. We test the model with the first wave of PSF.

Empirically, our results show that wife's relative access to consumption (using equivalence scales) in the household is positively related to the value of gift received, but neither to the bride-price paid or to the trousseau brought in the household. In the sample of women who are wives of household heads, the correlation between the value of the gift and the financial support of the husband is positive and significant. Both results hold when controlling for an important sets of observables variables such as the education of the wife, and the occupation of the husband. Somehow, the strength of the bride's position at the time of marriage translates both into a higher gift and a better access to household resources henceforth. The unobserved source of endogeneity could be the strength of the amity or the love between the spouses. As a result, the gift (an information rarely collected in household survey) is likely to be a better proxy of wife's welfare in the household than bride price is, in contemporary Senegal. We are the first ones to provide a theoretical framework that include different payments and to provide results that support the idea that they correlate differently to the wife's welfare.

Chapter 1

Demand for Insurance and Within-Kin-Group Marriages: Evidence from a West-African Country

Abstract:[1] In this chapter, we ask whether parents have incentives to marry their children to a member of the kin group in order to better insure against adverse idiosyncratic income shocks. Exploiting original panel data from a household survey collected in Senegal in 2006/2007 and 2011/2012, we find that daughters' within-kin-group marriage helps their parents' household to better smooth food consumption when a parent has fallen ill. This better smoothing is notably driven by the fact that households having married a daughter within the kin group receive relatively more transfers. Our results indicate that parents' demand for insurance can explain part of their demand for marrying within the kin group their daughter and extend the literature on inter-linkages between marriage decisions and demand for insurance.

1.1 Introduction

The interactions between market failures and a number of the institutional features of land, credit and labor markets in developing countries have been examined in depth in the economic literature (Besley *et al.* (1993); Braverman and Stiglitz (1982); Coate and Ravallion (1993); Eswaran and Kotwal (1985)). However, less is known about the role of market failures in shaping individual decisions regarding marriage. In this paper, we investigate the extent to which within-kin-group marriages in West Africa can be explained by parental demand for insurance.

Preference for within-kin-group marriage has been found in many West-African societies in anthropological (Goody (1976), Lesthaeghe (1989)) and medical work (for a recent review, see

[1]This chapter is co-authored with Karine Marazyan.

Bittles (2012)).[2] However, exact figures are harder to come by, and the determinants and consequences of these marriages have seldom been studied in this region. In contrast, with a prevalence rate varying between 40% (Yemen) and 58% (Saudi Arabia), the practice of within-kin-group marriage has been widely-analyzed for societies in the Middle East and Northern Africa.[3] Generally involving two parallel first cousins, its consequences on children's health have attracted much attention (Bittles, 2012).

In Senegal, the practice of within-kin-group marriage is also widespread. According to our original nationally-representative data (described below), between 2006/2007 and 2011/2012 one half of individuals who married did so with a member of their extended family. This is the first time that this measure has been established in Senegal. In contrast to what is found in Northern Africa and the Middle East, these marriages preferentially involve cross-cousins, with the preferred marriages being between a man and the daughter of his maternal uncle or the daughter of his paternal aunt (Diop (1985)).

The literature has identified two major motives for within-kin-group marriages: property retention within the family and repayment for past matrimonial debts. In this paper, we argue that within-kin-group marriages are also observed in Senegal because parents wish to marry their children and insure against adverse idiosyncratic income shocks.

Demand for insurance is high in Senegal. But there is little formal insurance because of information asymmetry. Kin-group-based insurance is also far from perfect (De Weerdt *et al.*, 2018). Members of the kin group may want to invest in strategies that increase other members' incentives to help them when they are in need. We believe that meeting the kin group's demand for a bride or a groom may be one strategy. The economic literature has already pointed out that parents' choices regarding their children's marriage may be strategically determined by demand for insurance. For instance, in rural India, parents marry their child to a spouse who is purposely located far from where they live (but a member of the same sub-caste group) in order to better cope with the adverse effects of locally-correlated income shocks (Rosenzweig and Stark, 1989). In Senegal, as indicated, a very common feature of marriage is that it ties two members of a same family. This is a choice often made by poorer households, who may have to deal with more frequent and intense shocks. This choice may thus be linked to parents' demand for insurance. Indeed, by marrying their child within the family, parents may look at strengthening preexisting links and at fostering altruistic behaviors or reciprocity expectations

[2]The measure is generally calculated using the interviewee's declaration about whether they are related to their spouse.

[3]See for instance Al-Awadi *et al.* (1985); Al-Gazali *et al.* (1997); Bener and Alali (2006); Bittles (2002); Jaber *et al.* (1997).

among members of the kin group. Thus, they may expect the kin group's incentives to help them in case they are in need.

Our hypothesis is that parents' households better smooth their consumption when a child married someone in the kin group (or endogamously) than when he married outside of the kin group (or exogamously).[4] We test this hypothesis using nationally-representative individual panel data from the 'Pauvreté et Structure Familiale' (hereafter, PSF) survey, collected in Senegal in 2006/2007 and 2011/2012 (De Vreyer *et al.*, 2008). These data are particularly suited for our objective as in addition to providing detailed information on the practice of within-kin-group marriages in a West-African country, they collect information on household level expenditures and household and individual level transfers over the year preceding the interview, and thus allow us to consider households' insurance with respect to consumption and the role of monetary transfers as a smoothing mechanism.

Following parents' illness, parents' households are found to better smooth their food consumption when a daughter married someone in the kin group. This better smoothing effect is notably due to a lower decrease of monetary transfers that parents' household receives from the kin group. Our results account for the effect of unobserved fixed characteristics potentially correlated with consumption trend, illness occurrence, and the decision to marry a daughter within the kin group. We discuss threats to identification induced by a potential latent heterogeneity between the two groups. Overall we provide some suggestive evidence that parents' demand for insurance can explain part of their demand for marrying their daughter within the kin group. The link between parents' demand for insurance and their sons' marriage to a member of the family is less clear-cut. We discuss alternative motives for sons' endogamous marriages.

The current paper is related to three strands of economic literature. The first concerns the determinants of consanguineous marriage in developing countries. Considering the marriage market in Bangladesh, Joshi *et al.* (2009) suggest that consanguinity and dowry payments should be substitutes in a context where the parents of both the groom and the bride are expected to invest in their child's marriage but where the patrilocality norm leads the bride's parents to potentially limit their support to the married couple. Using other data from Bangladesh, Mobarak *et al.* (2013) show that consanguineous marriages fall following a positive wealth shock, and suggest that consanguineous marriage is a way to smooth dowry payments over time (and after marriage) for liquidity-constrained households.

[4]Hereafter, we will use interchangeably the terms married within the kin group or married endogamously (or married outside of the kin group and married exogamously).

The second strand relates to how characteristics of the economic environment shape patterns of family formation and organization (La Ferrara (2010), Guirkinger and Platteau (2014), Akresh (2009), Serra (2009), Luke and Munshi (2006), Jacoby (1995)). To document how insurance market failures affect marriage related decisions, Corno *et al.* (2017) examine the impact of local economic conditions on the probability of child marriage for young women in Sub-Saharan Africa and India. While droughts increase early marriage in Africa, they reduce it in India. This difference in the effect of drought on marriage can be explained by the direction of the traditional marriage payments in each region (the brideprice in Africa and the dowry in India).

The third strand pertains to how the demand for insurance shapes individual decisions, beyond family formation and organization (see Dercon (2002) for a summary). The relative advantages of religious groups in managing individual and correlated risks have recently been questioned in the context of developing countries by Chen (2010) and Popova (2014).[5]

This paper makes two contributions to the empirical literature on marriage in developing countries. First, it provides detailed information on the current practice of within-kin-group marriages using nationally-representative data from a West-African country. Second, it combines original data on consumption and transfers to evaluate whether and how a child's within-kin-group marriage leads her parents to smooth differently shocks.

The remainder of the paper is organized as follows. Section 3.3 describes the data, reviews potential motives for endogamous marriages and presents our hypothesis. Section 1.3 describes the empirical model. Section 1.4 presents the results regarding consumption smoothing and discusses the robustness of the results to confounding factors and alternative specifications. Section 1.5 tests the role of monetary transfers as a smoothing channel and discusses competing explanations for the results. Last, Section 3.7 concludes.

1.2 Context and Hypothesis

1.2.1 Data

The PSF Survey

We use data from the PSF Panel Survey collected in 2006/2007 and 2011/2012 (De Vreyer *et al.*, 2008)[6]. The first wave consists of 14 450 individuals in 1750 households drawn randomly across

[5]For other contexts, see Ager and Ciccone (2017); Dehejia *et al.* (2007); Scheve *et al.* (2006).

[6]Momar Sylla and Matar Gueye of the Agence Nationale de la Statistique et de la Demographie of Senegal (ANSD), and Philippe De Vreyer (University of Paris-Dauphine and IRD-DIAL), Sylvie Lambert (Paris School of Economics-INRA) and Abla Safir (now with the World Bank) designed the survey. The data collection was carried

150 census districts. The second wave includes 3022 households and 28 376 individuals. In 2011-2012, 84% of individuals were identified and re-interviewed. Amongst the 16% of individuals who were not found, one quarter had died and 15% had migrated internationally.

These original data are particularly suited for our analysis. First, they provide detailed information on family background and marriage characteristics for each individual. To identify whether a marriage is endogamous or not, the information we use is whether an individual declares that his/her spouse belongs to his/her kinship.[7] Second, as they include information on household level expenditures at the household and individual level transfers over the year preceding the interview, they allow us to consider households' insurance with respect to consumption and the role of monetary transfers as a smoothing mechanism.

Samples

We count 228 origin-households in the PSF data where a parent has a coresiding child in baseline who married for the first time between the first wave of the interview and three months preceding their follow-up interview.[8] In this sample, described in Table 1.1, 56% of parents' household married a child within the kin group. At follow-up, 6 origin-households made of two parents splitted. Therefore, at follow-up, we count 234 households of parents. This sample will hereafter be referred to as *sample of households of children's parents*.

Table 1.1: Households (HH) where a child married between the two waves of interview

	All HH	Both parents present	Only the mother present
Marriage within the kin group: %	0.56	0.63	0.45
Number of HH	228	139	89

Note: We count marriages that have been celebrated between the first wave of the interview and three months before the second.
Note that six baseline households have splitted in follow-up.

Among the 228 households of children's parents, 149 have married a daughter (at 54%, endogamously). This second sample, described in Table 1.2, will hereafter be referred to as *sample of households of daughters' parents*. At follow-up, two of these households made of two parents splitted. Therefore, at follow-up, they are 151.

out by the ANSD.

[7] Thus, our measure is based on a self-declared information. This may raises some concerns about its accuracy but we show below that it correlates with characteristics of the sibship of the individual's parents according to patterns described by anthropologists.

[8] We restrict the sample to parents (two parents or mother alone) having married a daughter aged between 11 and 35 years old in 2006 or a son aged between 18 and 45 years old. We exclude marriages that occurred in the last three months before the second interview to ensure that shocks preceding the second interview happened after the child's marriage.

Table 1.2: Households (HH) where a daughter has married between the two waves of interview

	All HH	Both parents present	Only the mother present
Marriage within the kin group: %	0.54	0.64	0.38
Number of HH	149	91	58

Note: We count marriages that have been celebrated between the first wave of the interview and three months before the second.
Note that two baseline households have splitted in follow-up.

Two last samples are made of children and of daughters who married between baseline and three month before their parents' follow-up interview. They are 276 and 166, and will hereafter be referred to as the *sample of children* and *of daughters* respectively.[9] [10]

1.2.2 Motives for within-kin-group marriages

Review of existing hypothesis

The literature has identified two major motives for within-kin-group marriages: property retention within the family and repayment for past matrimonial debts. We first discuss the relevance of these motives in our context.

Parallel-cousin marriages and property retention Some authors have argued that within-kin-group marriages can be explained by the wish to keep accumulated property within the family (see for instance Rosenfeld (1957)). In contexts where this demand is high and where Koranic law applies (Barth, 1954; Murphy and Kasdan, 1959), patrilateral parallel cousin marriages are more likely to be observed. As under Koranic law, girls receive only half of boys' inheritance, the marriage of two cousins who are the children of two brothers (patrilateral parallel cousins) maximizes the retention of property within the family (more than the marriage of two cousins who are the children of a brother and a sister, e.g. two cross-cousins).

We test the extent to which property retention within the family explains demand for within-kin-group unions in Table 1.3. Based on the children sample, we compare households' assets (cattle ownership, whether the house has been inherited) depending on whether the child married endogamously or exogamously. We find that children who married endogamously are

[9] Children are defined as households members aged between 11 and 35 years old for women, and between 18 and 45 years old for men, who were coresiding either with both of their parents or with their mother in baseline. The sample of children is larger than the one of the parents' households, since some households have married several children over the period. In households with more than one child married (41 households), we measure whether at least one child married within the kin group. Interestingly, only in five of these households, a child married within the kin group and another one outside of it.

[10] We count 110 sons who married between baseline and three month before their parents' follow-up interview. In 22 households, both daughters and sons have married over the period considered. The total number of households having married a child over the period of interest is thus 228.

more likely to belong to households who own cattle and who have inherited their house. However, none of these differences remains significant when we account for other differences in a model estimating the probability to marry endogamously by OLS (last column of Table 1.3).

Cross-cousin marriages and repayment of past matrimonial debts Following the analysis of structural anthropologists, and notably of Levi-Strauss (1971), cross-cousin marriages can partly be interpreted as the counterpart of past matrimonial exchanges. For instance, a brother who agreed to give his sister in marriage to some man can later ask that his sister's daughter marries his own son. The sister's husband, by accepting to give his daughter in marriage, honors the debt he has incurred towards his brother or family-in-law when he married (Diop (1985), p.83). Testing this mechanism requires particular data that we do not believe to exist for West-African countries and is unfortunately beyond the scope of the current paper.

Patterns of endogamous marriages in Senegal

According to our data, in Senegal, we observe both patrilateral parallel-cousin marriages and cross-cousin marriages. Interestingly, the preferred configuration for cross-cousin marriages is when the cross-cousins are the children of mothers' half-brothers sharing only the same father. Having half-siblings sharing only the same father is fairly common in Senegal due to polygamy (siblings whose father is polygamous share the same father but may have different mothers). In Figure A-1.1 in Appendix, we illustrate this configuration: the cross-cousins who are preferred to marry the girl identified by the diamond are identified by stars.[11]

Indeed, as indicated in Table 1.4, children's endogamous marriage is positively correlated with the number of their mothers' half-brothers sharing only the same father. On the sub-sample of children coresiding also with their father in baseline, it is positively correlated with the number of their father's brothers sharing the same parents, or the same mother only.[12]

As marriage is patrilocal, sons of mothers' half brothers are likely to be located further away. This may partly explain why daughters who marry endogamously marry further away. Indeed, according to Table 1.5 which describes characteristics of endogamous and exogamous

[11] Cross-cousin marriages between children whose parents are half-siblings may be a preferred configuration for cross-cousin-marriages as it helps to maximize the mixing of the genetic capital while enabling marriage within the kin group.

[12] We estimate the probability to marry endogamously by OLS on the sample of children. We measure a child's stock of potential spouses by the number of siblings his mother has (first six rows of the Table). When at baseline the child coresides with his father too (in two-third of the cases), we provide a second measure of a child's stock of potential spouses which is the number of siblings his father has (last six rows of the Table). Indeed, information on sibship characteristics is available only for household members. The likelihood of an endogamous marriage increases also with the number of mothers' half-sisters sharing only the same mother. Their absolute number is however relatively low.

marriages, marrying endogamously is positively correlated with moving to another district (called 'arrondissements' in Senegal, which are equivalent to UK counties or French départements). [13]

Beyond the role of the maternal sibship composition, few other baseline characteristics are correlated with a child's probability to marry endogamously. According to Table 1.3, marrying endogamously is positively and significantly correlated with being from the Wolof ethnic group, living in a rural area, and living in a household exploiting farmland. It is also positively and significantly correlated with living in a household where both parents are coresiding members and where a parent had a fostering experience during his childhood. Marrying endogamously is negatively and significantly correlated with living in a household whose head received some formal education (French or Arab). The number of siblings sharing only the same mother is also lower, indicating that the probability to marry endogamously is higher if mothers have not experienced a divorce or a widowhood (note that fathers are also more likely to be alive). The living standard of households with a child having married endogamously, measured by consumption per capita in log, is also lower on average, as well as transfers sent. Lastly, children are also more likely to marry endogamously if their own parents also married endogamously. This could indicate a preference for endogamous marriage that is transmitted through generations. To summarize, a child is more likely to marry endogamously if he belongs to a poorer and more traditional household.

Estimating a child's probability to marry endogamously by OLS (last column in Table 1.3), characteristics that remain significantly associated with the decision of interest are whether his household is from the Wolof ethnic group, whether his household is located in a rural area, whether his parents married endogamously (positively), whether his household's head works as an independent in the agricultural sector, whether the house has been purchased, and the number of siblings of the same mother only he has (negatively).[14]

Demand for insurance

In Senegal, demand for insurance is high but there is little formal insurance. We test whether within-kin-group marriages could be attractive as they facilitate *future* monetary and non-monetary transfers between family members when one member is in need. As elsewhere in Sub-Saharan Africa (Akresh (2009); Baland *et al.* (2016); La Ferrara (2010)), the extended family

[13] The PSF data being geo-coded, we can calculate the distance between the household at baseline and at follow-up. We also show in Table 1.5 that this distance is higher when the daughter has married endogamously.

[14] Characteristics are all measured at baseline, that is before the child's marriage, in order to limit any bias due to reverse causality. Wealth measures are measures of long-term wealth. We do not add measures of household size, consumption and level of transfers (sent and received), which are more sensitive to recent shocks.

Table 1.3: Correlates of children's within-kin-group marriage

	Marriage: within kin	Marriage: outside kin	Diff.	Coefficient (OLS)
Is the first-born child (amng siblings of same parents)	0.40	0.45	-0.05	-0.02
			(0.44)	(0.66)
N. siblings of same parents	5.00	4.70	0.30	0.00
			(0.31)	(0.89)
N. siblings of same father only	3.02	2.73	0.29	0.00
			(0.50)	(0.77)
N. siblings of same mother only	0.27	0.72	-0.45***	-0.05***
			(0.00)	(0.01)
Wolof/Lebou	0.54	0.41	0.13**	0.18***
			(0.03)	(0.01)
Peuhl	0.20	0.23	-0.03	0.12
			(0.51)	(0.15)
Place of residence is rural	0.73	0.28	0.46***	0.42***
			(0.00)	(0.00)
HH head has French/Arab education	0.21	0.33	-0.13**	0.07
			(0.02)	(0.34)
HH head: independant agricul. sector	0.22	0.18	0.04	-0.16**
			(0.42)	(0.03)
HH head: independant non-agricul. sector	0.31	0.30	0.01	0.06
			(0.84)	(0.35)
HH head: other occup. status (incl. retired) [REF]	0.47	0.52	-0.05	
			(0.40)	
A HH member exploits farmland	0.68	0.32	0.36***	0.03
			(0.00)	(0.77)
A HH member owns cattle	0.80	0.53	0.27***	0.11
			(0.00)	(0.15)
A HH member owns the house (heritage)	0.37	0.27	0.10*	-0.11
			(0.09)	(0.23)
A HH member owns the house (purchase)	0.51	0.57	-0.06	-0.18*
			(0.29)	(0.05)
Tenant of the house [REF]	0.13	0.16	-0.03	
			(0.46)	
Father is deceased	0.18	0.27	-0.09*	0.09
			(0.07)	(0.36)
Two-parent HH	0.74	0.56	0.18***	0.03
			(0.00)	(0.77)
Parents are married endogamously	0.60	0.25	0.34***	0.22***
			(0.00)	(0.00)
A parent was fostered during childhood	0.25	0.17	0.08*	0.02
			(0.10)	(0.81)
N. HH members	12.08	11.66	0.41	
			(0.58)	
HH consumption level per capita (in log)	12.07	12.46	-0.39***	
			(0.00)	
Transfers received from kin by HH pc (log)	-2.43	-1.72	-0.70	
			(0.26)	
Transfers send to kin by HH pc (log)	-3.25	-2.06	-1.19**	
			(0.02)	
Constant				0.11
				(0.45)
Number of individuals	142	134	276	264
R2				0.29
pvalue				0.00

Note: The sample corresponds to children who married between baseline and three months preceding their parents' follow-up interview and who were coresiding with their mother in 2006. The number of observations computed in the last row corresponds to the maximum number of observations in each group. For some characteristics, due to missing values, the number of observations is lower. The conditional difference is the coefficient on the variable in a model estimating the probability to marry within the kin group in OLS. As explanatory variables, all those showed in the table are included (except contemporary measures of household size, consumption, and transfers). Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

group is an important provider of informal insurance, and we expect stronger ties between members to reinforce the group's efficiency in providing insurance.[15]

We hypothesize that parents whose child has married a member of the kin group benefit from it

[15]The long-lasting and inter-linked nature of family relationships provides a first set of incentives to enforce informal insurance (Coate and Ravallion (1993) and Ligon *et al.* (2002)). In addition, altruism within the family is expected to reinforce mutual help. However, family insurance appears to be incomplete (De Weerdt *et al.*, 2018), opening the door to strategies to improve the family's efficiency as an insurance provider.

Table 1.4: Correlates of children's within-kin-group marriage: parental network characteristics

	Marriage: within kin	Marriage: outside kin	Diff.	Coefficient (OLS) (1)	(2)
Maternal uncles - same grand-parents	1.96	1.90	0.06	0.02	
			(0.75)	(0.50)	
Maternal uncles - same grand-father only	1.93	1.16	0.77***	0.05***	
			(0.00)	(0.00)	
Maternal uncles - same grand-mother only	0.22	0.35	-0.12	-0.07*	
			(0.22)	(0.07)	
Maternal aunts - same grand-parents	1.93	2.18	-0.26	-0.04*	
			(0.19)	(0.07)	
Maternal aunts - same grand-father only	1.42	1.02	0.40*	0.01	
			(0.06)	(0.60)	
Maternal aunts - same grand-mother only	0.32	0.21	0.11	0.06*	
			(0.27)	(0.08)	
If father is present: Paternal aunts - same grand-parents	1.32	1.30	0.02		-0.03
			(0.91)		(0.38)
If father is present: Paternal aunts - same grand-father only	1.18	1.08	0.09		0.02
			(0.74)		(0.54)
If father is present: Paternal aunts - same grand-mother only	0.34	0.19	0.15		0.06
			(0.11)		(0.36)
If father is present: Paternal uncles - same grand-parents	1.68	1.08	0.59***		0.09***
			(0.00)		(0.00)
If father is present: Paternal uncles - same grand-father only	1.35	1.16	0.19		0.00
			(0.51)		(0.96)
If father is present: Paternal uncles - same grand-mother only	0.33	0.08	0.25**		0.08**
			(0.01)		(0.02)
Constant				0.49***	0.44***
				(0.00)	(0.00)
Number of individuals	139	131	270	267	175
R2				0.04	0.05
pvalue				0.00	0.00

Note: The sample corresponds to children who married between baseline and three months preceding their parents' follow-up interview, and who were coresiding with their mother in 2006. Data on sibship characteristics is available only for household members. The six first rows are computed on the sample of children, and the six last ones are computed on the sub-sample of children coresiding with their father, which represent two third of the first sample. Conditional difference corresponds to the coefficient on the characteristic in a model explaining the probability to marry endogamously controlling for other characteristics by OLS. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table 1.5: Daughters' marriage characteristics

	Marriage: within kin (1)	Marriage: outside kin (2)	Diff. (3)	Coefficient (OLS) (4)
Age at first marriage	19.59	23.88	-4.29***	
			(0.00)	
Has a French/Arab education	0.34	0.71	-0.37***	
			(0.00)	
Moved to another district	0.25	0.09	0.16***	
			(0.00)	
Distance in km	47.80	10.39	37.42***	
			(0.00)	
Spouse is more educated	0.29	0.41	-0.13	
			(0.10)	
Has married second rank (or more)	0.18	0.14	0.04	
			(0.54)	
Deflated amount of the gift (in thousands fcfa)	76.83	88.26	-11.43	-4.65
			(0.53)	(0.79)
Deflated amount of the brideprice (in thousands fcfa)	121.36	192.01	-70.64***	-56.74**
			(0.01)	(0.03)
Deflated amount of the bagage (in thousands fcfa)	54.36	49.76	4.60	8.14
			(0.69)	(0.48)
Coreside with mother or father (at the day of interview)	0.25	0.35	-0.10	
			(0.16)	
Number of individuals	87	79	166	158

Note: The sample corresponds to daughters, who married between baseline and three months preceding their parents' follow-up interview and who were coresiding with their mother in 2006. The number of observations computed in the last row corresponds to the maximum number of observations in each group. For some characteristics, due to missing values, the number of observations is lower. The conditional difference is the coefficient on the variable "having married within the kin group" in a model estimating the amount of marital compensations in OLS, controlling for the level of household's consumption per capita in log. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

in the form of improved insurance from the kin group, notably because it contributes to foster altruistic behaviors and/or reciprocity expectations. Parents whose child has not married a

member of the kin group face the risk that the kin group's incentives to help in case of need weaken.

Daughters move out to join the household of their husband, a potential source of support for their parents, whereas sons continue to coreside with their parents (or form a new household). We therefore hypothesize that the insurance benefit of an endogamous marriage may actually be stronger for parents of daughters. Indeed, the asymmetry of information between parents' households and the household of the in-laws may be lower with daughters being part of the two households. Daughters coresiding with their in-laws may also have more bargaining power to ask them for help.

We measure adverse idiosyncratic income shocks by whether a parent declares having had an illness during the three months preceding the interview.[16] Prevalence of illness shocks are described in Table 1.6: in roughly 45% of households, a parent reported to be ill over the last three months (whatever the year).[17] In follow-up, parents who have married a child within the kin group are more likely to report an illness compared to other parents. According to the two last rows of this Table, this difference is driven by parents who were not ill in baseline.

The difference in prevalence of illness between households having married a child endogamously and other households is actually explained by other observed differences between these households. Indeed, the significance of the difference vanishes once we control for a set of household level characteristics (see the last column of Table 1.6).[18] These observations hold on the sample of daughters' parents (see Table A-1.1) in the Appendix.

[16] We favor idiosyncratic shocks, since aggregate covariate shocks are more difficult to insure. In addition, the effectiveness of endogamy in the case of aggregate and potentially covariate shocks depends on the distance between the two households, and it would be difficult to disentangle the effect of endogamy from the one of distance.

[17] In our setting, illness may have significant adverse income effects, as in one third of the case (at least), it prevented the ill parent from performing his/her usual activities. In other words, beyond the medical expenditures it entails, it is likely to have a significant opportunity cost, as it can prevent from working.

[18] We estimate in OLS the probability for a parent to report being ill in second period (considering the subset of households having healthy parents in baseline). The controls are whether the parents' household is located in a rural area, the head's education, the head's occupation status, the mother's number of brothers, and a set of area fixed effects.

Table 1.6: Proportion of households with a parent reporting an illness

	Marriage: within kin (1)	Marriage: outside kin (2)	Diff. (3)	Coefficient (OLS) (4)
A parent reports an illness in 2006	0.48	0.42	0.06	-0.00
			(0.40)	(0.97)
A parent reports an illness in 2011	0.53	0.38	0.15**	0.07
			(0.02)	(0.40)
Among hh with a parent ill in 2006: a parent reports an illness in 2011	0.57	0.48	0.10	0.05
			(0.34)	(0.67)
Among hh with no parent ill in 2006: a parent reports an illness in 2011	0.46	0.31	0.15*	0.00
			(0.08)	(0.97)

Note: The sample corresponds to households where a child married between baseline and three months preceding the follow-up interview. In 2006, prevalence of shocks are computed on 228 households. In 2011, there are computed on 234 households. In column (4), the coefficient is obtained from a model estimated in OLS where the illness measure is regressed on whether an endogamous marriage has been celebrated, controlling for whether the parents' household is located in a rural area, the head's education, the head's occupation status, the mother's number of brothers, and a set of area fixed effects. In this model, standard errors are clustered at the origin household level. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

1.3 Testing the insurance motive: the model

1.3.1 Model specification

Using the sample of households of children's, we estimate:

$$C_{h,t} = \alpha_0 + \beta_1 Illness_{h,t} + \beta_2 WithinKin_{h,t} + \beta_3 WithinKin_{h,t} * Illness_{h,t} + \beta_4 T + \pi_h + \varepsilon_{h,t} \quad (1.1)$$

$C_{h,t}$ refers to the log of household and per capita consumption which excludes health-related expenditures. $Illness_{h,t}$ is a dummy reporting whether household h has had to cope with the illness of a parent three months prior the interview at t. $WithinKin_{h,t}$ is a dummy for household h having a child married within the kin group at t. It is zero at wave 1 for all households (by construction). It equals one at wave 2 if any child of the household married within the kin group between wave 1 and three months before the wave 2 interview (and zero otherwise).[19] π_h is the parents' household fixed effect. T is an interview-round fixed effect (0 for baseline and 1 for follow-up).[20] $\varepsilon_{h,t}$ is the error term.

Differentiating variables over time, Equation 1.1 becomes:

$$\Delta C_h = \alpha_0' + \beta_1 \Delta Illness_h + \beta_2 \Delta WithinKin_h + \beta_3 \Delta(WithinKin_h * Illness_h) + \Delta\varepsilon_h' \quad (1.2)$$

Equation 1.2 clarifies the sources of variation allowing the identification of coefficients β_1 and β_3. The coefficient β_1 is identified by households h whose shock status is different in wave 1 and in wave 2 (namely, households h where a parent has fallen ill in second period for the first

[19] For households with more than one child married over the time interval, $WithinKin_{h,t}$ is one if at least one child married endogamously.

[20] The model also includes interview-round fixed effects that are area-specific to account for area-specific price shocks. The geographic areas are: (a) the West with the regions of Dakar and of Thies, (b) the Center with the regions of Kaolack and Fatick, (c) the South with Casamance.

time and households h where a parent has fallen ill in first period only). The coefficient β_3 is identified by two types of households: those having married a daughter within the kin group and where a parent has fallen ill in wave 2 for the first time and those having married a child within the kin group and where a parent has fallen ill in both waves.

We re-write Equation 1.2 to make salient the sources of coefficient identification in our model :

$$\begin{aligned} \Delta C_h = \alpha'_0 + \beta_{11} Illness_{h,0,1} + \beta_{12} Illness_{h,1,0} + \beta_2 WithinKin_{h,0,1} + \\ \beta_{31} WithinKin_{h,0,1} * Illness_{h,0,1} + \beta_{32} WithinKin_{h,0,1} * Illness_{h,1,1} + \\ \Delta\varepsilon'_h \end{aligned} \tag{1.3}$$

$Illness_{h,0,1}$ (respectively, $Illness_{h,1,0}$) indicates whether in household h a parent has fallen ill in second period for the first time (respectively, whether in household h a parent was ill in first period only). $WithinKin_h * Illness_{h,0,1}$ (respectively, $WithinKin_h * Illness_{h,1,1}$) indicates whether households h celebrated an endogamous union and had to cope with the illness of a parent in second period for the first time (respectively, whether households h celebrated an endogamous union and had to cope with the illness of a parent in both periods).

In Equation 1.3, the coefficient β_{11} measures the effect of an illness shock occurring in second period for the first time on the consumption trend of households having married a child outside of the kin group. The reference category is made of households having married a child outside of the kin group who either didn't have to cope with the illness of a parent at any of the two dates considered, or had to cope with such an event at both dates. We therefore expect $\widehat{\beta_{11}}$ to be negative.[21] The coefficient β_{31} tests whether this effect is significantly different for households having married a child endogamously. Given our hypothesis, we expect $\widehat{\beta_{31}}$ to be positive. In addition, if the null hypothesis, H0 : $\beta_{11} + \beta_{31} = 0$, cannot be rejected, then we cannot reject that households having married a child within the kin group are fully insured.

The coefficient β_{32} tests whether the effect of having to cope with the illness of a parent in both periods on consumption trend is significantly different for households having married a child endogamously. Given our hypothesis, we also expect $\widehat{\beta_{32}}$ to be positive. However, if households having married a child outside of the kin group anticipated the illness of a parent in second period, based on the fact that they already faced the illness of a parent in first period, and put in place strategies to smooth their consumption in second period, then we might not be able to reject the null hypothesis H0: $\beta_{32} = 0$.

[21] The fact that illness status does not change between the two dates prevents us from estimating separately the effect of having to cope with the illness of a parent in both periods from the effect of having healthy parents at both dates for households who celebrated an exogamous union.

Fundamentally, whether a parent has fallen ill in second period for the first time or whether he was ill in both periods, are two events whose effect on consumption trend may be different. Having to cope with the illness of a parent in first period increases the probability that households adopt strategies to limit future consumption drop: while some households marry a child endogamously to improve kin-group based insurance, other households might also decide to invest in insurance, or they may adjust their household size or consumption needs. Therefore, identifying the insurance benefit of an endogamous marriage (if any) will be easier if illness shocks happen in second period for the first time, e.g. if illness shocks are unexpected. The main advantage of Equation 1.3 is to allow for such an identification. [22]

We replicate estimations of Equations 1.1 and 1.3 on the sample of daughters' parents[23].

1.3.2 Threats to causal interpretation

If shocks occurring in the second period for the first time are truly exogenous, then β_{31} can be interpreted as the causal estimate of the benefit of an endogamous marriage to insure against unexpected shocks. To evaluate the extent to which shocks occurring in the second period for the first time can be considered as exogenous, we perform two sets of tests.

Table 1.7 tests the correlation between baseline household characteristics and having to cope with the illness of a parent in second period, among households who did not report any illness in baseline. The two last columns replicate the analysis for the subset of households having a child married within the kin group. We reassuringly find only two significant correlations: illness is more likely among rural households or households whose head exploits farmland. Among households who have married a child endogamously, only the difference regarding rural location remains significant. Reassuring is also the fact that among households who did not report any illness in baseline, having married a child endogamously is not significantly correlated with reporting an illness at follow-up, controlling for a set of household level characteristics (last row of Table 1.6).

On the sample of daughters' parents, conclusions are qualitatively similar. We find only one significant correlation between illness occurrence for the first time in second period and household baseline characteristics : illness is less likely among households whose head does not work as an independent (in the agricultural or in the non-agricultural sector). This difference is not significant among households having married their daughter endogamously (see Table A-1.2

[22] All models are estimated by OLS with standard errors clustered at the origin-household level.

[23] We will also consider a specification including interaction terms with a dummy indicating whether the married child is a daughter to test the significance of differences between sons' and daughter's marriages.

in Appendix). Among households who did not report any illness in baseline, having married a daughter endogamously is not significantly correlated with reporting an illness at follow-up, controlling for a set of household level characteristics (last row of Table A-1.1 in the Appendix).

A second issue will arise if endogamy is correlated with characteristics that could help parents to smooth shocks (reciprocally, harm). As a robustness analysis, we test the extent to which our estimate of β_{31} is sensitive to controlling for the interaction between the shock measure and indicators of a household's wealth, in particular those correlated with the occurrence of shocks or the decision to marry a child endogamously, to capture potential bias from a differentiated smoothing ability of the two groups of households.

Table 1.7: Household (HH) baseline characteristics by whether she has celebrated a marriage within the kin group between the two rounds of interview and by whether a parent has fallen ill in second period

Variables				Marriage within kin		
	never ill	ill second period only	Diff. (1)	never ill	ill second period only	Diff. (2)
A HH member owns the house (heritage)	0.30	0.41	-0.11	0.34	0.44	-0.10
			(0.16)			(0.32)
A HH member owns the house (purchase)	0.51	0.45	0.06	0.51	0.38	0.13
			(0.44)			(0.21)
Tenant of the house	0.19	0.14	0.05	0.15	0.18	-0.03
			(0.41)			(0.72)
A HH member owns cattle	0.61	0.73	-0.12	0.76	0.79	-0.04
			(0.12)			(0.67)
A HH member exploits farmland	0.47	0.62	-0.15*	0.61	0.74	-0.13
			(0.08)			(0.19)
Number of parents in the hh	1.65	1.60	0.05	1.77	1.65	0.12
			(0.51)			(0.21)
HH is in a rural location	0.45	0.63	-0.19**	0.62	0.79	-0.17*
			(0.02)			(0.06)
HH head has French/Arab education	0.28	0.23	0.05	0.22	0.18	0.04
			(0.49)			(0.61)
HH head: independant agricul. sector	0.16	0.27	-0.11	0.18	0.29	-0.12
			(0.11)			(0.20)
HH head: independant non-agricul. sector	0.30	0.31	-0.01	0.28	0.32	-0.04
			(0.90)			(0.68)
HH head: other occupation status (inc. retired)	0.54	0.42	0.12	0.54	0.38	0.16
			(0.14)			(0.13)
Mother's N. of half brothers (if absent, father's N. of half sisters)	4.05	3.60	0.45	4.42	3.94	0.48
			(0.29)			(0.39)
Marriage: within kin group	0.55	0.65	-0.10	1.00	1.00	0.00
			(0.20)			(.)
Number of HH	134	52	186	74	34	108

Note: The sample corresponds to households satisfying two criteria : (1) a child has married between baseline and three months preceding the follow-up interview, and (2) parents reported to be healthy in first period. Significance levels are denoted as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

1.4 Testing the insurance motive: results

1.4.1 Main results

Table 1.8 presents the estimation results of Equation (1). The coefficients of interest are those on the main effect of $Illness_{ht}$ and on its interaction with the dummy indicating that the child has married within the kin group. We find that households having married a child outside of the kin group are able to smooth the negative consequences of a recent illness. Households having married a child within the kin group smooth similarly.

On the sub-sample of parents of daughters, when decomposing between food and non-food consumption, we observe that households having married a daughter outside of the kin group smooth the negative effect of a recent illness on household and per capita food consumption. But, households having married a daughter within the kin group better smooth their food consumption per capita. This may be due to eased adjustments of household size or composition.

Based on Equation 1.1, we compare households that differ in terms of whether they have married a child (or a daughter) within the kin group or outside of it, but we do not properly account for differences in terms of their shock patterns. This motivates the specification of a model as in Equation 1.3. Results from this model are presented in Table 1.9.

Let's first discuss our estimates of coefficients β_{11} and β_{31}. On the sample of parents of children, households having married a child outside of the kin group and having to cope with the illness of a parent for the first time in second period face a decrease of their household consumption. Households that are comparable in terms of their shock pattern, but who have married a child within the kin group, smooth similarly. However, on the sub-sample of parents of daughters, while parents who have married a daughter outside of the kin group face a drop of their consumption, parents who have married a daughter within the kin group do not. A daughter's endogamous marriage allows parents' households to smooth perfectly their consumption, of food in particular, as suggested by the p-value of the tests in the last panel of the Table 1.9.[24]

Investigating effects on consumption per capita on the sample of daughters' parents, illness is no more costly to parents' households when daughters have married outside of the kin group. This may be thanks to adjustments of household size or composition. Yet, there is still a benefit in terms of food consumption from having married a daughter within the kin group. Indeed, the interaction term on food consumption per capita remains positive and we reject the hy-

[24] We do not reject the hypothesis that the sum of β_{11} and β_{31} equals zero, with a p-value amounting to 0.98 for consumption, and to 0.28 for food consumption.

pothesis that the sum of the coefficients β_{11} and β_{31} equals zero at 10 percent level. These observations hold on the sample of children's parents, although the benefit of endogamy on food consumption per capita seems to be lower (the interaction term is of lower size while the effect of the shock itself is comparable).

Let's now discuss the estimate of the coefficient β_{32} in Table 1.9. Whatever the outcome or the sample of parents considered, it is not significant. We believe this result to suggest that having to cope with the illness of a parent in first period, households who have married a child outside of to the kin group also adopted long-term strategies to maintain their consumption. The adoption of ex-ante coping strategies may also explain why the coefficient β_{12} is not significantly different from zero.

Table 1.8: Effect of parents' illness on household consumption and consumption per capita
Equation 1.1

	Parents of children						Parents of daughters					
	Log of total cons.		Log of food cons.		Log of non food cons.		Log of total cons.		Log of food cons.		Log of non food cons.	
	(hh)	(pc)	(hh)	(pc)	(hh)	(pc)	(hh)	(pc)	(hh)	(pc)	(hh)	(pc)
Marriage within kin_ht	-0.08	-0.01	-0.15	-0.07	0.03	0.11	-0.17	-0.08	-0.14	-0.05	-0.05	0.04
	(0.12)	(0.11)	(0.11)	(0.11)	(0.18)	(0.17)	(0.18)	(0.16)	(0.16)	(0.16)	(0.25)	(0.23)
Illness_ht	-0.07	-0.09	-0.03	-0.05	-0.14	-0.16	-0.11	-0.07	-0.06	-0.03	-0.18	-0.15
	(0.08)	(0.08)	(0.08)	(0.08)	(0.12)	(0.11)	(0.11)	(0.11)	(0.10)	(0.11)	(0.15)	(0.14)
Marriage within kin_ht*Illness_ht	-0.01	0.17	0.06	0.24	-0.10	0.08	0.09	0.24	0.19	0.34*	-0.14	0.01
	(0.16)	(0.15)	(0.14)	(0.15)	(0.26)	(0.23)	(0.21)	(0.20)	(0.18)	(0.19)	(0.31)	(0.29)
Constant	14.67***	12.34***	13.98***	11.66***	13.67***	11.34***	14.66***	12.27***	14.00***	11.61***	13.63***	11.24***
	(0.05)	(0.04)	(0.04)	(0.05)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)	(0.08)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area specific time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of the dependent variable	14.87	12.54	14.16	11.83	14.01	11.68	14.73	12.40	14.07	11.74	13.81	11.48
N	234	234	234	234	234	234	151	151	151	151	151	151
R	0.05	0.07	0.11	0.10	0.06	0.07	0.05	0.07	0.10	0.10	0.05	0.07
pvalue	0.01	0.01	0.00	0.00	0.00	0.00	0.07	0.03	0.04	0.01	0.01	0.00

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include time FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table 1.9: Effect of parents' illness on consumption variation
Equation 1.3

	Parents of children						Parents of daughters					
	Diff Log of hh cons.			Diff Log of cons. per cap			Diff Log of hh cons.			Diff Log of cons. per cap		
	Total	Food	Non Food	Total	Food	Non Food	Total	Food	Non Food	Total	Food	Non Food
Marriage within kin	-0.13	-0.18	0.00	-0.05	-0.11	0.08	-0.21	-0.18	-0.08	-0.11	-0.08	0.03
	(0.13)	(0.12)	(0.18)	(0.12)	(0.12)	(0.17)	(0.18)	(0.16)	(0.26)	(0.16)	(0.16)	(0.23)
Ill in first period only	0.06	0.09	0.02	0.04	0.07	0.00	-0.06	-0.01	-0.10	-0.01	0.04	-0.06
	(0.11)	(0.12)	(0.16)	(0.11)	(0.12)	(0.15)	(0.15)	(0.14)	(0.21)	(0.14)	(0.15)	(0.20)
Ill in second period only	-0.34*	-0.20	-0.40	-0.37**	-0.23	-0.43*	-0.58**	-0.44*	-0.72**	-0.36	-0.22	-0.50
	(0.18)	(0.20)	(0.28)	(0.16)	(0.19)	(0.25)	(0.26)	(0.24)	(0.33)	(0.27)	(0.28)	(0.32)
Marriage within kin and Ill in second period only	0.38	0.41*	0.11	0.53**	0.56**	0.26	0.57*	0.66**	0.27	0.56*	0.64*	0.26
	(0.23)	(0.24)	(0.35)	(0.22)	(0.24)	(0.32)	(0.33)	(0.30)	(0.45)	(0.33)	(0.35)	(0.42)
Marriage within kin and Ill in both periods	-0.14	-0.07	-0.16	0.06	0.13	0.04	-0.04	0.06	-0.26	0.16	0.26	-0.06
	(0.19)	(0.15)	(0.31)	(0.18)	(0.17)	(0.27)	(0.23)	(0.19)	(0.35)	(0.23)	(0.21)	(0.32)
Constant	0.24	0.30*	0.24	0.06	0.12	0.06	0.31	0.32	0.36	0.02	0.03	0.07
	(0.17)	(0.16)	(0.23)	(0.16)	(0.16)	(0.21)	(0.22)	(0.20)	(0.28)	(0.20)	(0.19)	(0.26)
Area specific FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test: Within Kin and Ill second period only + Ill second period only = 0 (pvalue)	0.85	0.18	0.25	0.36	0.05	0.48	0.98	0.28	0.17	0.37	0.07	0.41
Mean of the dependent variable	0.14	0.18	0.20	0.07	0.11	0.12	0.15	0.13	0.25	0.07	0.05	0.17
N	234	234	234	234	234	234	151	151	151	151	151	151
pvalue	0.01	0.00	0.05	0.00	0.00	0.02	0.02	0.07	0.02	0.08	0.03	0.06

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

1.4.2 Robustness Analysis

Robustness to latent heterogeneity

As discussed in sub-section 1.3.2, a latent heterogeneity between households having married a child endogamously and other households could explain the differentiated ability to smooth shocks occurring after a child's marriage.

In Equation 1.3, we thus control for the interaction between the illness measure and whether the household lives in a rural area ($Rural_h * Illness_{h,0,1}$), the size of the kin group with whom risk sharing may occur (mother's number of brothers: $NBrothers_h * Illness_{h,0,1}$[25]), whether the household head has some formal education ($FormalEduHHhead_h * Illness_{h,0,1}$) and whether the household head works as an independent in the agricultural sector ($IndepAgriHHhead_h * Illness_{h,0,1}$) or as an independent in the non-agricultural sector ($IndepNonAgriHHhead_h * Illness_{h,0,1}$).

On the sub-sample of daughters' parents, the positive effect of β_{31} on the smoothing of household and per capita food consumption is robust to the inclusion of these controls, as indicated by Table 1.10. Perfect smoothing is achieved.

Now, on the sample of children's parents, we observe similar effects. The inclusion of controls (of head's education level especially) essentially affects the size of the coefficient on β_{11} (the measure of an illness shock occurring for the first time in second period). The coefficient on β_{11} is now significantly negative on both household and per capita food consumption. Having a child married endogamously offsets the drop of household and per capita food consumption. Perfect smoothing is also achieved.

[25] An alternative measure could have been the number of paternal brothers. However, this variable is available for only two-third of the sample (those coresiding with fathers in wave 1).

Table 1.10: Effect of parents' illness on consumption variation - Adding controls
Equation 1.3

	Parents of children						Parents of daughters					
	Diff Log of hh cons.			Diff Log of cons. per cap			Diff Log of hh cons.			Diff Log of cons. per cap		
	Total	Food	Non Food	Total	Food	Non Food	Total	Food	Non Food	Total	Food	Non Food
Marriage within kin	-0.13	-0.21*	0.03	-0.06	-0.14	0.10	-0.26	-0.24	-0.09	-0.15	-0.12	0.03
	(0.13)	(0.12)	(0.19)	(0.12)	(0.12)	(0.18)	(0.19)	(0.17)	(0.28)	(0.17)	(0.17)	(0.25)
Ill in first period only	0.07	0.10	0.03	0.05	0.08	0.01	-0.07	-0.00	-0.12	-0.02	0.05	-0.07
	(0.12)	(0.12)	(0.16)	(0.12)	(0.13)	(0.16)	(0.15)	(0.15)	(0.22)	(0.15)	(0.15)	(0.21)
Ill in second period only	-0.43	-0.57**	-0.09	-0.51**	-0.65***	-0.17	-0.80*	-1.14***	-0.46	-0.49	-0.83**	-0.15
	(0.27)	(0.25)	(0.41)	(0.23)	(0.23)	(0.36)	(0.41)	(0.35)	(0.57)	(0.39)	(0.38)	(0.50)
Marriage within kin and Ill in second period only	0.43	0.52**	0.08	0.59**	0.69***	0.25	0.59	0.67**	0.27	0.62*	0.70**	0.29
	(0.26)	(0.22)	(0.38)	(0.24)	(0.23)	(0.35)	(0.36)	(0.27)	(0.52)	(0.34)	(0.32)	(0.46)
Marriage within kin and Ill in both periods	-0.10	-0.00	-0.16	0.08	0.18	0.02	0.00	0.13	-0.27	0.18	0.31	-0.09
	(0.20)	(0.15)	(0.33)	(0.19)	(0.18)	(0.29)	(0.24)	(0.20)	(0.37)	(0.24)	(0.22)	(0.35)
HH head works as indep. in the agri. sector *Ill in second period only	0.01	0.28	-0.48	0.20	0.47**	-0.29	0.42	0.76***	-0.12	0.37	0.71**	-0.17
	(0.26)	(0.20)	(0.39)	(0.25)	(0.23)	(0.37)	(0.28)	(0.25)	(0.46)	(0.27)	(0.30)	(0.41)
HH head works as indep. in the non-agri. sector *Ill in second period only	-0.21	-0.22	-0.17	-0.05	-0.06	-0.01	0.04	0.31	-0.20	0.06	0.33	-0.18
	(0.29)	(0.22)	(0.41)	(0.25)	(0.24)	(0.33)	(0.46)	(0.34)	(0.61)	(0.42)	(0.39)	(0.52)
HH head has some formal education *Ill in second period only	0.27	0.81***	-0.34	0.31	0.86***	-0.30	0.28	0.95***	-0.38	0.40	1.07***	-0.25
	(0.32)	(0.21)	(0.51)	(0.24)	(0.19)	(0.42)	(0.51)	(0.30)	(0.74)	(0.38)	(0.26)	(0.60)
Mother's N. of brothers * Ill in second period only	0.02	0.03	-0.01	-0.00	0.01	-0.03	-0.01	0.04	-0.03	-0.04	0.00	-0.06
	(0.04)	(0.03)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.07)	(0.06)	(0.05)	(0.07)
Constant	0.24	0.33**	0.22	0.07	0.15	0.04	0.27	0.26	0.36	-0.01	-0.02	0.08
	(0.18)	(0.16)	(0.24)	(0.17)	(0.16)	(0.22)	(0.23)	(0.21)	(0.31)	(0.21)	(0.20)	(0.28)
Area specific FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Test: Within Kin and Ill second period only + Ill second period only = 0 (pvalue)	1.00	0.82	0.99	0.77	0.89	0.85	0.53	0.15	0.71	0.70	0.70	0.76
Mean of the dependent variable	0.14	0.18	0.18	0.07	0.12	0.12	0.16	0.14	0.26	0.09	0.06	0.18
N	228	228	228	228	228	228	146	146	146	146	146	146
pvalue	0.02	0.00	0.18	0.00	0.00	0.10	0.06	0.00	0.13	0.23	0.00	0.25

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

We test the extent to which the effects found on the sample of daughters' parents are quantitatively similar to those on the sample of children's parents. We therefore re-estimate Equation 1.3 adding interaction terms with a dummy indicating whether the married child is a daughter. Results are shown in Table A-1.3 in the Appendix. The coefficient on $WithinKin_{h,0,1} * Illness_{h,0,1}$ interacted with the dummy indicating if the married child is a daughter is significantly positive on household consumption. Thus the insurance benefit of endogamy seems to be stronger when daughters marry endogamously.

Alternative specification: testing for perfect insurance

An alternative approach to ours is to use the joint panel of household-level consumption and income and compute insurance tests *a la* Townsend (De Magalhaes and Santaeulalia Llopis, 2018). Since we wonder which type of marriage provides more insurance, we estimate Equation 1.4 separately for households having married a child (or a daughter) within the kin group and households having married a child (or a daughter) to a member outside of the kin group.

$$\Delta C_h = \gamma_0 + \gamma_1 \Delta INC_h + \epsilon_h \tag{1.4}$$

ΔC_h measures the difference across time of household annual total consumption in log. ΔINC_h measures the difference across time of household annual income in log. Income accounts for earnings from labor activity (as employee or as independent), pensions, and transfers received. Transfers sent are deduced. ϵ_h is the error term. The model is estimated by OLS with standard errors clustered at the origin-household level.[26]

Results are shown in Table 1.11. These tests show that household consumption change follows income change for households having married a child or daughter to someone outside of the kin group, but not for households who have married their child or daughter to a member of the kin group.[27]

[26] The model also includes area-specific dummies to account for area-specific price shocks. The geographic areas are the same as those controlled for in Equation 1.1 or 1.2.

[27] Note that in a model where change in income is interacted with the endogamy status of marriage, the interaction term is not significantly different from zero.

Table 1.11: Effect of parents' household level income variation on household level consumption variation

	Parents of children		Parents of daughters	
	Diff Log total cons.		Diff Log total cons.	
	Marriage: within kin	Marriage: outside kin	Marriage: within kin	Marriage: outside kin
Diff Log of Income	0.06	0.15***	0.07	0.12**
	(0.05)	(0.05)	(0.06)	(0.06)
Constant	0.08	-0.22	-0.01	-0.22
	(0.26)	(0.21)	(0.31)	(0.26)
Area specific FE	Yes	Yes	Yes	Yes
N	126	95	76	63
pvalue	0.08	0.00	0.09	0.03

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errors are clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

1.5 Discussion

1.5.1 Channels of improved consumption smoothing

To document the channels through which a within-kin-group marriage improves consumption smoothing, we estimate two additional models. First, in Equation 1.3, we replace the outcome by measures of received monetary transfers by the household, both at the extensive and intensive margin.[28] Second, we investigate the effect on household size.

We find that food consumption is better smoothed following the endogamous marriage of a child. We expect this is because transfers to the household increase. We test this prediction in Table 1.12. On the sample of daughters' parents, households who have to cope with the illness of a parent for the first time in the second period receive less transfers if they have married a daughter outside of the kin group. This is not the case if they have married a daughter to a member of the kin group. These patterns are qualitatively similar on the sample of children's parents, although not significantly.

We also find that food consumption per capita is better smoothed following the endogamous marriage of a daughter (or a child). One could expect this is because endogamy eases adjustments of household size. However, we do not find any evidence for such a mechanism.

[28] We study the occurrence of a transfer received over the past year and the log of the amount. We add one FCFA to transfer amounts to have strictly positive values when computing the log. Note that due to some missing values on transfers, estimations are run on a sample of lower size.

Table 1.12: Effect of parents' illness on variation of transfers and household size
Equation 1.3

	Parents of children			Parents of daughters		
	Diff. Occ.	Diff. Log Amount	Diff. HH size	Diff. Occ.	Diff. Log Amount	Diff. HH size
Marriage within kin	0.14	1.48	-1.46	-0.05	-0.45	-2.01
	(0.12)	(1.46)	(1.09)	(0.15)	(1.75)	(1.95)
Ill in first period only	-0.03	-0.18	0.23	0.02	0.25	-0.36
	(0.11)	(1.33)	(0.72)	(0.15)	(1.82)	(1.02)
Ill in second period only	-0.21	-3.60	-0.46	-0.41	-5.39**	-3.70
	(0.20)	(2.27)	(1.54)	(0.25)	(2.64)	(2.27)
Marriage within kin and Ill in second period only	0.23	3.58	-1.43	0.55**	6.56**	-0.50
	(0.21)	(2.50)	(1.49)	(0.25)	(2.69)	(2.34)
Marriage within kin and Ill in both periods	-0.07	-1.08	-0.95	0.07	0.13	-0.94
	(0.13)	(1.60)	(1.33)	(0.15)	(1.88)	(2.08)
HH head works as indep. in the agri. sector *Ill in second period only	0.11	0.53	-0.97	-0.04	-2.07	0.75
	(0.20)	(2.42)	(1.80)	(0.25)	(2.49)	(2.25)
HH head works as indep. in the non-agri. sector *Ill in second period only	-0.14	-0.82	-0.73	-0.13	-1.58	-0.48
	(0.21)	(2.51)	(1.90)	(0.24)	(2.77)	(2.09)
HH head has some formal education *Ill in second period only	-0.18	-1.74	1.91	-0.33	-4.05*	0.93
	(0.14)	(1.75)	(1.69)	(0.22)	(2.17)	(1.71)
Mother's N. of brothers * Ill in second period only	0.02	0.35	0.19	0.07	1.11**	0.42
	(0.04)	(0.46)	(0.24)	(0.05)	(0.53)	(0.32)
Constant	0.31**	4.80***	2.47***	0.35**	5.61***	3.13***
	(0.12)	(1.46)	(0.82)	(0.14)	(1.70)	(0.95)
Area specific FE	Yes	Yes	Yes	Yes	Yes	Yes
Test: Within Kin and Ill second period only + Ill second period only = 0 (pvalue)	0.95	0.99	0.28	0.59	0.66	0.10
Mean of the dependent variable	0.19	2.75	0.91	0.24	3.41	0.95
N	199	199	228	129	129	146
pvalue	0.03	0.02	0.05	0.16	0.09	0.06

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

The transfer patterns we find on the sample of daughters' parents are significantly different from those estimated on the sample of children's parents. Indeed, as indicated in Table A-1.4 in the Appendix, the coefficient on $WithinKin_{h,0,1} * Illness_{h,0,1}$ interacted with the dummy indicating if the married child is a daughter is significantly positive on both the occurrence of transfers and the amount of transfers received.

All in all, the endogamous marriage of daughters, more than the one of sons, helps the smoothing of household and per capita food consumption, at least by preserving the kin group's incentives to send monetary transfers. As already argued, one reason why a daughter's endogamous marriage, more than a son's one, may help preserving the kin group's incentives to send monetary transfers may lie in the differentiated migration patterns of daughters and sons when they marry.

We confirm that the follow-up household of brides (most often the household of their in-laws) is more likely to provide help in the form of monetary transfers to the household of bride's parents if the bride has married endogamously. This result follows the estimation of Equation 1.5:

$$T_h = \alpha'_0 + \beta_1 Illness_{h,} + \beta_2 WithinKin_h + \beta_3 WithinKin_h * Illness_h + \varepsilon'_h \tag{1.5}$$

T_h refers alternatively to the fact that the household has sent a transfer over the last year, and to the log of sent transfers by the daughter herself and by the rest of her household. We only consider the 2011 wave since the daughter's new household has not been surveyed in 2006. The illness considered is either the illness of the mother or the one of the father[29]. Results are shown in Table 1.13. Following the illness of a parent, both daughters and the rest of their household are more likely to transfer-out. The amount sent is also higher on average.[30]

[29]The model also includes area-specific fixed effects and controls for sex of the household head, whether he/she has been enrolled in a French or Arab formal school, and whether the daughter is living with one of her parents in 2011

[30]Results relative to daughters have to be taken with caution since the model is globally not significant.

Table 1.13: Effects of parents'illness on transfer behavior of the new household of daughters

	Daughter's level		Daughter's Household level (excluding the daughter)		
	Occurence	Amount	Occurence	Amount	Amount pcap
Daughter has married within the kin group	-0.13	-1.15	0.25*	1.73	1.36
	(0.15)	(1.37)	(0.13)	(1.54)	(1.31)
A parent has fallen ill in second period	-0.36**	-3.54**	-0.19	-3.31**	-2.65**
	(0.16)	(1.48)	(0.13)	(1.60)	(1.33)
Daughter has married within the kin group and a parent has fallen ill in second	0.45**	4.61**	0.12	3.62*	3.01*
	(0.20)	(1.86)	(0.18)	(2.07)	(1.75)
Demographic controls	Yes	Yes	Yes	Yes	Yes
Area specific FE	Yes	Yes	Yes	Yes	Yes
N	159	158	159	150	149
R	0.06	0.07	0.18	0.17	0.16
pvalue	0.40	0.23	0.00	0.01	0.02

Note: OLS estimates using data from the second wave. Demographic controls are the sex of the household's head, whether he has ever been enrolled in a French/Arab school and whether the daughter coresides with a parent (in 2011). The sample corresponds to daughters who married between baseline and three months preceding their parents' follow-up interview and who were coresiding with their mother in 2006.

Standard errors are in parentheses and significance levels are denoted as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

1.5.2 Why marry a son endogamously?

Our results indicate that the insurance benefit of endogamy is stronger when daughters marry endogamously. If not for insurance, why do parents marry their son endogamously? The benefit of an endogamous marriage for sons may lie in the difficulty for men to marry in Senegal.

Men's marriage has become increasingly difficult (Antoine *et al.*, 1995). Since the family of the groom (or the groom himself) is expected to pay a bride-price to the bride's family and provide a comfortable housing for the couple, this difficulty may have risen following the 1993 devaluation and the rapid rise in urban population density. In this context, as within-kin-group marriages are easier to arrange, the demand for marriage (from sons themselves, or from their parents) may explain the demand for within-kin-group marriages for parents of sons.[31]

In our data, the brideprice received by the bride is lower when she marries a male in her kin group (see Table 1.5).[32] Men also marry at a younger age when they marry a member of the extended family. Looking at men who married for the first time between the two waves of interview, men marry on average at age 29.3 when they marry someone outside of the kin group and at 27 when they marry someone within the kin group. The difference is significant at the 5% level. Measuring the average age at first marriage for cohorts of men born between 1950 and 1970, we find that the average age at first marriage increases over time for men who marry someone outside the family and is stable otherwise (see Figure A-1.2 in the Appendix).

1.6 Conclusion

This paper has considered how the adverse effects of illness are managed by households according to whether a child recently married within the kin group (endogamously) or outside of the kin group (exogamously). We expect this to matter if a child's endogamous marriage is a way for parents to strengthen preexisting links and to foster altruistic behaviors or reciprocity expectations among members of the kin group, increasing thus the kin group's incentives to help the parents in case they are in need.

We exploit original panel data on consumption and monetary transfers collected in Senegal in 2006/2007 and 2011/2012 and find that daughters' endogamous marriage helps their parents'

[31] The demand for within-kin-group marriage may reflect difficulties in marrying one's son for the first time and the difficulty of finding him a second wife. In Senegal, polygyny is widespread, and is associated with higher social status (Diop, 1985).

[32] Yet, brides who marry endogamously are younger on average (first row in the Table). One could have expected a positive association between the age of the bride and the amount of the brideprice. Note that the brideprice dominates payments made at the occasion of marriages. We observe very few transfers from the bride's to the groom's family. The difference remains significant at 5% when we account for baseline difference in household's consumption (column 4).

household to better smooth food consumption. This is notably thanks to a relative increase of the transfers their household receives. The better smoothing effect from a daughter's endogamous marriage when shocks are individual may explain part of the demand for endogamous marriages observed in Senegal. The link between sons' endogamous marriage and parents' demand for insurance is less clear-cut. If not for insurance, parents may want to marry their son endogamously to ease their marriage. Thus, endogamy appears as a mutually-beneficial arrangement: parents of sons marry their sons more easily, and as a counterpart to this benefit the parents of daughters improve their ability to smooth adverse shocks. This may explain its persistence across time.

The insurance benefit of daughters' endogamous marriage does not rule out drawbacks: there could be some costs for daughters who marry according to the desire of their parents, and potentially against their own. The question of potential costs associated with endogamous marriage is addressed by future work.

Acknowledgments

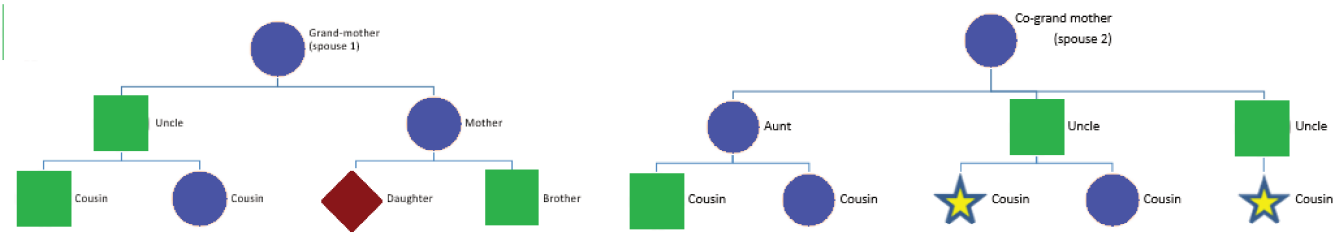
We are grateful to Richard Akresh, Luc Behaghel, Lorenzo Casaburi, Eric Edmonds, Fabrice Etilé, Catherine Guirkinger, Marc Gurgand, Kenneth Houngbedji, Sylvie Lambert, and Jann Lay for precious advice and insightful discussions on previous versions of this work, as well as participants at the Casual Friday Development Seminar, the D&S seminar in 2017 in Paris, the Journeés de Microéconomie Appliquées in 2017 in Le Mans, the Development Conference organized by DIAL in July 2017, the EUDN PhD Workshop in October for helpful comments, the CSAE, the CISEA and the AEL in Zurich.

Funding

We are thankful to the CEPREMAP for its financial support allowing us to conduct qualitative interviews in Dakar in 2017 and in 2018 on marriage.

Appendix

Figure A-1.1: Diagram of Cross-cousins in case of polygamy of the grand-father



The figure presents the definition of cross-cousins in case of polygamy of the grand father. The male members are represented by a square and female members by a circle, except the "daughter of interest", who is represented by a diamond. All the relationships in the figure are with respect to the daughter of interest. Her potential favorite spouses are those represented by a star: they are cross-cousins and have only one grand-father in common with the daughter of interest.

Table A-1.1: Proportion of households with a parent reporting an illness - Daughters

	Marriage: within kin (1)	Marriage: outside kin (2)	Diff. (3)	Coefficient (OLS) (4)
A parent reports an illness in 2006	0.51	0.38	0.14*	0.10
			(0.10)	(0.28)
A parent reports an illness in 2011	0.59	0.35	0.24***	0.17
			(0.00)	(0.11)
Among hh with a parent ill in 2006: a parent reports an illness in 2011	0.66	0.54	0.12	0.09
			(0.34)	(0.56)
Among hh with no parent ill in 2006: a parent reports an illness in 2011	0.49	0.23	0.25**	0.12
			(0.02)	(0.39)

Note: The sample corresponds to households where a daughter has married between baseline and three months preceding the follow-up interview. In 2006, prevalence of shocks are computed on 149 households. In 2011, there are computed on 151 households. In column (4), the coefficient is obtained from a model estimated in OLS where the illness measure is regressed on whether an endogamous marriage has been celebrated, controlling for whether the parents' household is located in a rural area, the head's education, the head's occupation status, the mother's number of brothers, and a set of area fixed effects. In this model, standard errors are clustered at the origin household level. Significance levels are denoted as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table A-1.2: Household (HH) baseline characteristics by whether she has celebrated a marriage within the kin group between the two rounds of interview and by whether a parent has fallen ill in second period - Daughters

Variables				Marriage within kin		
	never ill	ill second period only	Diff. (1)	never ill	ill second period only	Diff. (2)
A HH member owns the house (heritage)	0.31	0.43	-0.13	0.35	0.45	-0.10
			(0.22)			(0.48)
A HH member owns the house (purchase)	0.51	0.40	0.11	0.48	0.35	0.13
			(0.32)			(0.33)
Tenant of the house	0.19	0.17	0.02	0.17	0.20	-0.03
			(0.78)			(0.76)
A HH member owns cattle	0.62	0.73	-0.11	0.77	0.70	0.07
			(0.25)			(0.56)
A HH member exploits farmland	0.47	0.60	-0.13	0.67	0.60	0.07
			(0.23)			(0.62)
Number of parents in the hh	1.64	1.67	-0.02	1.79	1.75	0.04
			(0.81)			(0.72)
HH is in a rural location	0.47	0.63	-0.16	0.71	0.75	-0.04
			(0.13)			(0.73)
HH head has French/Arab education	0.27	0.20	0.07	0.17	0.15	0.02
			(0.43)			(0.84)
HH head: independant agricul. sector	0.17	0.23	-0.06	0.21	0.20	0.01
			(0.46)			(0.94)
HH head: independant non-agricul. sector	0.31	0.47	-0.16	0.31	0.50	-0.19
			(0.13)			(0.17)
HH head: other occupation status (inc. retired)	0.53	0.30	0.23**	0.48	0.30	0.18
			(0.03)			(0.17)
Mother's N. of half brothers (if absent, father's N. of half sisters)	4.05	3.73	0.32	4.49	4.05	0.44
			(0.57)			(0.57)
Marriage: within kin group	0.51	0.67	-0.16	1.00	1.00	0.00
			(0.12)			(.)
Number of HH	95	30	125	48	20	68

Note: The sample corresponds to households satisfying two criteria : (1) a daughter has married between baseline and three months preceding the follow-up interview, and (2) parents reported to be healthy in first period. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table A-1.3: Effect of parents' illness on consumption variation - Interaction with child's gender

	Diff Log of hh cons.			Diff Log of cons. per cap		
	Total	Food	Non Food	Total	Food	Non Food
Marriage within kin	0.08	-0.16	0.26	0.07	-0.17	0.25
	(0.17)	(0.21)	(0.26)	(0.19)	(0.23)	(0.26)
Ill in first period only	0.26	0.20	0.29	0.10	0.03	0.12
	(0.17)	(0.20)	(0.25)	(0.19)	(0.22)	(0.24)
Ill in second period only	-0.12	-0.39	0.33	-0.37	-0.64**	0.09
	(0.27)	(0.30)	(0.46)	(0.25)	(0.30)	(0.43)
Marriage within kin and Ill in second period only	-0.02	0.18	-0.42	0.19	0.39	-0.21
	(0.33)	(0.33)	(0.54)	(0.35)	(0.35)	(0.52)
Marriage within kin and Ill in both periods	-0.39	-0.40	-0.01	-0.11	-0.12	0.27
	(0.54)	(0.29)	(0.94)	(0.44)	(0.40)	(0.77)
HH head works as indep. in the agri. sector *Ill in second period only	0.19	0.45**	-0.36	0.24	0.51**	-0.30
	(0.26)	(0.22)	(0.39)	(0.24)	(0.24)	(0.35)
HH head works as indep. in the non-agri. sector *Ill in second period only	-0.18	-0.18	-0.13	-0.02	-0.03	0.02
	(0.28)	(0.21)	(0.41)	(0.26)	(0.25)	(0.35)
HH head has some formal education *Ill in second period only	0.24	0.78***	-0.36	0.30	0.84***	-0.31
	(0.31)	(0.18)	(0.51)	(0.25)	(0.18)	(0.45)
Mother's N. of brothers * Ill in second period only	0.03	0.05	0.00	0.00	0.02	-0.02
	(0.04)	(0.03)	(0.06)	(0.04)	(0.04)	(0.05)
Married a daughter	0.14	-0.10	0.33	0.02	-0.22	0.21
	(0.19)	(0.24)	(0.28)	(0.20)	(0.25)	(0.27)
Marriage within kin* Married a daughter	-0.40	-0.13	-0.39	-0.26	0.00	-0.26
	(0.25)	(0.28)	(0.35)	(0.25)	(0.30)	(0.34)
Ill in first period only* Married a daughter	-0.35	-0.21	-0.44	-0.10	0.04	-0.19
	(0.22)	(0.24)	(0.32)	(0.23)	(0.26)	(0.31)
Ill in second period only* Married a daughter	-0.74**	-0.60*	-0.85	-0.33	-0.20	-0.44
	(0.34)	(0.35)	(0.53)	(0.33)	(0.35)	(0.50)
Marriage within kin and Ill in second period only * Married a daughter	0.78*	0.66	0.85	0.68	0.56	0.75
	(0.45)	(0.42)	(0.71)	(0.44)	(0.45)	(0.66)
Marriage within kin and Ill in both periods * Married a daughter	0.43	0.55*	-0.16	0.30	0.42	-0.29
	(0.57)	(0.33)	(0.98)	(0.49)	(0.43)	(0.81)
Constant	0.09	0.36	-0.06	0.02	0.29	-0.13
	(0.21)	(0.25)	(0.31)	(0.22)	(0.26)	(0.30)
Area specific FE	Yes	Yes	Yes	Yes	Yes	Yes
Test: Within Kin and Ill second period only + Ill second period only = 0 (pvalue)	0.71	0.43	0.87	0.63	0.39	0.81
Test: Daughter Within Kin and Ill second period only + Within Kin Ill second period only = 0 (pvalue)	0.02	0.00	0.40	0.00	0.00	0.23
Test: Daughter Ill second period only + Ill second period only = 0 (pvalue)	0.01	0.00	0.29	0.02	0.00	0.40
Test: Daughter Within Kin and Ill second period only + Within Kin Ill second period only = Daughter Ill second period only + Ill second period only (pvalue)	0.01	0.00	0.28	0.00	0.00	0.25
Mean of the dependent variable	0.14	0.18	0.18	0.07	0.12	0.12
N	228	228	228	228	228	228
pvalue	0.00	0.00	0.23	0.01	0.00	0.20

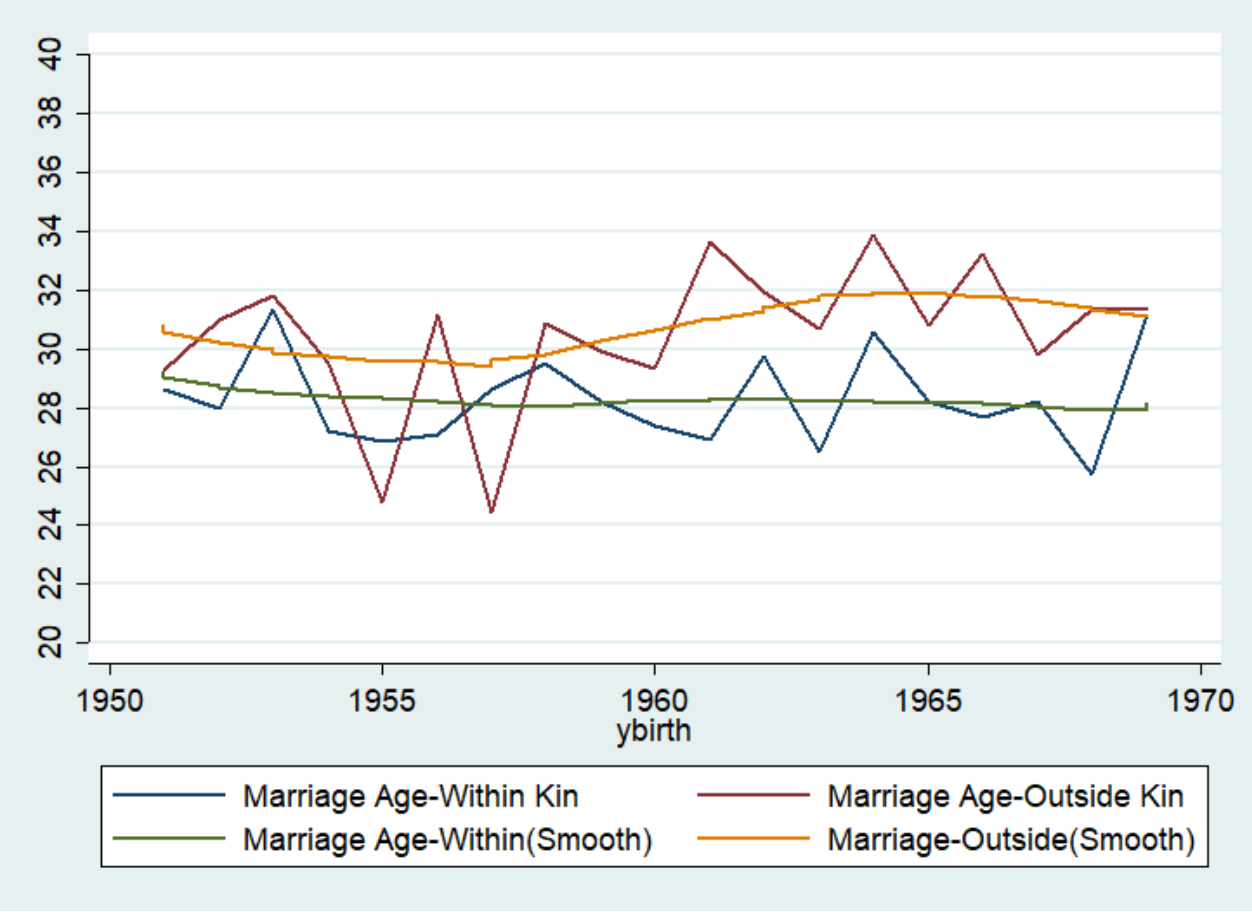
Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table A-1.4: Effect of parents' illness on variation of transfers and household size - Interaction with child's gender

	Diff. Occ.	Diff. Log Amount	Diff. HH size
Marriage within kin	0.35*	4.38*	-0.57
	(0.19)	(2.30)	(0.93)
Ill in first period only	-0.06	-0.37	1.73**
	(0.18)	(2.11)	(0.87)
Ill in second period only	-0.04	-1.31	0.96
	(0.26)	(3.02)	(1.43)
Marriage within kin and Ill in second period only	-0.23	-2.18	-1.56
	(0.37)	(4.56)	(1.80)
Marriage within kin and Ill in both periods	-0.11	-1.56	-0.96
	(0.23)	(2.87)	(1.60)
HH head works as indep. in the agri. sector *Ill in second period only	0.16	1.23	0.30
	(0.20)	(2.36)	(1.88)
HH head works as indep. in the non-agri. sector *Ill in second period only	-0.10	-0.33	-0.70
	(0.20)	(2.50)	(1.69)
HH head has some formal education *Ill in second period only	-0.19	-1.81	1.85
	(0.16)	(1.93)	(1.45)
Mother's N. of brothers * Ill in second period only	0.02	0.40	0.27
	(0.05)	(0.50)	(0.26)
Married a daughter	0.14	2.04	1.26
	(0.16)	(2.02)	(0.99)
Marriage within kin* Married a daughter	-0.38*	-5.10*	-1.51
	(0.23)	(2.70)	(1.83)
Ill in first period only* Married a daughter	0.05	0.31	-2.61*
	(0.23)	(2.66)	(1.43)
Ill in second period only* Married a daughter	-0.37	-4.90	-3.46**
	(0.35)	(3.93)	(1.74)
Marriage within kin and Ill in second period only * Married a daughter	0.75*	9.49*	0.39
	(0.44)	(5.28)	(3.00)
Marriage within kin and Ill in both periods * Married a daughter	0.12	1.49	0.12
	(0.26)	(3.23)	(2.40)
Constant	0.18	3.02	1.37
	(0.19)	(2.36)	(1.06)
Area specific FE	Yes	Yes	Yes
Test: Within Kin and Ill second period only + Ill second period only = 0 (pvalue)	0.37	0.39	0.73
Test: Daughter Within Kin and Ill second period only + Within Kin Ill second period only = 0 (pvalue)	0.04	0.01	0.61
Test: Daughter Ill second period only + Ill second period only = 0 (pvalue)	0.12	0.04	0.22
Test: Daughter Within Kin and Ill second period only + Within Kin Ill second period only =			
Daughter Ill second period only + Ill second period only (pvalue)	0.04	0.01	0.72
Mean of the dependent variable	0.19	2.75	0.91
N	199	199	228
pvalue	0.12	0.07	0.00

Note: The sample corresponds to households with a parent having married a child between baseline and three months preceding the follow-up interview. We include FE specific to three areas: (a) Dakar and Thies, (b) Kaolack and Fatick, (c) Casamance. Standard errorsare clustered at the level of the origin household. Significance levels are denoted as follows: * p<0.10, ** p<0.05, *** p<0.01.

Figure A-1.2: Age at first marriage for men according to birth cohort and type of marriage



The figure presents the average age at first marriage according to the year of birth for men surveyed in 2006 and the type of marriage. We use a locally weighted regression to smooth the graph, because of the importance of age heaping.

Chapter 2

Assessing the Effects of an Education Policy on Women's Well-being: Evidence from Benin

Abstract:[1] In this paper, we examine the effect of education on women's well-being through the analysis of the impact of a school construction program in Benin. We exploit a sharp increase in school constructions in the 1990s in this country, to assess the causal impact of a primary education program on primary school attendance, age at marriage and tolerance of intimate partner violence (IPV). Using a double difference method, along with a regression kink design, we find that the program increased the probability to attend primary school in rural areas. The policy also increased age at marriage and decreased the probability to find wife beating tolerable. We show that, in this context, the benefits of girls' education have percolated down to women's well-being beyond the initial goal of the policy.

[1] This chapter is co-authored with Sarah Deschênes.

2.1 Introduction

Over the past decades, the economic literature has been devoting attention to the relationship between women's well-being and economic development (Duflo (2012)). Women's well-being is multifaceted. Yet, in societies where marriage and motherhood are still considered the main milestones of a woman's life, women's well-being within their household is a key issue, especially in low or medium-income countries with no safety nets but the family. Beyond its intrinsic value, one of the vector for improving this dimension of women's welfare is education. First, it could impact when and how they enter the marriage market, and to whom they are married. Access to education is expected to postpone entry into marital life (Breierova and Duflo (2004)). This is crucial since the earlier women enter marriage the more their well-being is expected to be harmed. The literature has indeed well documented that entering early into marital life goes hand in hand with early motherhood, which is known to be detrimental to women's health (Raj *et al.* (2009) and Nour (2006)). It is often associated with a lower bargaining power within the household (Jensen and Thornton (2003)). Education could also affect a woman say in the choice of the partner (Banerji (2008)) or the quality of the match, in case of assortative matching (Fafchamps and Quisumbing (2007)).

Once the woman is married, education can affect the dynamic within her couple. Education is expected to increase married women's bargaining power within their household by increasing their ability to negotiate access to the household's financial resources (Lundberg and Pollack (1993)). And women's access to household resources is indeed critical: the theoretical and empirical literature have shown that increasing the share of resources accruing to women could have beneficial effects on themselves and on their descendants (Doss (1996), Rubalcava *et al.* (2009) and Duflo (2003)). For example, a higher bargaining power can increase child nutrition (Lépine and Strobl (2013)), or pre-natal and child-care (Beegle *et al.* (2001)).

Education can also be a catalyst to change gender norms and increase women's empowerment[2] and agency. As underlined by Hanmer and Klugman (2016), freedom from gender based violence is an essential domain of women's agency. Yet, if women support gender norms that condone the use of physical violence against them, we believe, with Hanmer and Klugman

[2]We define empowerment as the process by which women become aware of and challenge the gender norms that curtail the realm of possibilities available to them, compared to men, as well as their ability to choose and act, individually and collectively, to pursue their own strategic interests. This definition, though close to the one of Kabeer (2005) reintroduces an explicit mention to the psychological process of awareness necessary to challenge power relations betweens sexes and in that is closer to Stromquist (1999).

(2016), that it tells us something about an individual's sense of women's empowerment. This is why we use the tolerance to intimate partner violence as a proxy for it. A change in tolerance of IPV could then capture a change in gender norms about the expectation around women's behavior in the household, or in women's perception of husbands' alleged right to use physical violence. There are multiple channels through which education is expected to impact tolerance of IPV. It could, for instance, provide women with a better knowledge of their rights, better credible outside options in case of divorce or separation, or a higher self-esteem.

In the 1990's, West African leaders designed education policies that first aimed at improving access to education in the region. In several summits, they pledged to reach universal primary education and they implemented various measures ranging from school constructions to awareness campaign. Incidentally, girls turned to benefit most from the policy as they were less likely to have enrolled to primary school compared to boys at that time (in 1990 in Benin, the primary school enrollment is of 27% for girls and 52% for boys[3]). Part of our analysis examines whether this first objective was reached as it is not straightforward that increasing school supply automatically leads to more attendance. Beyond changing educational outcomes, education is expected to have far-reaching consequences for women's well-being, even though women's well-being was not on the top of political leader's mind at the time they designed the education policy. It has sometimes been hailed as a panacea to solve women's empowerment issues. In this paper, we put this stance to the test and study whether this regional education policy improved women's well-being beyond its initial designed effect.

Exploiting the Demographic and Health Survey of Benin, we use a difference in difference strategy along with a regression kink design. Our identification strategy relies on the quasi-experimental variation in the number of schools built in the 1990's in the seventy-six municipalities of Benin, fostered by world leaders' pledge to reach the Millenium Development Goals.

Our findings are threefold. First, we find that the increase in school constructions led to a higher primary school attendance among rural women, while we find no such evidence among urban women. Second, we find that the education program increases the age at marriage, as well as the age at first child. Third, we find that access to primary education decreases tolerance towards domestic violence. More precisely, it affects the tolerance of wife beating for refusing

[3]These figures come from the World Bank database.

sex or burning the food.

Our work relates to the strand of the literature focusing on the impact of various education policies on actual school enrollment. A large literature studies the link between school supplies and enrollment (Duflo (2001)). Conditional cash transfers can also increase education, as presented by Schultz (2004) in his work on Progresa. But various other policies, such as free meals, impact also education, as shown in the meta-analysis of random control experiment in developing countries, done by Kremer (2003). Other program, that do not directly target enrollment have also positive effects: Kremer and Miguel (2004) highlight the positive yet modest impact of a school-based mass treatment against worms on school enrollment. The effect of these education policies on education can vary according to some parameters. Ashraf *et al.* (2016) found that in ethnicities where bride price are exchanged at marriage, a shock on school supply has a larger impact on girls education, compared to ethnicities where bride prices do not exist.

Our work also relates to the literature analyzing the various impacts of education on dimensions ranging from labor market outcomes to welfare within the household. There is a very strong consensus on the positive impact of education on labor market outcomes (Card and Lemieux (2001), Card and Krueger (1992)). In the developing context, Duflo (2001), among other authors, shows that a schools construction program in Indonesia increased future earnings of beneficiaries. The literature has also emphasized that the positive effects of increased education could extend to other members of the household. Maternal education has been proven to percolate to children and improve their outcomes (Boyle *et al.* (2006), Desai and Soumya (1998)). In this paper, we emulate a literature that investigates the impact of education on age at marriage, fertility and tolerance of IPV. We set aside outcomes related to women's children because the reform is relatively recent. We are also unable to analyze the effect of the policy on women's actual experience of IPV as the data is not available in the survey[4].

An important share of the literature focuses on the links between education and two dimensions of women's welfare: age at marriage and fertility level. Part of this literature often presents correlations. A main empirical challenge for identifying a causal effect is that marriage and education decisions are made simultaneously and probably by a young woman's parents rather than herself. Yet, some papers managed to provide evidence of a causal inference. In

[4]Furthermore, self-reported measures of experience of violence should be taken with caution, as it is difficult to disentangle change in the actual experience of violence from a change in awareness of violence.

the context of Zimbabwe, Bharadwaj and Grépin (2015) uses a regression discontinuity design relying on the variation in the exposure to a set of policies that increased access to secondary school according to the age of respondents. They found that secondary education delays marriage which is in line with Breierova and Duflo (2004) findings for Indonesia. Regarding fertility, in Nigeria, Osili and Long (2008) have found that free primary education led to a decrease in fertility for girls who have benefited from the reform. Samarakoon and Parinduri (2015) exploit the lengthening of the school year by six months in Indonesia and show that primary education reduces the number of live births. Eventually, Ozier (2016) provides evidence that the opportunity to attend secondary school reduces pregnancy among Kenyan teenagers. Duflo *et al.* (2015) show, in the context of Kenya, that education subsidies reduce adolescent girls' drop out and pregnancy. In the context of Malawi, Baird *et al.* (2010) show that a cash transfer conditional on school attendance (CCT) helps maintains girls in school and significantly delayed entry into marital life and motherhood. Conversely, Field and Ambrus (2008) study how later marriage increases schooling, using age of menarche as an instrumenting variable for marriage. As for the impact of primary school on age at marriage, evidence is still scarce concerning Africa. An originality of our work lies in the fact that the link between primary education and age at marriage is probably less straightforward yet no less interesting than the one between secondary education and age at marriage. Indeed, girls reaching secondary school are of marriageable age whereas those in primary school are often not old enough to marry. Furthermore, the recent literature tends to focus on demand-side interventions, rather than supply-side. Here, we focus on the supply side one.

In contrast with the vast literature on the link between education and fertility, the literature on the links between education and other aspects of women's empowerment is rather scarce. The relationship between education and acceptance of domestic violence has seldom been studied by the economic literature and the current body of work provides mixed evidence. Mocan and Cannonier (2012) take advantage of the variation in the exposure to a free primary education program and an increase in funding dedicated to primary schools in Sierra Leone in 2001, linked to the date of birth and the regional variation of resources. They find that education reduces women's propensity to approve of wife beating. More recently, Erten and Keskin (2018) exploited a change in compulsory schooling law in Turkey. Using a regression discontinuity design, they demonstrate that increased women's schooling leads to a rise in self-reported psychological violence among rural women but find no impact on tolerance of IPV.

This paper contributes to the literature on primary education and women's welfare in several

ways. First, we document the impact of a program of school constructions in Benin. We offer causal evidence of the link between education and tolerance of domestic violence in this country, relying on geocoded data at a rather granular level. Third, we complement the classical approach of the double difference with a strategy inspired from a method scarcely used so far in this context: the regression kink design (RKD)[5].

The remainder of the paper proceeds as follows. Section 2.2 describes the context of the increase in government spending for education in Benin in the 1990s and the data used in the analysis. Section 2.3 details the identification strategy and section 2.4 presents the results. Robustness tests are performed in section 3.6 and section 2.6 discusses the potential channels that may explain the effects we find. Section 3.7 concludes.

2.2 Context and Data

2.2.1 Education Policies in the 1990's in West Africa

In 1990, 155 countries gathered at the *World Conference for Education for All* in Jomtien (Thailand), and pledged to reach universal primary education for all children by 2015. At the end of the 1990s, this priority was reaffirmed by the international community as one of the eight Millennium Development Goals (MDG's). They were designed by world leaders to frame national policies. These two international milestones kick started large investments in education in developing countries, including in sub-Saharan Africa, in the shape of school constructions or free primary schooling. At the continental level, the Conference of African Ministers of Education (MINEDAF), held in Dakar in 1991, endorsed the program MINEDAF VI which launched the financial efforts needed to achieve universal education in Africa.

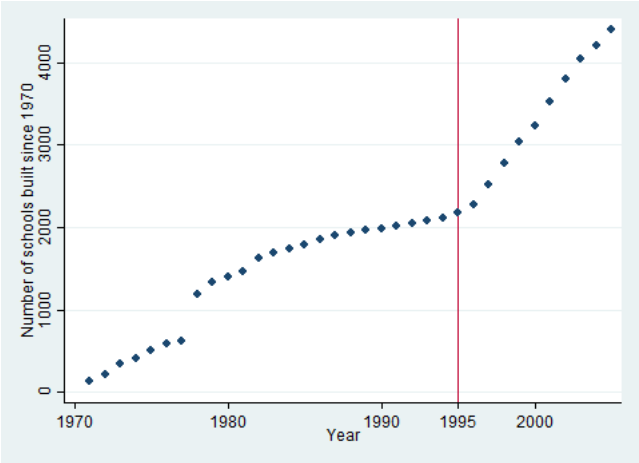
In Benin, since the holding of the Conference for Education in 1991, primary education has been promoted as a priority of the government[6]. A reform of education, whose objective was to improve infrastructure and increase girls' enrollment in primary school, was launched in 1992-1993. Between 1997 and 2003, more than 1500 schools were built by the State or by NGOs, as can be seen in figure 2.1. Figure 2.1 shows that, even though there exists a change in trend before 1997, this year sees a sharper change in the rhythm of schools built. This surge reached

[5]So far, and to the best of our knowledge, the RKD has especially been used in a political economy literature focusing on industrialized countries, using administrative data (Landais (2015), Simonsen *et al.* (2010) for instance).

[6]As presented in the National report on the Development of Education prepared for the International Bureau of Education, 2001.

all districts in Benin, as shown in table A-2.1 and figure 2.3 in Appendix. During that period, total enrollment increased from around 722000 to 911000 pupils (26.2%)[7]. The surge in the number of pupils is mainly driven by girls enrollment and is consistent with the observed kink in the share of women who went to primary school shown in figure 2.2. The policy impacted more women than men (at least for primary school attendance), since the school enrollment was lower for women. The rise in school constructions that occured in 1995 is mirrored in the steady increase in the share of women going to primary school starting for those born after 1983. It means that even women aged 12 years old at the time the policy was launched are treated, which is not surprising in a context where children can enter school late, and where age is not well-known. It could also reflect a policy implemented in two steps; first, girls were encouraged to enroll and existing schools were filled, and then new schools were built.

Figure 2.1: Number of schools built by year in Benin

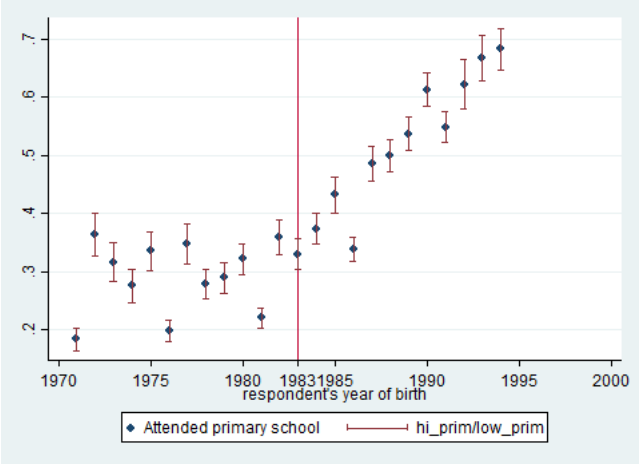


Note: The figure presents the number of schools built by year in Benin, since 1970.

Source: PASEC data on school construction in Benin.

[7] World Bank Country Status Report: "'The Beninese education system, performance and room for improvement for the education policy"', 2002.

Figure 2.2: Share of women attending primary school by cohort in Benin



Note: The figure presents the share of women who attended primary school, by birth cohort in Benin.

Source: DHS Benin 2006, 2011.

Benin's efforts in terms of infrastructure came on top of an already existing legal framework that made primary schooling compulsory as soon as 1975. Indeed, the revolutionary regime in place at the time already considered education as a priority. Yet in 1990, at the time of a regime change and in a context where countries were pledging their commitment to a larger access to education, Benin reasserted that primary schooling was mandatory by enshrining it in the Constitution.

2.2.2 Data

DHS Dataset

This study uses the Demographic and Health Surveys (DHS) for Benin (2011). The DHS collects information on women aged 15-49 years old in an harmonized manner across countries. Information collected in all surveys includes women's marital status, age at first marriage and age at first birth among other variables.

The DHS also collect data on women's tolerance of IPV. The respondents are asked whether they find it justified for a husband to beat his wife in a series of five scenarii; whether a woman goes out without telling her husband, if she neglects the children, argues with him, refuses to have sex or burns the food. These variables will be used as our main outcome of interest. Though there exists a module collecting data on women's actual experience of violence, Benin did not include such questions in its 2011 survey.

The data is geocoded so that we can locate the DHS survey clusters. In order to maintain confidentiality, the DHS Program randomly displaces the latitude and longitude of the clusters. They are moved by 0 to 2 kilometers in urban areas and rural clusters are displaced by 0 to 5 kilometers, with 1% of them moved by up to 10 kilometers. Because of this random displacement rule, we build a buffer of no less than 10 kilometers radius around the DHS clusters to have a measure of exposure to primary schooling that is granular enough but that also limits the error in measurement induced by the displacement. It is also worth noting that the DHS Program randomly displaces clusters but sees to keeping the clusters within their actual municipality.

Table 2.1: Assessment of the Quality of School Data

	Number of primary school in Benin in 2005/2006	
	Source	
	WB 2009 Report	Administrative dataset
ATACORA / DONGA	868	848
ATLANTIQUE / LITTORAL	1259	861
BORGOU / ALIBORI	881	832
MONO / COUFFO	894	828
OUEME / PLATEAU	1149	795
ZOU / COLLINES	1091	1010
Total	6142	5174

Note: This table presents the total number of primary schools available by districts, as defined before 2006.
Source: World Bank Country Status Report n°165 "Le systeme éducatif béninois : Analyse sectorielle pour une politique éducative plus équilibrée et plus efficace", 2009.

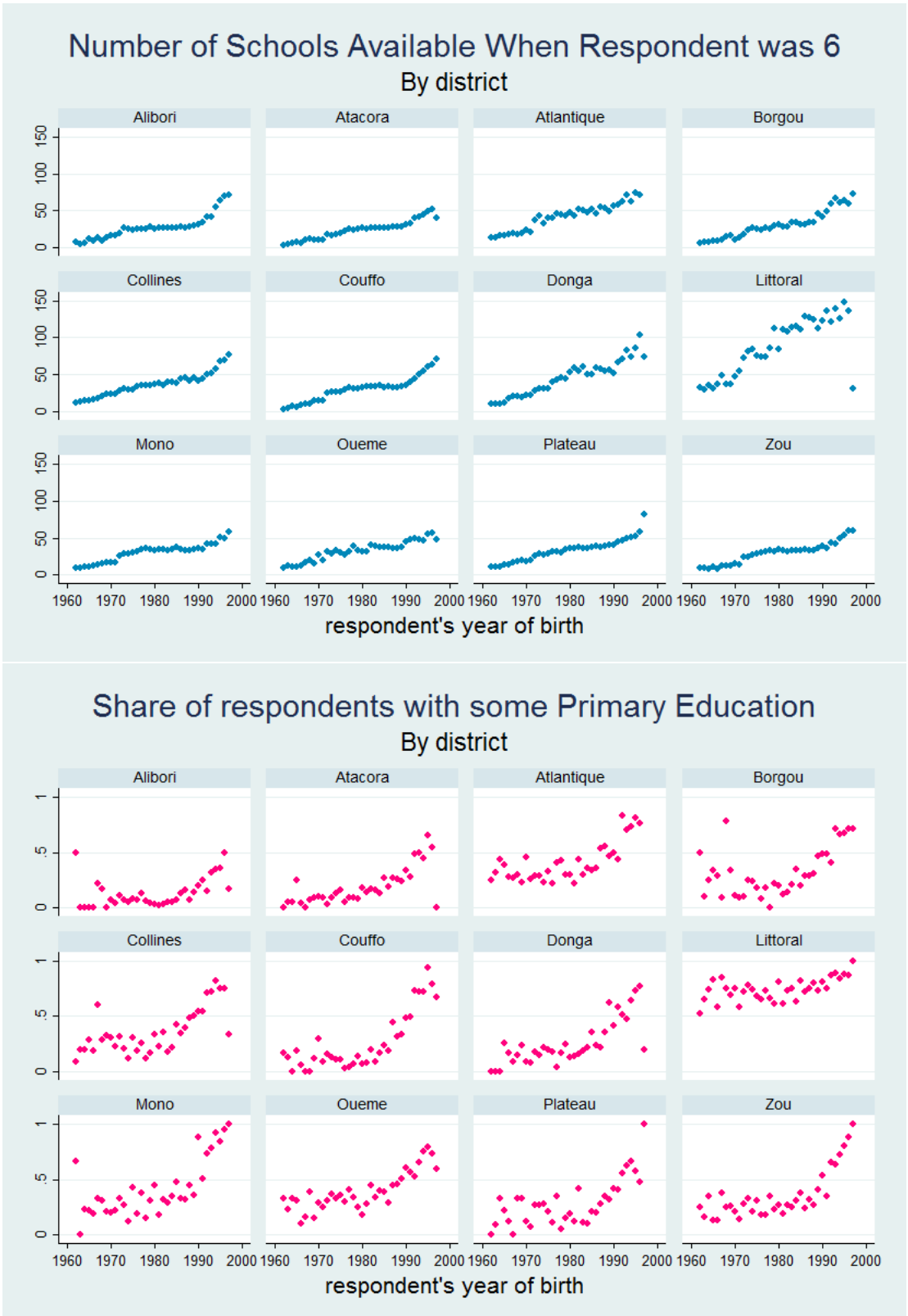
Schools constructions Dataset

In addition to the DHS, we use an administrative database of schools constructions in Benin. It provides the number of school built per year in each of the 12 districts and 76 municipalities of the country between 1970 and 2005. The original school construction dataset contained the town area where the schools were built. We geocoded the data based on the school name, which allowed us to have an even more precise location of the schools. The districts were matched with the 2011 DHS dataset for Benin, thanks to DHS's own geolocalization of its clusters. The resulting dataset allows us to know how many schools were built in a buffer around the DHS cluster of a respondent when she was of schooling age. Figure 2.3 presents the number of schools available when women were of schooling age and primary education by district and cohorts in Benin. It shows that even though the intensity of the treatment and the potential response to the treatment is different across districts, the policy reached all districts of Benin. The difference in difference strategy allows us to take advantage of the differential treatment intensity within Benin across time and space.

Quality of school constructions data

We benchmark our school constructions data against the numbers provided by the 2009 World Bank Report on Schooling in Benin. Table 2.1 shows that, despite some measurement error, our data accurately estimate the number of schools built in Benin at the national and department levels.

Figure 2.3: Number of schools when the respondent was 6 years old



Source: Upper part of the Figure: DHS Benin 2011. Higher part of the graph: PASEC data on school constructions in Benin.

Descriptive Statistics

In Benin, the age at marriage averages 19 years old. The share of women who have been married before fifteen years old is equal to 13%, and is comparable to other countries in the region, such as Senegal and Sierra Leone (table A-2.2 in Appendix). Concerning the acceptance of domestic violence, the homogeneity of the averages between the five different items, within country, is striking. In Benin, 10% of women condone IPV for the tree first items (going out without telling the husband, arguing with the husband, neglecting the children), whereas it is around 7% for the two last items (refusing sex and burning the food). Benin exhibits the lowest level of tolerance of IPV among the countries in the sub-region. The correlation matrix (table A-2.3) in Appendix suggests that the first three items are more strongly correlated, compared to the last two, confirming that, in nature, those items appear different. As a result, we choose to build a dummy variable called "commonly accepted offense", equal to one if the individual answers yes to at least one of the three first items, 0 if she answers yes to none. We also build a variable called "less commonly accepted", that takes the value one if the woman answer yes to one of the two last items (finding wife beating acceptable if a woman refuses sex or burns the food).

2.2.3 Same treatment, different recipients

Though both rural and urban areas were impacted by the school construction program, the intensity and determinants of the program appear to have been different in cities and in the countryside.

First, the surge in school constructions relative to the initial stock of schools just before the program begun, was stronger in rural areas than in urban areas. The second to last line of table 2.2 shows that this difference in the intensity of the program is both economically and statistically significant[8].

Not only was the intensity of the program different but the correlates of school constructions also differ across rural and urban areas. As shown in the last two columns of table 2.3, the correlation between women attendance before the program and the intensity of the treatment is twice as high in urban areas, compared to rural ones. Surprisingly, it seems that in urban areas, clusters were women were already more educated benefited the most from the program.

[8] In this analysis, we choose to exclude Cotonou because of the specificity of this agglomeration, since Cotonou is the economic capital city.

Table 2.2: Number of schools built

Variables	Urban	Rural	Diff.
Number of schools in the cluster in 1996	2.81	2.40	0.40
			(0.13)
Number of schools built in the cluster between 1997 and 2003	21.11	14.47	6.63***
			(0.00)
Number of schools built in the cluster between 1997 and 2003 for 1000 children	1.18	1.07	0.11
			(0.21)
Number of schoolst built between 1997 and 2003/Stock in 1996	0.53	0.63	-0.10***
			(0.01)
Number of clusters	226	434	660

Note: The table presents the differences in mean of school allocations between 1997 and 2003, according to the status of the cluster (in a rural or urban area). We look at the stock of schools available in 1996 in the cluster, before the policy, and to the number of schools built between 1997 and 2003, in absolute terms and in relation to the already available stock. Sample: DHS clusters. Cotonou is excluded.

Source: DHS Benin 2011.

Table 2.3: Schools allocation between 1997 and 2003

	Number of schools		Number of schools for 1000 children	
	Urban	Rural	Urban	Rural
Number of children in the municipality	0.001***	0.000**	-0.000**	-0.000***
	(0.00)	(0.00)	(0.00)	(0.00)
Female primary attendance average	9.281**	3.882	0.631**	0.327
	(4.03)	(3.16)	(0.28)	(0.25)
Number of clusters	225.00	430.00	225.00	430.00
r2	0.40	0.03	0.04	0.06
F	88.69	2.88	2.95	12.70

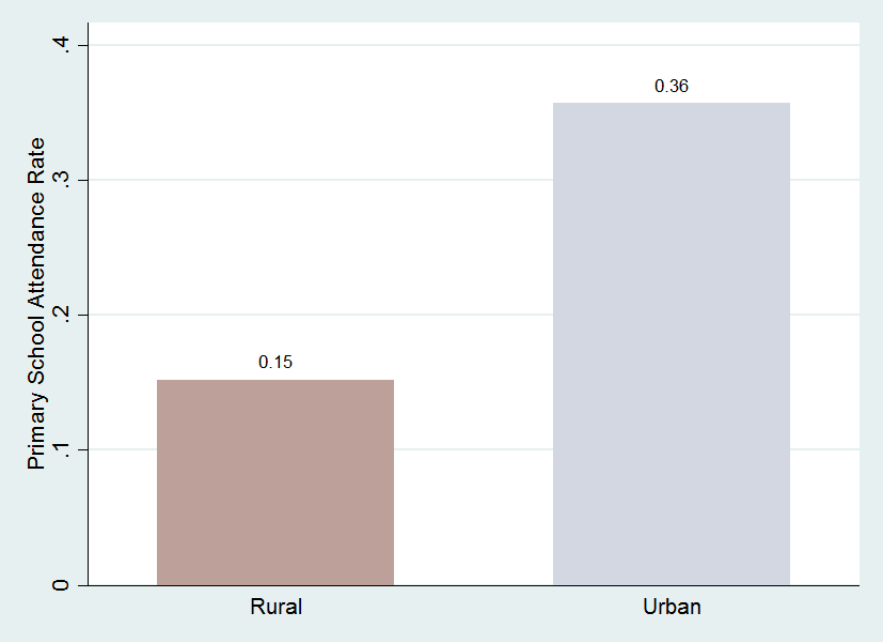
Note: In the first two columns, the dependent variable is the number of school built between 1997 and 2003 in the cluster. In the two last columns, we rescale this number to have the number of schools built on the same period, for 1000 children in the municipality. As explaining variables, we include the number of children in the municipality in 1993 and the share of women having been to primary school among the control group (women born between 1980 and 1985), by clusters. Sample: DHS Benin 2011 clusters. Cotonou is excluded.

Source: DHS Benin 2011.

It doesn't seem to be the case in rural areas.

This latter point brings us to the next, which is that the profile of women impacted by the policy differs in rural and urban areas. In urban areas, before the program started, the level of education was more than twice as high compared to rural areas, as shown in figure 2.4. In addition to this, table 2.3 showed that that more schools were built in urban clusters where women were more educated. As a result, in rural areas, we expect more women to go from no schooling to some primary schooling. In other words, the policy is more likely to go through an extensive margin effect. Women at the extensive margin in urban areas are probably more peculiar than women at the extensive margin in rural areas.

Figure 2.4: Primary School Attendance rate among women aged 12 and more in 1997



Source: DHS Benin 2011. Women born between 1980 and 1985. Cotonou is excluded.

2.3 Methodology

2.3.1 Difference in Difference

Following in the footsteps of Duflo (2001) seminal paper, we first use a difference-in-difference to identify the causal impact of the rise in schools constructions on our outcomes of interest. We exploit the fact that women's exposure to the policy varies according to their birth cohort and municipality of residence. Yet, we go a step further as we take advantage of the geolocalization of the DHS clusters in the 2011 DHS survey. We mapped the geocoded DHS clusters and build a 10km radius buffer around them[9]. Using the geocoded school constructions database we built, we count the number of schools that were built between 1997 and 2003, in a 10km radius around a woman's DHS cluster. As a result, exposure to the program varies according to women place of residence and age at the time the program was implemented[10]. Age at entry into primary school is set to 6 years old in Benin but it is not rare that children enter and/or stay in school beyond the official age. With that in mind, in our first specification, we define the exposed cohort as women aged 4 to 8 years old in 1997 and the untreated cohort as women aged 12 to 17 years old when the program began. This choice of cohort may lead to an attenuation bias as some women in the control cohort may be exposed to the education program because of late entry at school. We estimate the following model:

[9]The choice of the buffer's size is justified in Section 2.2

[10] We proxy the place of birth of women by their place of residence. We discuss the implications of this approximation in Section 3.6 .

$$y_{imc} = a_0 + \beta_c + \theta * N_g + \delta * N_g * TREAT_i + \alpha_m + \eta X_i + \gamma Z_{mc} + \varepsilon_{imc} \tag{2.1}$$

where y_{imc} is the outcome of interest for individual i, residing in municipality m and born in year c, a_0 is a constant and α_m is a municipality of residence fixed-effect[11]. β_c is a cohort of birth fixed-effect, N_g is the number of schools built between 1997 and 2003 in a 10km-radius around a woman's DHS cluster of residence. It can be read more broadly as the intensity of the program in cluster g. $TREAT_i$ is a dummy variable equal to 1 if the individual was born between 1989 and 1993, equal to 0 if she was born between 1980 and 1985. We also add a set of individual controls X_i including religion and ethnicity. Finally, Z_{mc} is a municipality-specific year effect of the density of children of schooling age before the program begun. This particuliar control is added because we believe that, should the density of children of schooling age play a role in the implementation of schools on the Beninese territory, the impact of the initial density overtime may vary according to the municipality. Since the intensity of the treatment is correlated to the initial attendance rate, we also control for a municipality-specific year effect of the intial attendance rate. As suggested by Duflo (2001), it allows us to make sure our estimates do not capture a simple reversal to the mean of the primary attendance rate.

When presenting our results, we also provide placebo tests using model 2.1. In those placebo tests, $TREAT_i$ is a dummy variable equal to 1 if the individual was born between 1980 and 1984, equal to 0 if she was born between 1974 and 1979. In other words, our placebo compares women aged 13 to 17 years old in 1997 to women aged 18 to 24 years old in 1997. Those women are not expected to have benefited from the education program. If the education has started to increase in treated regions before the surge in schools construction, the coefficient δ will be positive and significant.

In Section 2.4, we also present the effect of the policy on the outcomes of interest per age at the time the policy was implemented which is tantamount to studying the effect of the policy on a given cohort. The results shown are yielded by the following specification:

$$y_{imc} = +\beta_c + \theta * N_g + \sum_{a=2}^{21} \delta_a * (N_g * v_{ia}) + \ + \eta X_i + \gamma Z_{mc} + \varepsilon_{imc} \tag{2.2}$$

[11] We do not apply a DHS cluster fixed-effect because the number of observations in each cluster ranges from 7 to 42 with an average of 23, which we deem to be too few.

where y_{imc} is the outcome of interest for individual i, residing in muncipality m and born in year c, a_0 is a constant, α_m is a municipality of residence fixed-effect, β_c is a cohort of birth fixed-effect. N_g is the number of schools built between 1997 and 2003 in a 10km-radius around a woman DHS cluster of residence g, v_{ia} is a dummy indicating whether individual i was age a in 1997, X_i includes religion and ethnicity of the individual, and Z_{mc} is a municipality-specific year effect of the density of children of schooling age before the program begun. Standard errors are clustered at the DHS cluster level.

The literature on the impact of education on age at marriage has to tackle several sources of endogeneity. First, there could be an omitted variable bias: some unobservable characteristics, such as the socioeconomic characteristics of parents, can explain both education and child marriage. We are confident that the double difference takes care of this bias.

Second, there is a simultaneity bias. Indeed, parents decide who and when their daughter marry, especially at ages when girls attend primary school. The decision to have her marry or to keep her in school is made simultaneously, not sequentially. Rosenzweig and Wolpin (2000) have shown that even when using natural experiment, this simultaneity bias prevents researchers from pinning down causal estimates. Translated to our context, when studying the impact of the education policy on child marriage, instrumenting education with exposure to school constructions would violate the exclusion restriction. As a result, we believe it is illusory to try and instrument education with exposure to school constructions when education and marriage are decisions taken by the same person at the same moment. Finally, increase in school constructions can impact the probability to marry as a child, because the education policy also spurs changes in the norms of age at marriage or tolerance to domestic violence without going through a girl's own education. In this case also, the exclusion restriction is violated. In this paper, we suggest a way around these potential sources of bias. Instead of looking at the impact of education on women's welfare outcome, we choose to remain agnostic about the channels through which the education policy impacts these outcomes and we treat primary education as an outcome. Consequently, we look only at reduced forms. It is also more cautious in a context where the educational program could have had an impact on the quality of education at the same time[12]

[12]The negative impact of school expansion programs on the quality of education is well documented in many contexts (Duraisamy *et al.* (1998), Deininger (2003)).

2.3.2 Regression Kink Design

Emulating Duflo (2001) using a difference-in-difference has become a classical method used in the development literature to assess the impact of a shock whose effect varies with time and place. Yet, given that the increase in school constructions in Benin in the 1990's follows a linear trend and that our current specification absorbs a good share of this variation with the cohort of birth fixed effects, we choose to apply another strategy as well, inspired from the regression kink design (RKD). With this "kink-in-difference" design, we exploit the geographical variation and more of the time variation available in the data.

Originally, the RKD exploits a change in slope of the likelihood of being treated at a kink point. If the outcome also exhibits a kink at the same point, then the causal impact is found by dividing the change in slope for the outcome by the change in slope for the treatment. This method has often been used in public economics (Simonsen *et al.* (2010), Landais (2015), Card *et al.* (2012) and Card *et al.* (2015)). It allows us to use the information included in the slope of the treatment, continuously for every individuals born around the kink. Since the program triggered a change in trend in the number of schools built continuously over time, this approach seems also adapted to the setting.

Here, we draw inspiration from the RKD and we exploit the change in the trend in the exposure to schooling defined as the number of schools built between 1997 and 2003 in a 10 kilometers radius around a given cluster and according to the birth cohort.

Since we use both historical and the geographical variations, we will look at the following reduced form:

$$\begin{aligned} SchoolAttendance_i = a_0 + \alpha_m + \beta * (BirthCohort_i - 1984) + \gamma * (BirthCohort_i - 1984) * Post + \\ \lambda * (BirthCohort_i - 1984) * Post * N_g + \\ \mu * X_i + \varepsilon_i \end{aligned} \tag{2.3}$$

where N_g is the number of schools built between 1997 and 2003 in a 10km-radius buffer around individual i's DHS cluster of residence g. α_m is a municipality of residence fixed-effect. The coefficient of interest is λ, which measures the change in the slope of school attendance, by municipality, once the policy has been implemented. We also add municipality fixed effects

and individual controls (religion and ethnicity), as well as a differenciated trend according to the initial enrolment in the municipality and the initial number of children of schooling age. Instead of cohort of birth fixed-effect, we include a time-trend control. Since the increase in exposure to schooling is linear, this strategy is more flexible that difference-in-difference specification with birth cohort fixed-effects and provides more statistical power. Standard errors are clustered at the DHS cluster level. We show in Section 2.4 that the two strategies yield consistent estimates.

2.3.3 Duration Model of Entry into Marriage or Motherhood

We identify the effect of primary education on women's well-being on a sample of women aged 18 to 32 years old at the time of the survey. Yet the median age at marriage in Benin is nearly 18 years old. As a result, there is a non negligible share of right-censored observations when we study marital and motherhood outcomes (age at first marriage, age at first child, birth spacing between the first and second child). As a consequence, the difference-in-difference strategy or the RKD for these outcomes yield estimates that are biased by women who entered their marital or fertile life earlier than the average Beninese women. To circumvent this selection issue, we use a duration model of entry into marriage, into motherhood and a model of the interval between the first and second birth. The duration models are able to deal with right-censored observations in ways the usual regression models cannot. Such models have been used in the literature to pin down socio-economic correlated to birth spacing in sub-Saharan Africa (Ghilagaber and Elisa (2014)) or to study son preference through birth spacing (Lambert and Rossi (2016), Rossi and Rouanet (2015)).

We use a discrete time duration model to test whether being exposed to more primary schooling is related to a delay in marital and fertile life. Our variable of interest is t, the duration between birth of a respondent and the age at which she cohabited for the first time with a partner or the age at which she had her first child. Though it is rather common in the literature to use a proportional hazard (PH) model or Cox model, we choose the discrete time duration model for two main reasons. First, in models such as the Cox model, time is strictly continuous. There cannot be simultaneous events. A duration t_i that led to the studied event should be associated with one observation i if the clock used to measure the duration is precise enough. Yet in the DHS as in many other household surveys, data are collected with a discretized time. As a result there are many simultaneous events (woman born the same year entering their first

union at the same age for instance) which violates a necessary condition of the Cox model[13]. Second, the Cox model relies on the assumption of PH, which in our case translates into the ratio of the risk of experiencing the event is constant between treated and untreated women at every moment of the duration studied[14]. Yet, we could imagine that for women from older cohorts, the risk of experiencing the event of interest (getting married for the first time or having a child) intensifies at an earlier moment of the duration studied than for treated women[15]. The discrete time model allows us to circumvent this potential issue since time is introduced as a covariate. The risk is modeled as a conditional probability and the estimation relies on the maximization of a binomial-type likelihood. The most commonly used function is the logistic regression[16]:

$$log(\frac{p}{1-p}) = a_0 + \sum_p a_p * t + \sum_p a_p * t^2 + \sum_k a_k * X_k \tag{2.4}$$

In the double-difference approach, X_k includes N_g the number of schools built between 1997 and 2003 in a 10km-radius buffer around an individual DHS cluster, $TREAT$ the binary exposure to treatment according to the cohort of birth, $N_g * TREAT$, a municipality of residence fixed-effects, individual controls (religion and ethnicity) as well as cohort of birth fixed-effects and municipality specific time effect of the initial attendance and of density of children of schooling age.

For the RKD inspired specification, X_k includes N_g, the number of schools built between 1997 and 2003 in a 10km-radius buffer around an individual DHS cluster of residence, the cohort of birth centered at the kink $BirthCohort_i - 1984$, the latter interacted with $Post$, $(BirthCohort_i - 1984) * Post * N_g$. X_k also includes a municipality fixed effects and individual controls (religion and ethnicity).

[13]This constraint can be alleviated by correcting the partial likelihood function with simultaneity using the "Breslow" method, which is the method used by most statistical software or programming language like STATA or R respectively.

[14]It is important to remember that the duration studied corresponds to the years between the birth of the respondent and her first union/child.

[15]The log-log plot test seems to suggest otherwise though, which points to the respect of the PH assumption.

[16]The model is applied to a database reshaped according to the principle: one line is one observation-at time t. For instance, if a woman experiences the event at at time 2, she will appear as two lines in the reshaped database

2.4 Results

2.4.1 Double Difference

All the tables of this section are split between *Panel A* that shows the results of the regressions of interest, and *Panel B* that displays the results of placebo regressions. The placebo difference in difference regressions rely on the comparison of cohorts that are supposed to be unaffected by the policy intervention. In *Panel A* of table 2.4, we provide evidence that the education policy increased attendance of primary school among girls of schooling age in 1997. On average, one school built in a 10km radius around a cluster for 1000 children in a municipality, rises the probability to have enrolled to primary school by 3.2 percentage points in rural areas[17]. The effect is robust to controlling for enrollment and density of children of schooling age in the municipality before the program started. The placebo test in *Panel B* shows that earlier cohorts were, as expected, unaffected by the policy. The test also hints at the fact that there was no pre-existing change in trend in primary education that may be confounded with the effect of the schooling program. Figure 2.5 allows to single out the cohorts that were more affected by the program. It shows the coefficients identified by equation 2.2. The figure provides visual confirmation that women aged 4 to 11 in 1997 in rural areas benefited from the program and suggests that the younger in 1997, the more intense the effect of school constructions on primary school attendance. Because we are interested in improvements in women's well-being induced by education, from now on, our analysis will focus on women currently living in rural areas[18] [19].

Table A-2.5 in Appendix puts forward that the benefits of the intervention on primary school attendance do not seem to extend to secondary school attendance, as we find no significant effect of the program on such variable.

[17] For a child born in 1982, at ten years old, they were on average 1.2 schools per thousand children. For a child born in 1992, they were on average 1.9 schools per thousand children

[18] We show that our results on education are robust to the addition of younger cohorts in table A-2.4 in the Appendix. Results are not significant anymore when adding partially treated cohorts. This is not surprising since these older cohorts could have been treated partially.

[19] The fact that the effect is not significant and of negative sign in urban area could also be driven by the approximation that we do using the number of schools built in the current place of residence. There is much more migrant women in urban areas (among the treated women 30% versus 16% in rural areas), and this high level of migration could introduce a complex bias in the results. This is an additional reason why we are more confident about the causal impact of the treatment for rural women.

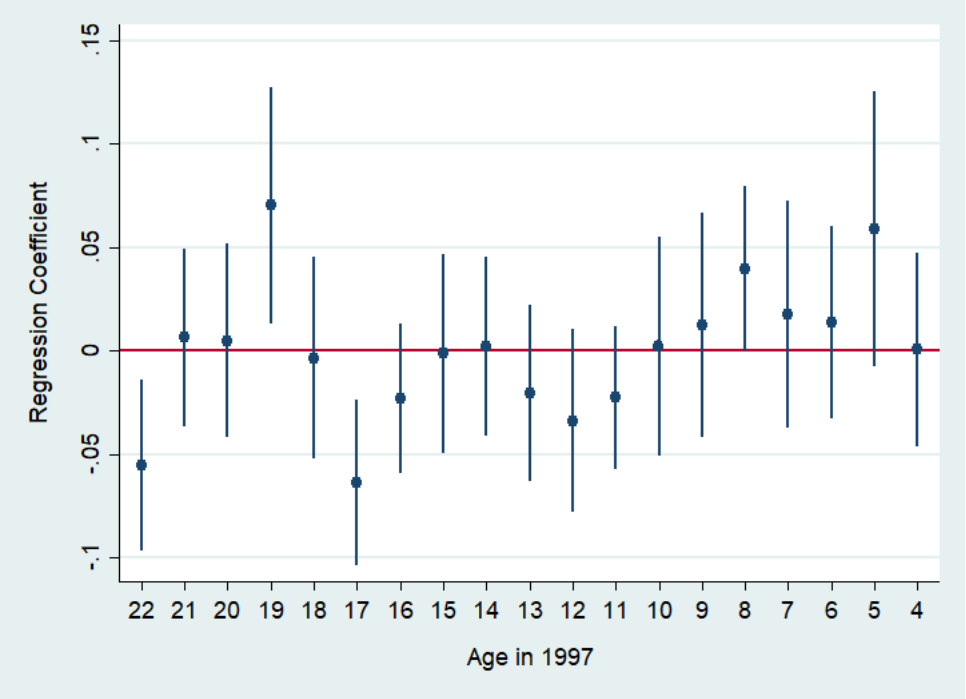
Table 2.4: Probability of primary school attendance

	All	Urban	Rural
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997			
Number of school built between 1997 and 2003 * Treat	0.005	-0.028	0.032**
	(0.02)	(0.02)	(0.02)
Controls Individual	Yes	Yes	Yes
Mean Dep. Var.	0.35	0.49	0.27
N	5424	1985	3439
r2	0.29	0.29	0.25
F	18.73	10.29	11.10
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997			
Number of school built between 1997 and 2003 * Placebo	-0.022**	-0.023	-0.019
	(0.01)	(0.02)	(0.01)
Controls Individual	Yes	Yes	Yes
Mean Dep. Var.	0.21	0.36	0.14
N	5661	1939	3722
r2	0.25	0.28	0.13
F	7.50	4.99	3.28

Note: The dependent variable is having attended primary school. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. In model (2), we control for urban or rural residence, ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Eligible women aged 15-49 years old.

Source: DHS Benin 2011.

Figure 2.5: Effect of the treatment on school attendance by birth cohort



Note: The figure presents the coefficients of the interaction of respondent's age in 1997 and the number of schools built between 1997 and 2003 in the region of residence in equation (2). The dependant variable is having attended primary school. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

We then investigate changes in the age at first marriage, in the probability to be married as a child, as well as changes in age at first birth or birth spacing between the first and second child[20].

Table A-2.6 in the Appendix shows that, with the difference-in-difference model estimated with OLS, we find no effect of the education policy on marital outcomes nor on entry into motherhood or birth spacing. Yet, as mentionned earlier, this model does not take into account the right-censored nature of the data, unlike duration models. Table 2.5 presents the results with the discrete time duration model. It provides evidence that the education program delayed entry into marital life and motherhood in rural area for the treated cohort. For instance, for age at marriage, building one school per 1000 children decreased the probability of experiencing the event by 10 percentage points relative to the older cohort. We find similar results using a Cox model (table A-2.7 in Appendix). However, it does not decrease the probability to be married as a child[21].

[20]The demographic literature has expressed concern about the measurement errors for the age at first marriage due to recall issues. The DHS's interviewer manual (ICF (2017)) states that age at first union is collected by asking women the month and year when they started cohabiting for the first time with a partner. If they do not know the year, the interviewer has to probe the year of first cohabitation. They are advised to do so based on the year of the first birth collected earlier in the survey and by asking how long after the beginning of the union the respondent gave birth to her first child. If the interviewer is unable to have an answer for the year of the first cohabitation, he asks women at which age she started cohabiting with a man for the first time. Like for the age at the time of the survey, if the interviewer does not get an answer, she probes the age following the procedure described earlier. It could explain why we do not find any results on age at marriage.

[21]Among women married as children (before 15 years old), we find a positive but not significant impact of the school constructions program on primary school attendance. Though it may be because of a lack of power, it could mean that those women are "non compliers" to this education policy. See table A-2.8 in Appendix.

Table 2.5: Marital Outcomes - Discrete Time Duration Model

	First union	First child	First child Married women	Second child Married with a child
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997				
Number of school built between 1997 and 2003 * Treat	-0.105**	-0.111**	-0.029	0.072
	(0.05)	(0.05)	(0.05)	(0.06)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.05	0.04	0.05	0.02
N	61924	64913	53747	90067
r2_p	0.28	0.30	0.31	0.09
chi2	3391.25	3154.59	2831.89	1967.58
Panel B: Placebo Experiment: Individuals aged 13 to 17 18 to 24 in 1997				
Number of school built between 1997 and 2003 * Placebo	-0.019	-0.011	-0.011	0.014
	(0.04)	(0.04)	(0.04)	(0.04)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.05	0.05	0.05	0.02
N	69608	73660	72467	136111
r2_p	0.26	0.28	0.28	0.07
chi2	4286.52	4017.91	4019.06	2215.22

Note: The dependent variable is in the following order: time before marriage, time before first child and time between first and second child. The table presents the coefficient beta, and not the log odd-ratio. The number of observations changes between the different outcomes, since not all women have faced such events at the time of survey. The number of observations is also higher than in the OLS estimates, because data are reshaped: one observation corresponds to one year for woman. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49. In the third column, the sample corresponds to women already married at the time of the survey. In the fourth column, the sample is all women who have already given birth.

Source: DHS Benin 2011.

Table 2.6: Tolerance to IPV

	Goes out without telling husband	Neglects the children	Argues with husband	Refuses sex	Burns the food
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997					
Number of school built between 1997 and 2003 * Treat	-0.012	-0.019*	-0.010	-0.020**	-0.017**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.08
N	3439	3439	3439	3439	3439
r2	0.16	0.13	0.13	0.11	0.12
F	1.48	1.61	1.42	1.61	1.38
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997					
Number of school built between 1997 and 2003 * Placebo	0.013	0.023**	0.015*	0.009	0.007
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.08
N	3722	3722	3722	3722	3722
r2	0.15	0.12	0.12	0.09	0.11
F	1.50	1.36	1.32	1.36	1.29

Note: The dependent variable is in the following order a dummy taking the value 1 if the woman finds wife beating acceptable if a woman goes out without telling her partner, argues with him, neglects the children, refuses sex and burns the food. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, the religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Eventually, we shed light on changes in women's mindset regarding tolerance of IPV. Table 2.6 Panel A provides evidence that, on average, one school built for 1000 children significantly decreases the probability to condone wife beating for neglecting the children, refusing sex and burning the food by roughly 2 percentage points. The effects are significant at the 10% level for neglecting the children and 5% for the other two motives mentioned. For the last two items, it represents nearly one third of the baseline level of tolerance of IPV for those motives. We suggest an alternative measure of IPV using indexes built with a PCA as outcome variables. It allows us to aggregate information according to the type of violence (commonly accepted and less commonly accepted). Using theses indexes as outcomes variables, the difference-in-difference trategy yields that the decrease in tolerance of IPV caused by the school construction policy was particularly acute for severe offense or the less commonly accepted motives for violence (table 2.7) .

The effect of the treatment on each cohort displayed in Figure 2.6 illustrates that there is a change in trend occurring for the younger cohorts.

Table 2.7: Tolerance to IPV - Indexes

	Index tolerance to all violence	Index tolerance to commonly accepted violence	Index tolerance to less commonly accepted violence
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997			
Number of school built between 1997 and 2003 * Treat	-0.121**	-0.078	-0.098**
	(0.06)	(0.05)	(0.04)
Controls Individual	Yes	Yes	Yes
Mean Dep. Var.	0.05	0.04	0.04
N	3439	3439	3439
r2	0.16	0.16	0.12
F	1.75	1.59	1.76
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997			
Number of school built between 1997 and 2003 * Placebo	0.105**	0.097**	0.045
	(0.05)	(0.05)	(0.03)
Controls Individual	Yes	Yes	Yes
Mean Dep. Var.	0.06	0.05	0.02
N	3722	3722	3722
r2	0.14	0.15	0.11
F	1.61	1.51	1.44

Note: In the first column, the dependent variable is an index for every items of tolerance to domestic violence, built through a PCA. In the second column, the index only covers the first three items: the woman finds violence justified if she goes out without telling the husband, if she argues with him or neglects the children. In the last column, the index covers the two last items: if she refuses sex or burns the food. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, the religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Figure 2.6: Effect of the treatment on the index for tolerance of severe violence

Note: The figure presents the coefficients of the interaction of respondent's age in 1997 and the number of schools built between 1997 and 2003 in the region of residence in equation (2). The dependent variable is an index built through a PCA on the two last items of tolerance to violence: in case of sex refusal, or burning the food.Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table 2.8: Probability of primary school attendance - Regression Kink Design

	(1)
Normalized birth year* post kink* Number of schools built	0.003*
	(0.00)
Controls Individual	Yes
Mean Dep. Var.	0.25
N	6497
r2	0.23
F	37.47

Note: The dependent variable is having attended primary school. We control by the ethnicity and the religion of the woman. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

2.4.2 Regression Kink Design

The RKD strategy yields results that are in line with the one found with the double difference strategy, as shown in table 2.8. A back of the enveloppe calculation based on the 10 years gap between the control and treatment group shows that the RKD strategy yields similar estimates than the one of the double difference for attending primary school ($10 * 0.003 = 0.03$, comparatively to the 0.032, found with the double difference).

As with the double difference, we find significant results on marital outcomes with the RKD as shown in table 2.9. This is also true when we compare the magnitude of the results ($10 * 0.015 = 0.15$, comparatively to the 0.10, found with the double difference). Using a Cox model, results are similar (table A-2.9 in the appendix). We present the results from the OLS estimation in table A-2.10 in the Appendix. We do not find any significant impact like with the double-difference. As for tolerance of domestic violence, we find that the estimates, displayed in table 2.10, are slighlty lower than those found with the double-difference strategy ($10 * (-0.001) = -0.01$). Yet, the direction and its significance remain consistent with the double difference estimates. As developed in Section 2.3, part of the minor differences between the estimates yielded by the two strategies are likely to be driven by a more flexible control for time effects in the RKD. In addition the RKD exploits more of the variation coming from the linearity of the treatment than the difference-in-difference.

Table 2.9: Marital Outcomes - Discrete Time Duration Model - Regression Kink Design

	First union	First child	First child Married women	Second child Married with a child
Normalized birth year* post kink* Number of schools built	-0.015***	-0.016***	-0.005	0.019**
	(0.01)	(0.01)	(0.01)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.05	0.04	0.05	0.02
N	118242	124232	105860	185348
r2_p	0.27	0.29	0.30	0.08
chi2	6620.19	6130.43	5585.23	3512.87

Note: The dependent variable is in the following order: time before marriage, time before first child and time between first and second child. The table presents the coefficient beta, and not the log odd-ratio. The number of observations changes between the different outcomes, since not all women have faced such events at the time of survey. The number of observations is also higher than in the OLS estimates, because data are reshaped: one observation corresponds to one year for woman. We control also by the ethnicity and the religion. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table 2.10: Tolerance to intimate Partner Violence - Regression Kink Design

	Goes out without telling husband	Neglects the children	Argues with husband	Refuses sex	Burns the food
Normalized birth year* post kink* Number of schools built	-0.002**	-0.001	-0.000	-0.001**	-0.001*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.07
N	6497	6497	6497	6497	6497
r2	0.12	0.10	0.10	0.08	0.08
F	1.71	2.60	2.10	2.21	1.51

Note: The dependent variable is in the following order a dummy taking the value 1 if the woman finds wife beating acceptable if a woman goes out without telling her partner, argues with him, neglects the children, refuses sex and burns the food. We control also by the ethnicity and the religion. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

2.5 Robustness Checks

2.5.1 Are the results driven by the increase in men's education?

The results presented in Section 2.4 make the case for an increase in women's outcomes driven by their increased access to education. Yet, our results would also be consistent with alternative scenarii. It may be that what matters for age at marriage or IPV is not (only) a woman's own education but the education of her partner. So if the husbands of the women in our sample are also impacted by the reform, the effect captured with the double difference may overestimate the effect of the reform going through women's own outcomes.

Elements specific to the context studied tend to go against the assumption that our effect is solely driven by husbands. First, in Benin, the mean difference in age between partners is 8 years. It means that the average husband was not impacted by the reform because he was too old to have benefited from it, except, perhaps, for the youngest women in our sample. Only 11% of husbands of treated women are born in 1989 or after. We still perform a test to show that the reform did not have an impact for men. We use the same double difference strategy than for women, explaining primary school attendance. Table 2.11 displays the results: boys are not significantly impacted by the reform. Table 2.12 presents the results for the husbands: there is no significant effect of the reform as well. The absence of change in the trend of boys' education can be explained by their already greater access to schooling before (and even after) the reform. A 2002 World Bank report[22] estimated the difference in access to primary school between boys and girls to 22 percentage points in rural areas (86% for boys versus 64% for girls).

The policy studied does not seem to have a significant impact on men's education. Still, we also show in table A-2.11 in the appendix that results on tolerance to domestic violence remain unchanged when we remove women married with husbands potentially affected by the reform. Let it be clear that we are not claiming that matching has no part at all in the effect identified. It is plausible that women who are more educated thanks to the policy tend to wed more educated husbands. In this case, the education of the husband is a channel especially when it comes to domestic violence, but a channel activated by the increased education of women.

2.5.2 Migration

One caveat of our work is that we use the number of schools built in the current residence of the respondent, and not in the residence of birth. Unfortunately, DHS data does not include

[22] World Bank Country Status Report: "'The Beninese education system, performance and room for improvement for the education policy"', 2002.

Table 2.11: Probability of primary school attendance for men

	Primary school attendance
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997	
Number of school built between 1997 and 2003 * Treat	0.025
	(0.04)
Controls Individual	Yes
Mean Dep. Var.	0.64
N	1028.00
r2	0.39
F	5.12
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997	
Number of school built between 1997 and 2003 * Placebo	-0.019
	(0.04)
Controls Individual	Yes
Mean Dep. Var.	0.43
N	864.00
r2	0.29
F	3.07

Note: The dependent variable is having attended primary school. All specifications include district dummies, year of birth dummies and interactions between the year of birth dummy and the number of children in the district of birth in 1993. We control also for the ethnicity and the religion. Sample: Rural men aged 15-49 years old.

Source: DHS Benin 2011.

information on the respondent's municipality of birth. To measure the extent of the approximation we make using the place of residence, we use the Beninese census and compute statistics on migration. We find that 18% of women born between 1989 and 1993 have migrated between municipalities. Ideally, we would have liked to match the location of the schools with the place of birth of womens and check whether we find consistent results on primary school attendance with the census data. But the data on the Beninese census are unfortunately not precisely geolocalised[23]. However, since our main analysis is conducted on women living in rural area, we do not think that this approximation is a major threat to our identification strategy. First, there are far more migrant among women currently living in urban areas than in rural area. According to the census, only 16.8% of women who actually reside in rural areas are migrant while this rate is as high as 30.9% in urban areas. Furthermore, migrant women currently living in urban areas are much more educated than non-migrant women who are currently living in rural areas (71.9% vs 32.7%). It hints at the fact that rural-born women who migrate to urban areas are on average more educated than the ones who stay in rural areas. As a result, if anything, it would bias our estimates downward.

[23]We are nevertheless aware that by doing so, we would have introduced another measurement error as women did not necessarily attend primary school in the municipality where they were born. Furthermore, both data are not comparable. For instance, the share of women attending primary school is 10 percentage points lower in the census compared to DHS.

Table 2.12: Probability of primary school attendance for husbands

	School attendance of the husband
Panel A: Interest Experiment: Individuals aged 2 to 6 or 12 to 17 in 1997	
Number of school built between 1997 and 2003 * Treat	-0.134
	(0.08)
Controls Individual	Yes
Mean Dep. Var.	0.79
N	2872
r2	0.11
F	1.67
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997	
Number of school built between 1997 and 2003 * Placebo	0.089
	(0.08)
Controls Individual	Yes
Mean Dep. Var.	0.76
N	3672
r2	0.10
F	2.12

Note: The dependent variable is having a husband who has attended primary school. All specifications include district dummies, year of birth dummies and interactions between the year of birth dummy and the number of children in the district of birth in 1993. We control also for the ethnicity and the religion. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table 2.13: P-values of IPV estimates adjusted for Multiple Hypothesis Testing

Condoning IPV for	p-value	Adjusted p-value	Rejection of the null
refusing sex	0.0148	0.0739	1
burning the food	0.0316	0.0791	1
neglecting the children	0.0738	0.1229	0
going out w/o telling partner	0.2202	0.2752	0
arguing with partner	0.3382	0.3382	0

Note: P-values adjusted following Simes (1986) using the STATA package *qqvalue* with the option *method(simes)*.

Source: DHS Benin 2011.

2.5.3 Correcting for multiple hypothesis testing

Because we are investigating the effect of school constructions on several outcomes, we test whether our results are robust to correcting for multiple hypothesis testing following Simes (1986). Table 2.13 provides evidence that they remain statistically significant at the 10% level except for tolerating IPV for neglecting the children, whose adjusted p-value suggests the estimates is significant at the 13% level.

2.6 Channels

We can expect that the key pathway explaining the results in terms of acceptance of intimate partner violence in case of sex refusal is going through the relationship between husband and wife, rather than through parental choice. In the robustness section of the paper, we checked that husbands or potential husbands had not been affected by the reform. Therefore, we can interpret our results as the consequence of an increase in women's education instead of a consequence of improved men's education. Men's education is here a pure channel, and not a confounding effect. Yet, it is not enough to conclude that they do not play a part in the chain of mechanism leading to our results on women's well-being. Indeed, even though men are not affected on average, more educated women potentially have access to more educated men on the marriage market, making a better match. This could explain what we see in terms of domestic violence. Ideally, we would have liked to have data on all potential (unrealized) matches. Nevertheless, our data allows us to look at some characteristics of the realized matches for married women at the time of the survey. However, it is worth noting that the reform being relatively recent, treated women are not all married at the time of the survey. $43,6\%$ of the treated women have never been in union at the time of the survey, when it is the case for only $2,9\%$ of the women in the control group. As mentioned earlier, already married women are likely to be selected in a particular way and so are their husbands. Our analysis on the characteristics of the husbands is therefore likely to be biased.

Table 2.14: Interaction with marital status

	Goes out without telling husband	Neglects the children	Argues with husband	Refuses sex	Burns the food
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997					
Number of school built between 1997 and 2003 * Treat	0.029	0.019	0.046**	-0.006	-0.007
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Number of school built between 1997 and 2003* Ever married*Treat	-0.036*	-0.033*	-0.053**	-0.013	-0.007
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.08
N	3439	3439	3439	3439	3439
r2	0.16	0.14	0.14	0.11	0.12
F	1.59	1.81	1.91	1.82	1.51

Note: The dependent variable is in the following order a dummy taking the value 1 if the woman finds wife beating acceptable if a woman goes out without telling her partner, argues with him, neglects the children, refuses sex and burns the food. All specifications include district dummies, year of birth dummies and interactions between the year of birth dummy and the number of children in the district of birth in 1993. We control also for the ethnicity and the religion. Sample: Married rural women aged between 15 and 49.

Source: DHS Benin 2011.

Another point to keep in mind is that we conduct our main analysis on both married women and unmarried women. However, the tolerance of IPV is unlikely to have the same meaning for women who never lived with a partner and for those who have an experience of marital life. With that in mind, we first check whether the results on IPV are driven by married or unmarried women, before looking at the characteristics of the husbands. We investigate the results according to the marital status in the table 2.14. Results on tolerance to domestic violence are driven by married women. It is important to keep in mind that, among the treated, married women are likely to exhibit some vulnerability compared to their unmarried counterparts. It could mean our results are biased downwards. Alternatively, we may believe that there is more room for improvement among those more vulnerable women: in this case, the direction of the bias is unclear. This feature urges us to be modest on the interpretation of the impact of the education policy on tolerance of IPV[24].

We first look at the age gap with the partner. The sign of the coefficient of interest is negative but not significant for all married women (table 2.15). It hints at the fact that, in our specific case, improvements in women's mindset regarding tolerance of physical abuse is not driven by a change in their partner's age profile. Second, we look at the difference in education with the husband (table 2.15). We find that the education policy did not decrease the education gap with the partner. This result comes from the fact that not every women of the treatment group are married at the time of the survey, which entails, as underlined earlier, issues related to selecting peculiar women among the married.

It stems from this analysis that the impact of the program on the tolerance of IPV seems neither

[24]It would be useful to look at the same impact with posterior data, in order to see whether the effect holds when every women get married, and in the long term

Table 2.15: Age and education gap with the husband

	Age difference with husband	Education difference with husband
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997		
Number of school built between 1997 and 2003 * Treat	-0.214	0.005
	(0.31)	(0.02)
Controls Individual	Yes	Yes
Mean Dep. Var.	8.43	0.29
N	2765	2765
r2	0.09	0.13
F	1.93	2.04
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997		
Number of school built between 1997 and 2003 * Placebo	0.410	0.031
	(0.29)	(0.02)
Controls Individual	Yes	Yes
Mean Dep. Var.	8.51	0.29
N	3504	3504
r2	0.10	0.12
F	2.16	2.69

Note: The dependent variable is the the difference between the age of the husband and the age of the bride, for the first column, and the difference in attendance to primary school for the second column. All specifications include district dummies, year of birth dummies and interactions between the year of birth dummy and the number of children in the district of birth in 1993. We control also for the ethnicity and the religion. Sample: Married rural women aged between 15 and 49.

Source: DHS Benin 2011.

driven by a change in the characteristics of the partner nor in the relative characteristics of women comparatively to their partner. An improvement in women's own opinion of the way they should be treated and increased bargaining power due to schooling are likely to be the main driver of our results.

2.6.1 Discussing tolerance of IPV as a proxy for women's empowerment and well-being

We argue, with Hanmer and Klugman (2016), that using the tolerance of IPV is a meaningful proxy to capture women's own sense of empowerment and well-being. Despite the success of the notion of women's empowerment, there are no clear and consensual definition of the concept. This is why, finding inspiration in the literature reflecting on the concept of women's empowerment in development studies (Kabeer (2005), see Mosedale (2005) for a review of it) we combined several approaches to propose our own definition of it. We define empowerment as the process by which women become aware of and challenge the gender norms that curtail the realm of possibilities available to them, compared to men, as well as their ability to choose and act, individually and collectively, to pursue their own strategic interests. This definition, though close to the one of Kabeer (2005) reintroduces an explicit mention to the psychological process of awareness necessary to challenge power relations betweens sexes and in that is closer to Stromquist (1999).

Starting from this definition, studying tolerance of IPV is a matter of studying women's individual support to a norm that allows a man, here the partner or husband, to exercise his physical power (physical violence) to police a woman's behavior. The DHS questions actually relate to two things: first, it supposes that the behavior described in the scenario to justify wife beating transgresses gender norms. In the present case, the literature on Western African societies has largely documented that the behaviors mentioned refer to what is indeed expected from women (though it is less clear for the "burning the food" item). Second, if the behavior mentioned is considered transgressive, finding acceptable for a husband to beat his wife in those circumstances actually means that a woman recognizes that it falls to husbands to police women's behavior, which suggests that she acknowledges that partners have an authority to sanction wives' behavior, that they have power over them and that this power legitimately impedes their right to physical integrity. It could be argued that some women may answer "yes" to this question because they know that should violence in the household happen, they wouldn't be the one experiencing it because they are the oldest wive for instance or because they live

with their son and his wife and answers the question with the situation of her daughter-in-law in mind. In both these examples, the respondents would derive their protection from their seniority, not from being a woman. The definition of empowerment we use, as the one mentioned in Mosedale (2005), is not incompatible with women deriving power from their age, ethnicity, wealth or position in the family. But this power would not be derived from being a woman, which still says something about their own sense of women's empowerment.

Additionally, the literature has shown that, in some context, women's individual and collective tolerance of IPV was positively associated with the risk of experiencing IPV (Boyle *et al.* (2009) in India). In Jewkes (2002), the author relies on a cross-cultural analysis to demonstrate that the occurence of IPV is stronger in contexts where physical violence against women is condoned for certain motives.

Eventually, we may wonder what a change in tolerance of IPV over time means. As mentioned before, the DHS questions to assess tolerance of IPV rely on the fact that (i) the behavior in the scenario transgresses gender norms, (ii) that a woman believes it falls on the husband to chastise her using violence. So the effect of primary school we capture may mean that (1) either education modified gender norms and relaxed the expectation around women's behavior in the household; or (2) that increased education changed women's perception of husbands' alleged right to use physical violence to police their behavior or that both phenomena happened simultaneously. Either way, both these scenarii are testimony of improvement of different dimensions of women's empowerment. The former would mean that the education policy relaxed the constraint on women's expected behavior in their household. As a result, it would mean that education can foster a process of awareness of a gender norm that curtails women's ability to choose, for instance, when to have intercourse with their partner. If access to primary school only impacted women's opinion of the use of violence to police wives' behavior, it would also be a matter of improving women's empowerment through challenging another norm ie husbands' right to use violence to chastise wives. Either way, both channels are synonymous of improving women's empowerment and well-being and are likely to be at play.

2.7 Conclusion

Using a double difference strategy along a method inspired by a regression kink design (RKD), we show that a rise in school constructions in the nineties in Benin, designed to reach the MDG's, increases primary school attendance of women living in rural areas. We find evidence that the policy intervention decreased the justification of wife-beating for diverse scenarii: when a wife refuses sex to her partner or burns the food. We also find that the education program delays entry into marital life and motherhood. Investigating the pathways of our effect, we tried to identify channels through which the policy impacts women's wellbeing. As for condoning physical abuse in case of sex refusal, our results hint at the fact that the effect is not driven by an evolving profile of women's partner in terms of age difference or education, but rather by a change in women's own outcomes. This education policy, which targets essentially the supply side of education, appears to have been successful beyond its initial agenda. This work provides evidence that the benefits of girls' education percolate down to women's well-being. It would be fruitful to expand the analysis with more recent data, such as the 2017 DHS data of Benin, which are yet to be released, in order to look at the long term impact of the policy. It would allow us to deepen our analysis with more contemporaneous data.

Acknowledgments

We are grateful to Richard Akresh, Pierre André, Luc Behaghel, Andrew Clark, Denis Cogneau, Catherine Guirkinger, Sylvie Lambert and Alessandro Tondini for their precious advice and insightful discussions on previous versions of this work. We also thank participants of the Casual Friday Development Seminar and of the WIP seminar at the Paris School of Economics (PSE), of the Journées de Microéconomie Appliquées in 2018 in Bordeaux, of the UNU-Wider Nordic Conference on Development Economics in Helsinki, of the Journées Louis André Gérard Varet in Aix-en-Provence, of the CSAE (Oxford), the SMYE (Bruxelles) and the RES (Warwick) in 2019 for their helpful comments.

Appendix

Table A-2.1: School Construction by District since the 1980's

	Region level				
	Stock 1979	*1980-1989*	*1990-1999*	*2000-2005*	*Stock 2005*
Mean	175.17	53.42	89.42	113.25	431.17
min	99	23	56	27	299
max	284	84	180	170	562
median	162	54	84.5	125	454.5
N	12	12	12	12	12

Source: PASEC data on school constructions in Benin.

Table A-2.2: Descriptive Statistics for Benin, Senegal, Guinea and Sierra Leone

	Benin			Senegal		
	Mean	SD	N	Mean	SD	N
	Marital and domestic violence outcomes					
age at first cohabitation	18.88	4.77	12768	18.08	4.36	30306
Married before 15 years old	0.13	0.33	16599	0.13	0.33	41663
age of respondent at 1st birth	19.81	4.47	12522	19.48	4.05	27941
beating justified if wife goes out without telling husband	0.08	0.27	16094	0.49	0.50	41488
beating justified if wife neglects the children	0.09	0.29	16315	0.49	0.50	41500
beating justified if wife argues with husband	0.11	0.31	16346	0.52	0.50	41482
beating justified if wife refuses to have sex with husband	0.07	0.25	16286	0.51	0.50	41142
beating justified if wife burns the food	0.06	0.24	16360	0.26	0.44	41519
	Education and birth cohort					
Enrolled to Primary School	0.37	0.48	16599	0.41	0.49	41663
respondent's year of birth	1982.20	9.01	16599	1984.37	9.40	41663
	Covariates					
urban	0.43	0.49	16599	0.39	0.49	41663
Main Ethnic Group	0.44	0.50	16599	0.34	0.47	41663
	Guinee			Sierra Leone		
	Mean	SD	N	Mean	SD	N
	Marital and domestic violence outcomes					
age at first cohabitation	16.66	3.62	7144	17.80	4.28	11747
Married before 15 years old	0.23	0.42	9142	0.13	0.33	16658
age of respondent at 1st birth	18.20	3.73	6950	18.72	3.95	12352
beating justified if wife goes out without telling husband	0.83	0.38	9101	0.54	0.50	16002
beating justified if wife neglects the children	0.82	0.39	9119	0.54	0.50	16017
beating justified if wife argues with husband	0.78	0.41	9105	0.49	0.50	16009
beating justified if wife refuses to have sex with husband	0.71	0.45	9058	0.27	0.44	15708
beating justified if wife burns the food	0.47	0.50	9097	0.19	0.39	15894
	Education and birth cohort					
Enrolled to Primary School	0.33	0.47	9141	0.45	0.50	16658
respondent's year of birth	1983.28	9.59	9142	1984.55	9.65	16658
	Covariates					
urban	0.39	0.49	9142	0.41	0.49	16658
Main Ethnic Group	0.39	0.49	9142	0.34	0.47	16658

Note: The table reports mean, standard deviation and number of observations for a certain number of characteristics. "Urban" means living in an urban milieu at the time of the study. Sample: Women aged 15-49 years old.

Table A-2.3: Correlation matrix of tolerance of IPV items

	Goes out w/o telling	Neglects the children	Argues	Refuses sex	Burns the food
Goes out w/o telling	1				
Neglects the children	0.7031*	1			
Argues	0.6561*	0.6568*	1		
Refuses sex	0.4966*	0.4890*	0.5348*	1	
Burns the food	0.5250*	0.5555*	0.5447*	0.4913*	1
N	15906	15906	15906	15906	15906

Source: DHS 2011 Benin.

Table A-2.4: Probability of primary school attendance : variation of the treated cohorts

	1980-1985 and 1989-1993	1975-1985 and 1989-1993	1980-1988 and 1989-1993	1980-1985 and 1989-1996	1975-1988 and 1989-1996
Number of school built between 1997 and 2003 * Treat	0.032**	0.023	0.022	0.033**	0.029**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.27	0.23	0.27	0.37	0.29
N	3439	4851	4327	4176	6960
r2	0.25	0.23	0.21	0.32	0.28
F	11.10	10.88	9.75	21.66	20.81

Note: The dependent variable is having attended primary school. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. They include also controls for ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table A-2.5: Probability of secondary school attendance

	Secondary school attendance
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997	
Number of school built between 1997 and 2003 * Treat	0.013
	(0.02)
Controls Individual	Yes
Mean Dep. Var.	0.12
N	3439
r2	0.21
F	6.88
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997	
Number of school built between 1997 and 2003 * Placebo	-0.002
	(0.01)
Controls Individual	Yes
Mean Dep. Var.	0.04
N	3722
r2	0.10
F	1.64

Note: The dependent variable is having attended secondary school. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. They include also controls for ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table A-2.6: Marital Outcomes - OLS

	Age at marriage	Marriage before 15	Age at first child	Time between marriage and first birth	Time between first and second child
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997					
Number of school built between 1997 and 2003 * Treat	-0.085	0.008	-0.075	0.199	0.050
	(0.15)	(0.01)	(0.13)	(0.81)	(0.93)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	17.60	0.15	18.50	19.40	34.01
N	2872	3439	2766	2355	2128
r2	0.11	0.06	0.13	0.08	0.06
F	5.78	3.02	7.04	2.90	1.09
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997					
Number of school built between 1997 and 2003 * Placebo	0.132	-0.005	0.121	0.535	-0.463
	(0.16)	(0.01)	(0.13)	(0.86)	(0.69)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	18.54	0.17	19.48	22.93	36.07
N	3672	3722	3620	3047	3389
r2	0.08	0.05	0.09	0.07	0.06
F	2.06	1.38	2.64	3.22	1.49

Note: The dependent variable is in the following order: age at marriage, marriage before 15 years old, age at first child, time between the marriage and the first birth, and lastly, time between the first and second birth. The number of observations changes slightly between the different outcomes, since not all women have faced such events at the time of survey. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49.

Source: DHS Benin 2011.

Table A-2.7: Marital Outcomes - Cox Duration Model

	First union	First child	First child Married women	Second child Married with a child
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997				
Number of school built between 1997 and 2003 * Treat	-0.069*	-0.078*	-0.008	0.097*
	(0.04)	(0.04)	(0.04)	(0.06)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	18.01	18.88	18.71	33.43
N	3439	3439	2872	2671
r2_p	0.01	0.01	0.01	0.01
chi2	402.31	311.47	339.99	222.09
Panel B: Placebo Experiment: Individuals aged 13 to 17 18 to 24 in 1997				
Number of school built between 1997 and 2003 * Placebo	-0.023	-0.005	-0.004	0.008
	(0.03)	(0.03)	(0.03)	(0.04)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	18.70	19.79	19.74	37.76
N	3722	3722	3672	3601
r2_p	0.00	0.01	0.01	0.00
chi2	322.61	358.65	364.46	276.97

Note: The dependent variable is in the following order: time before marriage, time before first child and time between first and second child. The table presents the coefficient beta, and not the odd-ratio. The number of observations changes between the different outcomes, since not all women have faced such events at the time of survey. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49. In the third column, the sample corresponds to women already married at the time of the survey. In the fourth column, the sample is all women who have already given birth.

Source: DHS Benin 2011.

Table A-2.8: Probability of primary school attendance - Girls married before 15 years old

	Primary school attendance
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997	
Number of school built between 1997 and 2003 * Treat	0.018
	(0.04)
Controls Individual	Yes
Mean Dep. Var.	0.11
N	525
r2	0.25
F	1.21
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997	
Number of school built between 1997 and 2003 * Placebo	0.004
	(0.02)
Controls Individual	Yes
Mean Dep. Var.	0.09
N	629
r2	0.24
F	1.53

Note: The dependent variable is having attended primary school. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. In model (2), we control for urban or rural residence, ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Eligible women aged 15-49 years old, who have been married before 15 years old.

Source: DHS Benin 2011.

Table A-2.9: Outcome Mariage - OLS - Regression Kink Design

	Age at marriage	Marriage before 15	Age at first child	Time between marriage and first birth	Time between first and second child
Normalized birth year* post kink* Number of schools built	-0.003	0.001	-0.004	0.127	-0.131
	(0.02)	(0.00)	(0.01)	(0.09)	(0.13)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	17.93	0.16	18.85	20.88	35.19
N	5542	6497	5378	4547	4412
r2	0.10	0.05	0.12	0.07	0.05
F	16.30	6.67	21.92	6.15	2.68

Note: The dependent variable is in the following order: age at marriage, marriage before 15 years old, age at first child, time between the marriage and the first birth, and lastly, time between the first and second birth. We control also by the ethnicity and the religion. Sample: Rural women aged 15-49 years old.

Source: DHS Benin 2011.

Table A-2.10: Marital Outcomes - Duration Cox Model - Regression Kink Design

	First union	First child	First child Married women	Second child Married with a child
Normalized birth year* post kink* Number of schools built	-0.012**	-0.012**	-0.002	0.021***
	(0.00)	(0.00)	(0.00)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	18.20	19.12	19.10	35.35
N	6497	6497	5542	5240
r2_p	0.01	0.00	0.00	0.00
chi2	565.16	419.48	459.11	277.82

Note: The dependent variable is in the following order: the time before marriage, the time before first birth and the time between first and second child. The table presents the coefficient beta, and not the odd-ratio. The number of observations changes between the different outcomes, since not all women have faced such events at the time of survey. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49. In the third column, the sample corresponds to women already married at the time of the survey. In the fourth column, the sample is all women who have already given birth.

Source: DHS Benin 2011.

Table A-2.11: Tolerance to IPV - Women whose husband is not affected by the policy

	Goes out without telling husband	Neglects the children	Argues with husband	Refuses sex	Burns the food
Panel A: Interest Experiment: Individuals aged 4 to 8 or 12 to 17 in 1997					
Number of school built between 1997 and 2003 * Treat	-0.013	-0.019*	-0.012	-0.021**	-0.018**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.08
N	3309	3309	3309	3309	3309
r2	0.16	0.14	0.14	0.11	0.12
F	1.44	1.66	1.69	1.62	1.52
Panel B: Placebo Experiment: Individuals aged 13 to 17 or 18 to 24 in 1997					
Number of school built between 1997 and 2003 * Placebo	0.012	0.022**	0.014	0.009	0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Controls Individual	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.10	0.11	0.13	0.08	0.08
N	3667	3667	3667	3667	3667
r2	0.15	0.12	0.12	0.09	0.11
F	1.55	1.40	1.42	1.35	1.43

Note: The dependent variable is in the following order a dummy taking the value 1 if the woman finds wife beating acceptable if a woman goes out without telling her partner, argues with him, neglects the children, refuses sex and burns the food. All specifications include municipality dummies, year of birth dummies and interactions between the year of birth dummies and the number of children in the municipality of residence in 1993. We control also for the ethnicity, the religion and for the interaction between year of birth dummies and the attendance rate in 1993 in the municipality of residence. Sample: Rural women aged 15-49 years old whose husband is not in the cohort affected by the policy.

Source: DHS Benin 2011.

Chapter 3

Marriage Payments and Wife's Welfare: All you need is love

Abstract:[1] Bride price is essential to marriage in West Africa and particularly in Senegal where transfers to the family of the bride characterize about 85% of marriages. The relationship between the bride price and the well-being of the wife in her household has scarcely been studied in West Africa. Furthermore, the simultaneous existence of other marriage payments, flowing in different directions between the stakeholders is also largely ignored. To assess the impacts of these marital transfers on the women's well-being in Senegal, we use a unique survey that enquires separately about the different marriage payments. We highlight the strength of the link between what is given to the bride herself and her welfare, contrary to the looseness of the link with what is given to the family.

3.1 Introduction

In Senegal, marriage is nearly universal for women, and the social pressure to be married is extremely strong. Marriage and motherhood are important components of their social status and an essential part of their lives. Therefore, their welfare within marriage is a crucial aspect of women's well-being.

Marital payments are pervasive in this country, bride price being the most important. Bride price, or bridewealth, is a transfer from the family of the groom to the family of the bride[2]. According to our data, 85% of marriages that occurred between 1996 and 2006 involved a bride

[1] This chapter is co-authored with Sylvie Lambert.

[2] The distinction between bride price and bridewealth has several dimensions. Bridewealth is sometimes used because it doesn't carry as much the stigma of wife-purchase in the transaction. Nevertheless, the transfer between the groom's kin and the bride's is not necessary a transfer of wealth strictly speaking, as it doesn't necessarily consist in assets that could generate a future income flow. It might well be consumption goods purchased with the product of labor (see for example Bell (2008) for a discussion of this distinction).

price. Bride prices exist in other contexts, as it is for example the main form of marital payments in rural China, Thailand, Sub-Saharan African and Middle-Eastern countries (Anderson, 2007), but this common denomination hides major contextual variations in this practice.

Bride price has been studied in social sciences in particular through its ceremonial function, mostly by the anthropological literature (Drucker (1965), Kressel (1977)). It characterizes marriage markets where the search for a spouse is done by the groom's side, the groom and his kin trying to find the most desirable match. In marriage markets where dowries prevail, the search is conducted by the bride's side. The literature has devised models to explain the existence of such payment. The bride price is seen as a compensation for the bride's parents, facing the loss of their daughter who represents an asset, or as a compensation for the bride herself (Becker, 1991). The role of women in agricultural labor-intensive societies is often put forward to explain the prevalence of bride-price over dowries in those societies, where it amounts to a payment for the transfer of the woman's workforce and the rights to her fertility from her parents' to her husband's household (Bell (2008), Boserup *et al.* (2013)).

There are a number of reasons why bride price could affect the wellbeing of women in their marriage. In 2004, the International Conference on Bride Price, held in Kampala, Uganda, concluded by a resolution stating that the practice of bride price should be banned, as this was akin to the purchasing of women who therefore loose all agency on their fertility and sexuality (Wendo (2004)). This is echoed in the economic literature, in particular about Uganda, by papers stressing the negative impact of bride price on women's independence and household decision making role (Kaye *et al.*, 2005). Gaspart and Platteau (2010) stress another channel for a potential negative impact of the bride price on wives' welfare. In the context they study (the River Valley in Senegal), the bride price might have to be returned in case the woman leaves the relationship early in the marriage. The strategic model they develop implies that high bride price increases the groom's incentives to push his wife to ask for divorce, potentially using violence to this end. In the recent economic literature, Corno and Voena (2016) and Corno *et al.* (2017) have shown, using data on several countries of Africa, that the probability to have an early marriage is higher in case of negative shocks on family income, among societies that practice bride prices. Early marriage could be a way for families to smooth consumption, thanks in part to the receipt of the bride price.

Despite these findings, the social science literature doesn't lead to a clear-cut conclusion on the subject of the impact of bride price on wives' welfare. In fact, since the bride price is paid when the wife has a positive value, it could reflect her bargaining power in her household

and hence influence positively her access to household resources and her children outcomes (for studies on the impact of mother's bargaining power on children outcomes see Doss (1996), Duflo (2003), Lépine and Strobl (2013)). Consistent with this view, Mbaye and Wagner (2017) find that higher bride-price reduces fertility pressure in rural areas of Senegal. In a different setting, Mansoor (2018) also finds that higher bride price increases the probability of modern contraception use, interpreted as a sign of a higher bargaining power. In addition, Ashraf *et al.* (2016) show in Indonesia and Zambia, that construction of schools have increased the education of girls belonging to ethnic groups practicing high bride-price. Parents' strategic decision regarding their daughters marriage aiming at affecting timing or amount of bride-price can therefore have positive as well as negative impacts. Finally, in the context of the DRC, Lowes and Nunn (2016) show no systematic link between the amount of bride prices and earlier marriage or higher fertility.

Bride price might even at times be used as a proxy for bargaining power, because it is viewed as a substantial amount earned by the woman, which can participate to her empowerment or because it reflects her positive value for the husband (Doss (2013)). On the contrary, in the beckerian model, dowries would be negatively correlated with wives' welfare, as they exist when the value of the wives is negative. Another view contrasts dowry and bride-price in another dimension, that of the recipient of the transfer. The dowry is often seen as a pre-mortem inheritance and a way for parents to transmit inheritance to their daughter in a context of patrilocality (Goody and Tambiah (1973)), while bride-price goes to the parents of the bride. Following this conception, Chan and Zhang (1999) suggest that only the dowry and not the bride-price should impact intra-household allocation of resources: they highlight implicitly the fact that the dowry is retained by the wife, contrary to the bride-price, and therefore does not enter her utility in the same way.

In total, how bride-price relates to the bride's wellbeing is still an open question and might well depend on the context.

In Senegal, bride price is the main marriage payment. Formally given by the groom and the groom's family to the bride's parents, it is the most systematic payment, but other transfers between the various stakeholders are also commonly observed. Two important components of these transfers concern the bride herself. She receives a transfer from her husband, that will be hereafter referred to as the gift or as *le cadeau*, as it is called in French, and she brings in the household a certain amount of resources, akin to a wedding trousseau (*le bagage*). In addition,

the bride's parents might contribute to the expenses of the marriage ceremony.

The bride price is traditionally fixed by the two families and the groom, and is mostly spent for the wedding ceremony and distributed as presents among the extended family members by the mother of the bride at this occasion. On the contrary, the *cadeau* is directly given to bride and the *bagage* remains her property. It can therefore be expected that these marriage payments could relate differently to the wife's welfare, so that considering each of them separately seems necessary. In our data, *cadeaux* are less frequent than bride price, and of a lower amount. The sum of these two payments amounts to nearly 200 000 (2005) CFA francs, (342 $), which represents close to one year of per capita household consumption for those households who give out such payment (96% of the sample of marriages).

Marriage payments have rarely been analyzed in their full complexity, at least by economists. Indeed, although a significant literature on dowries and bride prices exists, the fact that marriages give often rise to several simultaneous payments (this is for example true also in Pakistan or Bangladesh, as presented by Ambrus *et al.* (2010)) is scarcely ever taken into account. This paper fills part of this gap.

In this paper, we will use various proxies for the the wife's wellbeing, ranging from consumption to fertility pressure. We will assess the links between the various marriage payments and those outcomes. This is made possible thanks to the use of original data from the survey "Pauvreté et Structure familiale" (thereafter, PSF), collected in Senegal in 2006 (De Vreyer *et al.*, 2008). These data are particularly well suited for our objective, because they provide detailed information on transfers at the time of marriage, for every unbroken marriages: the bride price, the gift and the *bagage* are precisely recorded. They provide also information on consumption at disaggregated within-household level, allowing in particular to distinguish the consumption accruing to the wife from that of her husband.

This paper allows to dig deeper into the question of the link between marriages payments and intra-household resources allocation. We believe our work to be one of the first to detail the different transfers occurring at marriage and to show that they relate differently to wife's welfare. We cannot nevertheless claim to uncover causal links, as we have no source of exogenous

variations for the amount of payments[3]. In order to make sense of the results, we develop a conceptual framework that articulates a model of the determinants of marriage payments to the wife's welfare outcomes. In conformity with anthropological knowledge and qualitative evidence, we underline the weight of social norms in fixing the bride price and the potential signaling role of the gift. Empirically, in a way conform to the implications of the model, results show that the bride price does not seem to correlate with the wife's access to household resources, contrary to the gift received from the husband. Results point at unobservable characteristics explaining both the existence and level of the gift and the relative consumption of the wife in the household, but uncorrelated to the bride price itself. The model suggests to interpret these unobservable variables as the value the husband attaches to his wife (or his love for her), that he signaled through the value of the gift.

In this context, we therefore show that bride price should not be used to proxy wife's welfare. On the contrary, the amount of the gift is correlated with wife's welfare years into the marriage and might capture unobserved characteristics explaining this welfare that are difficult to seize in another way. We also show that analyzing the links between bride price and marital welfare could be misleading if other payments occurring at the same time are not controlled for. Altogether, these are strong arguments for adapting the collection of data on marital payments to the precise context under scrutiny. It underlines finally the necessity to be very careful and avoid generalizing findings from one context on this question to all societies with bride price, as this terminology hides extremely diverse realities.

Section 3.2 of the paper presents the context and the conceptual framework. Section 3.3 describes the data. Section 3.4 highlights the determinants of the diverse marital payments. Section 3.5.1 presents the methodology and section 3.5.2 lays out the results. Section 3.6 presents the robustness checks. Finally, section 3.7 concludes.

[3]In fact, contrary to the regularity exposed by Corno *et al.* (2017) in a different context, we even find that bad agricultural years (for lack of rain) tend to imply postponement of weddings, probably due to the fact that families cannot afford the required level of ceremonial expenses. It does not affect the amount paid. See section 3.4.2.

3.2 Marriage Payments in Senegal

3.2.1 Bride-Price, *Cadeau* and *Bagage*

Bride prices are present in most marriages in Senegal. They are transfers in kind or cash given by the family of the groom or the groom himself to the family of the bride. The bride price is given before the marriage. Although the marriage might have been arranged very early on, the payment of the bride-price is the signal allowing for the wife to join her husband's household and actually start a marital life. Its amount is negotiated between both couples of parents, largely on the basis of local norms. A large part of the bride price is spent in the wedding ceremony, for meals and clothing. The size of the wedding ceremony matters for families as, according to qualitative interviews, it is a way for the family of the bride to establish its social status. In addition, the wedding ceremony is also an occasion for many gifts to be exchanged with all the guests, and for people to strengthen their network. Thus, the part of the bride price that is not spent on ceremonial expenses is redistributed by the bride's mother to people deemed to deserve it, because they have played a role in the childhood of the bride or because they contribute to the ceremony. The guests (who did not necessarily receive money from the bride's mother) will also each make a small monetary contribution (called *ndawtal*). The counterpart of this contribution will take place when they will themselves organize a ceremony. Wedding is therefore an essential occasion to strengthen the family social network, that could be mobilized again later, in particular for future marriages of the siblings. See Buggenhagen (2012) for a description of this gift/counter-gift dynamics and its role in maintaining an active social network. Hence, even though bride's families receive a bride price, in the Senegalese context, it does not imply a real windfall earning at the occasion of their daughters' wedding. A long-term effect through the network may exist but the direct income shock caused by bride price is probably very limited. In some rare cases, a little part of the bride price could be given to the bride, but it is often spent for her ceremonial outfit. At the end, if bride prices may have an effect on the parental network, it can percolate to the bride, in a context where family is the natural insurance network and where transfers between generations are extremely common (La Ferrara (2010), Fafchamps and Quisumbing (2007)). Hence, bride price could still affect the well-being of the wife, but to a lesser extent than the one of her parents. This is consistent with the argument made by Chan and Zhang (1999).

The *cadeau* is given specifically by the husband to the bride. Traditionally, jewelry was offered, which constituted a precautionary saving that was retained by the wife and could be used in

case of divorce or widowhood. It therefore played a similar role to the dower found in other Muslim countries. Nowadays, qualitative interviews suggest that it consists more in some conspicuous consumption goods such as smartphones or radios, as well as some money, at least in urban settings. It might therefore have lost its long term protective role. The *cadeau* is not mandatory to get married, contrary to the bride price. In fact, it is present in less than two thirds of the marriages we observe. As it is optional, controlling for the husband's wealth, it could represent a fairly accurate signal of the value the husband attaches to marrying this particular woman, and this is clearly the way many women interpret it[4].

The money of the *cadeau* can be used to partly cover for the cost of the *bagage*, which is what the wife brings into her new household. The wife's family also contributes to it. There is a lot of individual variation in the share of the *bagage* covered by the bride's own family relative and that covered with the husband's contribution. This *bagage* takes the form of kitchen utensils, dishes and other housewares, as well as sometimes bedroom furnishing. It is essential in ensuring the wife's well-being in her new household: borrowing kitchen utensils from other women in the house is frowned upon. The content of the *bagage* remains the property of the bride alone. Because it often comes in large part from the bride's own family, its presence and level may well reflect the strength of the support she can expect from her kin group. In this sense, it might correlate with her outside options and affect her bargaining power within marriage.

Beyond the bride price, the *cadeau* and the *bagage*, a transfer is sometimes made from the family of the bride to the family of the groom, mainly as a contribution to the wedding ceremony.

In case of divorce, in principle, the *cadeau* and the *bagage* remain the property of the bride. Bride price is supposed to be paid back if the divorce is initiated by the woman and happens very early after the wedding. In practice, through the interviews we conducted in Senegal with divorced women, we never met anyone who had to reimburse the bride price, but we also observed that, when women initiate the divorce, it often means that they leave the house with hardly anything, leaving most of the *bagage* behind[5].

The Senegalese data used in this paper reveal that, in the sample of women whose first marriage occurred in the 10 years preceding the survey (between 1996 and 2006), bride prices were given in 85% of the cases, *cadeau* received in 62% of them and the wife brought a *bagage* in 57%

[4]We have no direct measure of husband's wealth prior to marriage, but we control for his occupation, that of his father and whether he already had an income earning occupation before the marriage.

[5]see transcribed interviews in French in Lambert and van de Walle (2012).

of those marriages (table 3.1). Amounts are also quite large as the mean bride price at first marriage is 124 000 (constant 2005) CFA francs (212 $) and the mean *cadeau* is 71 000 (2005) CFA francs (122 $), while the value of the *bagage* reaches on average 52 000 (2005) CFA Francs (89 $) (table 3.2)[6]. In one third of all marriages, the 3 types of transfers existed simultaneously (table A-3.2 in the appendix[7].). The sum of bride price and *cadeau* represents almost two third of the mean yearly consumption per capita in Senegal at the national level. The simultaneous presence of these different transfers at weddings has never been studied. It echoes some work trying to understand simultaneous dowry and bride price (Bangladesh and Taiwan), but mainly in contexts of slow transition from one system to another. Here, the nature of those transfers differs in a deep way, and understanding their respective drivers and how they relate to married women welfare would shed light on this understudied aspect of the marital institution in Senegal.

Table 3.1: Frequency of marriage payments

	N	Mean	SD
Positive Bride-Price	638	0.85	0.36
Positive *cadeau*	638	0.62	0.49
Positive *bagage*	638	0.57	0.50

Note: Sample: Women married between 1996 to 2006, observed in their first marriage.
Source: PSF1.

Table 3.2: Value of the marriage payments

	N	Mean	SD	Min	Max
Bride-Price (1000 FCFA 2005)	638	124.50	139.56	0.00	813.67
Cadeau (1000 FCFA 2005)	638	71.04	102.78	0.00	650.83
Bagage (1000 FCFA 2005)	638	52.15	74.19	0.00	497.84
Share of the *cadeau* in total payment to the bride's side	610	0.35	0.35	0.00	1.00
Bride-Price (1000 FCFA 2005), excluding zeros	541	146.82	140.32	3.23	813.67
Cadeau (1000 FCFA 2005), excluding zeros	395	114.74	109.78	3.23	650.83
Bagage (1000 FCFA 2005), excluding zeros	360	92.41	77.68	5.42	497.84

Note: Sample: Women married between 1996 to 2006, observed in their first marriage.
Source: PSF1.

[6]Bride price are much less frequent when women remarry (60% of the cases), while the occurrence of gifts is only slightly less frequent (53%). See Table A-3.7 in the Appendix.
[7]The table A-3.1 in the appendix presents the coefficients of correlation between the different payments.

3.2.2 Conceptual framework.

In order to clarify the potential mechanisms that underline the empirical findings, we present here a simple model that articulates the determinants of the payments and the way they might correlate with the wife's wellbeing in her marital household[8].

For marriages to take place, both families need to agree. The groom's kin discuss with the parents of the bride they have identified as a suitable match. The potential groom has also some say. Women who have never been married before have much less decision power than anyone else about the marriage itself. They nevertheless have the choice of the level of cooperation they will exercise in the future couple. Both families and the groom discuss over the bride-price, that should be sufficient to allow the bride's family to keep up with their social standing with a suitably dimensioned ceremony. What is appropriate is very much a matter of social norms prescribing what is expected from each family given their social status and the relation they already have with the future in-laws. It might also reflect the local marriage market. Besides, the groom has to decide whether to make a gift to his future wife and how much. The gift is a way for the groom to signal the fact that he actually aspires to this match. It might reassure the wife about the way he will behave with her in the future, by implicit committing to provide her the required financial support[9]. The main objective of such signal is to ensure the wife's cooperation in future marital life. The more a man desires a particular wife, the more willing he is to make sure the signal conveys this inclination appropriately. The incentive to respect the commitment implied by the gift is ensured by the risk that a disappointed wife might ask for divorce (a very common occurrence in Senegal: in 2006, more than 13% of women older than 30 have divorced at least once, with divorce rates peaking between 2 and 5 years into the marriage as established by Lambert *et al.* (2019)). The model below is designed to represent this situation with the simplifying assumption that the groom is the unique decision maker when it comes to both bride-price and gift, the position of other parties entering into play through minimum requirement constraints.

First, the groom (or his family) offer to pay a bride price of BP. For this amount to be accepted and the marriage to be allowed, it cannot be below the one customarily determined by $\overline{BP} = BP(z_w, z_h, m, sn)$, where individual characteristics of both husband and wife are denoted by (z_h, z_w), m stands for the marriage market conditions (gender imbalance for example) and sn the social norms that apply to a particular marriage (due to the ethnic affiliation,

[8]The work of Bloch *et al.* (2004) on wedding celebrations in rural India was very inspirational.
[9]In interviews, women describe a good husband as one who provides for the family

regional practices, families social standing...). z_w could encompass for example age and education level of the bride. z_h could represent husband's occupation (for instance whether this occupation goes hand in hand with a stable income). In the Senegalese context, where the bride-price results from negotiations at the family level and, as explained above, is relied upon by the bride's family to be able to throw a party that reinforce their social standing, we can expect it to be heavily constrained by existing norms (sn).

The amount of gift G is chosen once the bride price has been fixed[10]. Parents of the bride may have had a higher decisional power than the bride herself in the initial acceptance. Nevertheless, the level of goodwill with which the bride enters the marriage might matter to the groom, as it will determine the level of cooperation and harmony in the couple. The more he attaches importance to marrying this particular bride, the more he will be willing to ensure cooperation. The gift is therefore a signal sent once the match is decided and independently of the bargaining that occurs between the parents. Through this *cadeau*, the groom attempts to increase the utility he will gain from the marriage, by inducing his wife's goodwill. Moreover, the gift is also often one of the first occasions to show commitment or involvement and for the husband to demonstrate that he values the individualized relationship. Signaling is especially needed if future spouses do not know each other very well, which is frequent, since many marriages are arranged by families and cohabitation is forbidden before marriage. Therefore, the incentives to offer a large *cadeau* are particularly high in this situation. The incentives are also very high if the groom does not belong to the community of the bride and if information available about him is limited.

We model this by assuming that the bride needs to be induced to expect a certain level of care and involvement from her husband, (denoted $\overline{I_w}$), to be ready to cooperate in the marriage. The implicit threshold she has in mind depends on the characteristics of the future husband (z_h). We assume that the groom seeks to send a signal that would exceed his expectation of this threshold, as a failure to meet with the wife's anticipations would prevent him from reaping the utility gain associated with having an harmonious couple with the woman he actually cares for. We introduce a measure of the degree of premarital knowledge between the spouses. The potential bride directly observes the intensity of the interest of the groom towards her (denoted I, for involvement with the bride) with probability π. With probability (1-π), the bride does not know the groom's attachment and can only form expectations about it thanks to the *cadeau*. π could be empirically proxied by the link between both families in-law: being from the same ethnic group or the same family would increase π. Further, the expectation of the

[10]The sequentiality mainly serves expositional purposes. In reality bride price and gift might be decided more or less simultaneously, but the bride price remains the only compulsory marriage payment.

groom's quality induced by the gift is supposed to be an increasing function $q(G - \overline{G_w}(z_h))$ where q(0)=0, $q' > 0$, $q" < 0$. $\overline{G_w}(z_h)$ represents the amount of gift required by the bride when she does not know the groom. It is an increasing function of the characteristics of the husband (z_h). It means that her anticipation of the future involvement of the groom increases with the level of gift G, and is positive only if G exceeds what she expects considering the characteristics of the husband.

Next, we suppose that the higher the actual desire of the groom to marry this woman (I), the greater the utility gain from marital cooperation. We assume that this level of involvement I can be formalized as an increasing function of two different factors: a component related to the observable characteristics of the wife (z_w) and a less tangible (unobservable) component of attraction or love (l). The utility associated with the emotional benefit of marrying this particular woman and having an harmonious marital life is denoted $v(I)$, where v is strictly increasing and concave. It can only be enjoyed if the signal sent leads the bride to expect a level of care that exceeds $\overline{I_w}$, the involvement she requires to cooperate in the marriage. If the signal sent is below $\overline{I_w}$, it leads to a disutility for the husband. As a result, we assume that the husbands utility from marrying this bride can then be written:

$$v(I)(\pi I + (1-\pi)q(G - \overline{G_w}(z_h)) - \overline{I_w}(z_h)).$$

For a little involved groom, $v(I)$ will be almost null, and the interest in increasing

$$\pi I + (1-\pi)q(G - \overline{G_w}(z_h)) - \overline{I_w}(z_h)$$

will be low, whereas not sending a valuable signal would be very damageable for the utility of a highly involved groom.

We suppose that the utility of the groom is separable in consumption and involvement. The groom chooses the gift G maximizing:

$$U = u(Y_h - BP - G) + v(I(z_w, l))(\pi(I(z_w, l)) + (1-\pi)q(G - \overline{G_w}(z_h)) - \overline{I_w}(z_h))$$

with $Y_h =$ income of groom, $I =$ groom's involvement, and u and v are both strictly increasing and concave.

Under the constraint:

$$BP \geq \overline{BP}(z_w, z_h, m, sn)$$

Saturation of the constraint lead to

$$BP = \overline{BP}(z_w, z_h, m, sn)$$

and the first order condition on G gives:

$$-u'(Y_h - \overline{BP}(z_w, z_h, m, sn) - G) + v(I(z_w, l))(1-\pi)q'(G - \overline{G_w}(z_h)) = 0$$

For the bride price, the comparative statistics are directly obtained from the hedonic price function. For the gift, we compute the implicit derivatives:

- $\frac{\partial G}{\partial \pi} = -\frac{-v(I(z_w,l))q'(G-\overline{G_w}(z_h))}{u'' + v(I(z_w,l))(1-\pi)q''} < 0$
- $\frac{\partial G}{\partial Y_h} = -\frac{-u''}{u'' + v(I(z_w,l))(1-\pi)q''} > 0$
- $\frac{\partial G}{\partial m} = -\frac{u''\frac{\partial BP}{\partial m}}{u'' + v(I(z_w,l))(1-\pi)q''} > 0$
- $\frac{\partial G}{\partial z_h} = -\frac{u''\frac{\partial BP}{\partial z_h} - v(I(z_w,l))(1-\pi)\frac{\partial G_w}{\partial z_h}}{u'' + v(I(z_w,l))(1-\pi)q''}$ whose sign is ambiguous if $\frac{\partial BP}{\partial z_h} > 0$, given the positive effect of z_h on G_w. The sign is positive if the link between the amount of gift requested by the wife and the characteristics of the husband is stronger than the one between these characteristics and the bride price.
- $\frac{\partial G}{\partial z_w} = -\frac{u''\frac{\partial BP}{\partial z_w} + (1-\pi)\frac{\partial v \circ I}{\partial z_w}q'(G-\overline{G_w}(z_h))}{u'' + v(I(z_w,l))(1-\pi)q''}$ whose sign is ambiguous ($\frac{\partial G}{\partial z_w} > 0$ if the link between education and involvement is stronger than between education and bride price.)
- $\frac{\partial G}{\partial l} = -\frac{(1-\pi)\frac{\partial v \circ I}{\partial l}q'(G-G_w(z_h))}{u'' + v(I(z_w,l))(1-\pi)q''} > 0$

Finally, these comparative statistics are obtained:

Variables	Effect on gift	Effect on bride price	
Level of knowledge about the groom	-	0	(1)
Income of the groom	+	0	(2)
Quality of the bride	?	+	(3)
Quality of the groom	?	+	(4)
Marriage market favorable to men	+	-	(5)
Love	+	0	(6)

In a second step, we focus on the situation during the marital life, once the ceremony has taken place. We suppose that the groom's love, or the harmony in the couple, plays positively on the financial support of the groom toward his wife. It would mean: $S = S(\underset{+}{l})$ with $S =$ financial support of groom. Since we are expecting that $\frac{\partial G}{\partial l} > 0$, we also expect that $\frac{\partial S}{\partial G} > 0$ whereas $\frac{\partial S}{\partial BP} = 0$.[11]

Finally, the *bagage* does not appear in the above model, as the husband and his family have no say about it, even if it can also be partly financed by the gift. It is more likely to be determined by the support the bride can obtain from her own family and by the structure of the household she is planning to join (presence of co-wives or in-laws in particular). The role of her own family suggests that succeeding in raising a large *bagage* bodes well for future support from her kin group. As such it could be correlated with future income transfers for example, and therefore, higher individual consumption. Further, it might well reflect the strength of her outside options, and hence contributes to a higher bargaining power within the household.

We will bring these predictions to the data. First, we will be interested in the correlates of the marriage payments and simply estimate :

$$P_i = g(sn_i, z_{hi}, z_{wi}) + v_i \tag{3.1}$$

Where P stands for payment, which can be either a bride-price (BP), a *cadeau* (G) or a *bagage* (T). Some unobservable factors linked to personality traits of husband and wife and the interpersonal quality of the match, are likely to enter into play on all of these payments (v). Love in the model would be encompassed in this v.

In a second step, we will be interested in the link between the payments and the welfare of the wife in her new household, after the marriage. Here again, we will simply exhibit regularities thanks to the following set of regressions:

$$Y_i = g(sn_i, z_{hi}, z_{wi}, G_i, BP_i) + u_i \tag{3.2}$$

[11]Note that an alternative story is possible. It could be the case that the *cadeau* does not have a signaling role and only reflects the love between the future spouses. In the same way love also explains the support the husband gives to his wife, so that the same correlation pattern would be observed. It could be the case that love is more often present when future spouses are "distant", not from the same family or not the same ethnic group, as those marriages are less likely to have been arranged by the kin groups.

Our model suggests that the coefficient associated to G_i should be significantly positive while the one associated to BP_i might not be significantly different from zero. Indeed, unobservable characteristics (kindness of the husband, quality of the marriage, harmony in the couple) play a role in determining the wife's access to household resources and we expect them to be captured by the *cadeau* more than by the bride price, contributing to the correlations with the wife's wellbeing (Y), as measured for example by her access to household resources, controlling for the observables that affect both the payment and the wife's outcomes.

3.3 Data and Descriptive Statistics

Survey Data used in this study are from the PSF Survey (De Vreyer *et al.*, 2008)[12]. Data have been collected in 2006 and are nationally representative. It covers 1750 households, and 14 450 individuals. The survey recorded all the marital transfers: bride-price, *cadeau* and *bagage*[13]. This level of detail is very rare. Data sets that record bride-prices or dowries usually stop at this single (main) marital transfers. There are few exceptions concerning Bangladesh and Pakistan, countries where bride-price and dowry tend to increasingly coexist (Ambrus *et al.*, 2010). In the Senegalese context, the practice of multiple marital transfers, in addition to the nearly universal bride-price, is widespread. These marital payments are self-recorded, asked to the husband when he is present, to his wife otherwise: as such, they can be biased (beyond a random measurement error). We do not think that the bias would systematically correlate with the outcomes considered at the time of survey, but maybe, rather to the education level of the bride or the consumption level of the household. We control for these variables in the analysis.

Consumption The PSF survey collects information on food and non-food expenditures. The recall period is chosen for each good by the respondent, expenditures have then been annualized. A particular strength of the data set is that it takes into account the intra-household allocation of consumption. Qualitative interviews have shown that each household could be split into semi-autonomous budgetary units. Between these subgroups, the distribution of the burden of expenditure is very clearly defined and own resources are not pooled. In the quantitative data, we have reproduced this natural division of the household, calling each unit a

[12]Momar Sylla and Matar Gueye of the Agence Nationale de la Statistique et de la Demographie of Senegal (ANSD), and Philippe De Vreyer (University of Paris-Dauphine and IRD-DIAL), Sylvie Lambert (Paris School of Economics-INRA) and Abla Safir (World Bank) designed the survey. The data collection was conducted by the ANSD.

[13]We also attempted to record the contribution of the bride's family to the family of the groom, but the question was not understood in an homogeneous way by all enumerators. Some of them understood that participation to ceremonial expenses were not to be recorded here, while others included such expenses. As a result, we chose not to use this information.

cell. These cells are composed of a cell-head and his dependents: wife, children, or unaccompanied members of the family. Household head are however systematically recorded in an autonomous cell, that includes only their unaccompanied dependent (children whose mother does not coreside or widowed parent for example). Their wives each head a separate cell. Adult male members, other than the head of household, receive different treatment, depending on whether or not they are polygamous. They are in the same cell than their wife if they are monogamous, or in different cells if they are polygamous. Given this rule, most women heading a cell of their own are either household head or married to the household head[14]. Their husband should not be in their cell, except if they do not live in the same household and he is visiting at the time of the survey. This happened for 10 women in our sample.

Consumption is recorded in three parts: consumption common to the whole household, consumption that can be assigned to specific cells and finally, consumption shared between several cells but not the whole household. Total cell consumption can be constructed by ascribing a share proportional to cell size of the common or shared expenditures and adding cell specific expenses. Intra-household inequality in access to consumption can therefore be exhibited. Individuals within the same household do not have always the same consumption level. It appears that food consumption is rather equally shared within a household, while it is not the case for non-food consumption (De Vreyer and Lambert, 2017)[15]. We will consider the ratio of the woman's cell per capita non-food consumption to that of her household as a measure of her access to household resources. The share of the household consumption that comes down to the wife is actually a direct measure of her welfare. This measure should reflect her bargaining power according to classical collective household models. It gives a fairly encompassing picture of wife's welfare within the household and informs on what really matters *in fine*, the share of total resources accruing to her. Note that for those women who are not in a independent cell, they are generally in their husbands cell and the resources reaching the cell also reflect the position of the couple in the household. Although it represents a situation where what is at stake is not what can be obtained from the husband, this is nevertheless one dimension of her situation within the household.

For each consumption record in the survey, the persons who financed the corresponding ex-

[14]Single mothers leaving with kins would also be heading a cell, as well as wives of polygamous household members.

[15]Meals are taken out of a common dish, so that it is virtually impossible to actually record individual intakes for the meals that are taken at home. We might therefore underestimate actual inequality in food consumption. Nevertheless, inequality is likely to be rather limited in such setting, compared to a situation where everyone has access to an individualized portion (De Vreyer and Lambert, 2017).

penditures are registered. We can therefore consider another outcome reflecting the support the husband provides to his wife, the share of the wife's cell consumption that is financed by the husband. We are nevertheless aware that this measure is ambiguous. A high level of husband's support could also mean less autonomy, and therefore less welfare. This is the same ambiguity than the one attached to the wife's income, highlighted by Doss (1996): wife's income is not a good measure of the bargaining power, since a woman with a high bargaining power could decide not to work. Note that consumption data do not suffer from this ambiguity. We complete this analysis by studying other outcomes that can proxy women's welfare, such as fertility pressure, polygamy and coresidence with the in-laws. This is detailed in section 3.5.

Sample Amounts recorded for the marriage payments possibly suffer from recall bias. To try to confine this problem, we restrain our sample to women who have been married in the 10 years preceding the survey, hence after 1996. The sample for which information on the amount of each marriage payments is available contains 783 women once trimmed for outliers[16]. Among them, we have information on control variables for 751. We have full information on the husband only in case of co-residence of the couple: 521 women coreside with their husband (69% of the sample)[17]. The analysis of financial support of the husband will be restricted to the sample of wives who are cell's head and not in the same cell than the husband (465). The measure of financial support would not be relevant if husband and wife are recorded in the same cell. We conduct a number of robustness check to the definition of the sample, restricting in turn the analysis to women in their first marriages (638 women, among them 370 cell's head), to coresiding women (521 women, among them 310 cell's head[18]), and finally enlarging the sample to women having been married in the 15 years preceding the survey (1004, among them 672 are cell's head).

Married Women's Characteristics Table 3.3 provides descriptive statistics for women in our sample. 23% of women have a primary education and 12% have a secondary education. Half of the sample lives in a rural area. The age at marriage is on average 22 years old (note that for some of these women, the marriage observed is not their first marriage, hence the rather high age at marriage reported here), and the age gap with the husband is 12 years. 75% live in a

[16]Trimming here is very conservative. To avoid potential errors, we exclude the two last percentiles for every marriage payments. The sample, initially of 883 women, is restricted to 848. We exclude also the two last and the two first percentiles of the non food consumption per capita and of the relative non food per capita, since these are our main outcomes, and as monetary amounts, outliers could bias our results.

[17]Non-coresidence can happen in different situations: (i) very recent marriages, if the wife remained with her parents, waiting to join the marital household, (ii) in some polygamous unions where wives want (and obtain) independent dwellings, or (iii) if the wife lives in the village, while the husband is based in town for work and only comes for regular visits.

[18]Among them,289 are wives of household's head.

monogamous union.

Table 3.3: Married women's characteristics

	N	Mean	SD
Wife with some primary education	751	0.23	0.42
Wife with secondary or higher education	751	0.12	0.32
Age of the wife at marriage	751	22.42	8.86
Spousal age gap	650	11.60	7.81
Log of hh per cap. expenditures	751	12.32	0.76
Wife lives in a rural area	751	0.51	0.50
In a monogamous union	751	0.75	0.43
In a polygamous union, first rank	751	0.04	0.19
In a poly. union, sec. or further rank	751	0.20	0.40

Note: Sample: Women married between 1996 to 2006. The information on husband's age (and hence on spousal age gap) is missing for some non-coresiding women.
Source: PSF1.

3.4 Correlates of Marriage Payments

3.4.1 Who draws which marriage payments?

To analyze the correlates of the various payments, we first estimate the probability that such transfers occurs at the time of marriage, and then the amount paid. Explanatory variables are grouped into different sets. A first set describes the local environment and aims at approaching the role of local norms. It includes the region of residence of the couple (as a proxy of the region of residence of the parents of the husband), dummies for ethnic group, and average per capita consumption at the district level (to control for the wide geographic disparities in living standards). It also includes date (year) of marriage and conditions of the local marriage market at that time captured by the women-to-men sex ratio in the district of residence of the wife (following Chiappori *et al.* or Abramitzky *et al.* (2011))[19]. A second set of variables reflects the endogamy of the match in various dimensions (spouse members of the same family, of the same ethnic groups, or with fathers having the same employment status). Greater endogamy might increase the information set of the wife about her husband prior to the wedding. On the

[19]We define the gender ratio as the number of women aged 16 to 26, divided by the number of men aged 26 to 36, by district, using the census data of 2002. We chose the district of residence of current residence of the wife, since, given patrilocal practices, it has a high probability to be also the district of residence of the groom at the time of marriage.

other hand, highly endogamous marriage are more likely to have been arranged by the families, without regards for the wishes of the spouses. Characteristics of the families form the third group of variables: professional occupation of the wife's father (whether employer, employee, civil servant, formal or informal worker, farmer or inactive), wife's parents alive at the time of the survey and size of the sibship of each spouse. Finally, individual characteristics of the wife and husbands form the lasts sets: education and occupation are accounted for.
In a first specification, we investigate for all married women the link between the probability that each of the three transfers took place at the time of marriage and those sets of characteristics, For the subset of women who coreside with their husband, more information is available, and we also present the results for this sample with the wider set of variables (table 3.4).

We then explore the determinants of the amounts of transfers. Given the share of null payments, we conduct this analysis using a tobit specification (results in table 3.5)). Results on the sample of coresiding women, for the restricted set of variables are available in Appendix (tables A-3.3 and A-3.4). They are very similar to the ones with the whole sample of married women.

For both existence and level of the bride price, explanatory variables related to region and date of marriage have jointly a significant explanatory power. Ethnicity also plays a role, Wolof women attracting a higher bride price. The women-to-men ratio plays negatively on this transfer, showing the weight of local conditions on the marriage market. This is true controlling for the average consumption level in the department that could well be correlated with the sex ratio if men migrate to earn a living. As expected, this measure of local living standard is positively correlated with the bride-price. The characteristics of the wife enter into play as well. Her age at marriage affects the probability a bride price is paid, this being lower for older bride, while her education affects its amount: women with secondary or higher education command higher bride price. Remember that women with this level of education are only 12% of our sample, and this achievement may be as indicative of her family social standing than of her own quality. It is also noteworthy that higher bride-prices are paid when at least one of the parents of the bride is alive at the time of marriage. In fact, parents are really the ones who rely on the bride-price to reaffirm their social standing and have therefore higher stakes in negotiating it. Higher bride prices are also paid if the husband is a farmer. On the other hand, consistent with the conceptual framework, belonging to the same family or the same ethnic group is not significantly correlated with the amount of bride price. Regarding the *cadeau* or the *bagage*, it is worth noting that if they also vary by region and marriage dates, they do not vary by district level consumption and marriage market conditions are not, supporting the notion that these

payment are determined at a more individualized level than bride price. The *cadeau* seems to be driven more by characteristics of the husband, for both the probability of a gift to be given (particularly strong when the husband is a farmer) and for the value of the gift: husbands who already had a job at the time of marriage and men at both end of the socio-economic spectrum (civil servant or employer on the one hand, and farmer and educated in koranic school on the other) give higher gifts. Belonging to the same family, or to the same ethnic group probably induces a better prior mutual knowledge. The model suggests that it would make signaling from the groom less necessary, and we indeed find that belonging to the same ethnic group is negatively correlated with the gift, both in terms of occurrence and value. Belonging to the same family is not correlated with the existence nor the amount of the *cadeau*, except that it increases the probability to receive a gift when considering all married women (but not when restricting to co-residing wives). Note however that in most cases, belonging to the same family also means belonging to the same ethnic group, and the total effect is always significantly negative[20]. Finally, the *bagage* is more likely to exist if the husband is a farmer and when the fathers of the spouse share the same occupation.

Unfortunately, the information on the income of the husband at the time of the marriage is not available in the survey. But thanks to retrospective data on the first job, we are able to compute a dummy indicating whether the husband has worked before the time of the marriage. As expected, it is positively correlated with the amount of the gift but not the one of the bride price.

In total, all those results can be read through the lens of the conceptual framework developed above, that allows to make sense of the patterns just described. Bride price payments appear to be decided mainly to accord with local standards that vary per region, ethnic group, local standard of living, local sex-ratio at the time of marriage, whether the bride's parents are alive, for women of a given age and education level. On the contrary, the *cadeau* seems to be more individualized, the characteristics of the spouses playing a greater role. The negative correlation between ethnic endogamy and the *cadeau* can be understood in our framework by the fact that signaling one's good will is more important for the husband if he is more distant from his future wife to start with.

[20] Among possible interpretations for the positive correlation that appears when considering the probability to receive a gift, we can imagine either that a gift can be exchanged also when spouses already know each other, precisely because they love each other or that endogamous marriage are more often arranged by the families so that the man needs to make a special effort to signal his personal interest above and beyond the family desire to see this particular marriage happen.

Table 3.4: Probability of Positive Marriage Transfers, All Marriages

Payment	Bride Price		Cadeau		Bagage	
	All	Coresident	All	Coresident	All	Coresident
Women-to-men ratio in the department	-1.03	-3.74**	0.51	1.13	0.85	0.34
	(1.01)	(1.57)	(0.66)	(0.85)	(0.67)	(0.88)
Average of the logarithm of the hh consumption per cap by department	1.65**	1.93**	-0.48	-0.39	0.15	0.39
	(0.65)	(0.95)	(0.47)	(0.57)	(0.47)	(0.59)
Wife is wolof	0.14	0.24	-0.02	0.04	0.32	0.34
	(0.28)	(0.41)	(0.23)	(0.29)	(0.23)	(0.31)
Wife is poular	-0.04	-0.15	0.25	0.58**	0.36	0.14
	(0.29)	(0.41)	(0.23)	(0.29)	(0.24)	(0.31)
Characteristics of the Match						
Couple from the same family	0.22	0.22	0.35*	0.24	0.25	-0.15
	(0.24)	(0.32)	(0.19)	(0.25)	(0.19)	(0.25)
Couple from the same ethnic group	-0.25	-0.26	-0.59**	-0.69**	-0.49*	-0.54*
	(0.30)	(0.42)	(0.27)	(0.34)	(0.26)	(0.33)
Fathers with same professional status		0.07		-0.07		0.39*
		(0.31)		(0.22)		(0.22)
Characteristics of the Families						
Professional status Wife's Father (*ref. independent/informal employee*)						
..... Farmer	0.42	0.68*	-0.09	-0.24	-0.21	-0.55*
	(0.29)	(0.40)	(0.23)	(0.31)	(0.23)	(0.31)
..... State employed/employer	-0.19	0.02	0.35	-0.03	-0.16	-0.21
	(0.32)	(0.40)	(0.27)	(0.33)	(0.27)	(0.34)
..... Other	-0.55	-0.62	0.25	-1.21	-1.74*	0.00
	(1.01)	(1.10)	(0.99)	(1.26)	(0.96)	(.)
Number of siblings of the wife alive	-0.02	-0.10	0.08**	0.09**	0.04	0.02
	(0.04)	(0.06)	(0.03)	(0.04)	(0.03)	(0.04)
Number of siblings of the husband alive		0.01		0.10**		0.06
		(0.05)		(0.04)		(0.04)
Parents of the wife alive at marriage	0.15	0.22	-0.08	-0.08	-0.10	-0.22
	(0.43)	(0.62)	(0.38)	(0.53)	(0.38)	(0.55)
Characteristics of the Wife						
Education (*ref. no education*)						
..... Primary	-0.25	-0.20	0.66***	0.55*	0.26	0.24
	(0.25)	(0.32)	(0.23)	(0.31)	(0.22)	(0.28)
..... Secondary	0.39	0.63	0.47	0.09	0.39	-0.03
	(0.40)	(0.60)	(0.32)	(0.40)	(0.31)	(0.40)
Age of the wife at marriage	-0.06***	-0.05*	-0.01	-0.02	-0.05***	-0.02
	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)
Wife lives in a rural place	0.21	-0.50	0.24	-0.08	0.26	0.10
	(0.32)	(0.51)	(0.27)	(0.35)	(0.27)	(0.39)
Characteristics of the Husband						
Professional status (*ref. independent/informal employee*)						
..... Farmer	-0.13	-0.03	0.40	0.67*	0.09	0.65*
	(0.35)	(0.57)	(0.26)	(0.35)	(0.25)	(0.34)
..... State employed/employer	0.16	-0.42	0.13	0.30	0.31	0.19
	(0.29)	(0.41)	(0.24)	(0.33)	(0.23)	(0.31)
..... Other	-0.19	-0.48	-0.17	-0.06	0.20	-0.05
	(0.40)	(0.51)	(0.34)	(0.37)	(0.33)	(0.37)
Husband has been to coranic school		-0.28		0.36		0.56**
		(0.37)		(0.26)		(0.27)
Husb. worked at time of marriage		1.17*		0.68		1.18*
		(0.68)		(0.59)		(0.63)
Constant	-17.08**	-17.51	5.50	2.66	-1.97	-6.07
	(8.14)	(11.65)	(6.10)	(7.40)	(6.13)	(7.77)
Region and marriage year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pval_region+marriage year	0.23	0.01	0.00	0.01	0.00	0.00
N	751	509	751	513	751	517
Dep. Var. mean	0.81	0.85	0.61	0.61	0.54	0.63
st. dev.	0.39	0.35	0.49	0.49	0.50	0.48
r2_p	0.14	0.17	0.10	0.14	0.14	0.16
chi2	89.20	81.03	88.59	75.71	116.00	88.43

* p<0.10, ** p<0.05, *** p<0.01.

Note:Logit estimates, Dependent variables: occurrence of bride price, *cadeau* or *bagage*.

Omitted occupation category is that of "independant or informal employee". Coefficients related to the occupation dummies "inactive" and "unknown" are not displayed because they are never significant, as well as the dummy "unknown" for "Same family" and the dummy "unknown" for "Fathers with same professional status". Standard errors clustered at the husband level in parentheses.

Sample: For the first, third and fifth columns, women who married between 1996 and 2006. For the second, fourth and sixth column, subsample of those who reside with their husband. Source: PSF1

Table 3.5: Amount of Marital Transfers, All Marriages

Payment	Bride Price		Cadeau		Bagage	
	All	Coresident	All	Coresident	All	Coresident
Women-to-men ratio in the department	-68.29	-181.61***	-37.46	57.33	6.26	-9.51
	(42.60)	(53.93)	(53.26)	(52.83)	(30.36)	(32.38)
Average of the logarithm of the hh consumption per cap by department	87.52***	57.71	-8.26	-23.10	21.40	45.81
	(31.89)	(37.66)	(31.74)	(34.21)	(28.96)	(32.67)
Wife is wolof	33.67**	31.92	-5.94	11.63	7.29	10.19
	(16.25)	(19.51)	(14.32)	(16.88)	(12.80)	(14.16)
Wife is poular	3.40	-0.18	14.02	42.65**	1.54	-5.87
	(14.73)	(17.04)	(14.69)	(16.88)	(12.70)	(14.09)
Characteristics of the Match						
Couple from the same family	-8.04	-20.65	16.39	11.73	9.54	-6.04
	(13.02)	(14.66)	(13.20)	(15.03)	(10.28)	(11.23)
Couple from the same ethnic group	9.38	12.67	-38.50**	-57.81***	-26.61*	-29.99*
	(18.10)	(19.96)	(17.24)	(20.88)	(14.64)	(15.92)
Fathers with same professional status		28.16**		-8.84		5.44
		(13.56)		(12.96)		(9.93)
Characteristics of the Families						
Professional status Wife's Father (*ref. independent/informal employee*)						
..... Farmer	13.39	9.29	1.17	1.16	-10.74	-22.78*
	(12.63)	(14.04)	(13.47)	(16.40)	(12.18)	(12.90)
..... State employed/employer	17.61	35.62	25.19	-0.26	-8.01	-5.96
	(20.45)	(21.93)	(16.60)	(18.03)	(17.11)	(18.62)
..... Other	-18.06	-1.92	-6.90	-91.05	-127.71**	-603.14
	(47.60)	(54.97)	(59.32)	(70.41)	(61.14)	(.)
Number of siblings of the wife alive	3.19	-0.41	4.22**	3.04	0.29	-0.38
	(2.38)	(2.64)	(2.03)	(2.23)	(1.72)	(1.91)
Number of siblings of the husband alive		3.42		6.24***		4.73**
		(2.60)		(2.29)		(2.08)
Parents of the wife alive at marriage	32.61*	54.16**	-13.85	-18.80	8.32	0.99
	(19.05)	(21.20)	(24.40)	(33.93)	(19.49)	(20.71)
Characteristics of the Wife						
Education (*ref. no education*)						
..... Primary	19.30	7.55	51.42***	31.93**	20.63*	11.94
	(13.62)	(16.36)	(14.08)	(15.33)	(12.00)	(13.01)
..... Secondary	124.95***	114.51***	69.43***	39.19	40.90**	16.02
	(24.07)	(27.71)	(21.27)	(26.26)	(18.91)	(22.21)
Age of the wife at marriage	-4.44***	-3.74***	-2.16***	-2.31**	-2.34***	-0.86
	(0.78)	(1.02)	(0.73)	(0.98)	(0.64)	(0.82)
Wife lives in a rural place	21.14	-5.17	26.56	-1.14	23.54*	21.27
	(15.09)	(19.51)	(16.53)	(19.45)	(13.45)	(16.10)
Characteristics of the Husband						
Professional status (*ref. independent/informal employee*)						
..... Farmer	14.88	40.93**	29.38*	54.67***	-6.64	12.41
	(15.28)	(17.82)	(16.33)	(18.80)	(11.83)	(12.25)
..... State employed/employer	26.97	25.76	29.69*	40.32**	26.31*	22.13
	(17.97)	(20.55)	(15.66)	(17.86)	(13.83)	(16.62)
..... Other	49.52**	44.70*	-1.87	8.22	8.80	-0.14
	(22.43)	(23.90)	(18.60)	(17.86)	(17.50)	(17.07)
Husband has been to coranic school		19.75		34.47**		26.89**
		(15.55)		(16.73)		(12.02)
Husb. worked at time of marriage		1.60		71.79**		64.69**
		(42.72)		(31.86)		(31.62)
Constant	-915.19**	-427.00	222.38	201.08	-210.62	-594.73
	(421.48)	(488.10)	(404.55)	(446.56)	(377.31)	(418.00)
sigma	143.08***	133.74***	127.58***	117.61***	106.27***	95.65***
	(6.90)	(7.34)	(6.91)	(7.79)	(5.80)	(6.47)
Region and marriage year FE	Yes	Yes	Yes	Yes	Yes	Yes
Pval_region+marriage year	0.02	0.02	0.00	0.00	0.00	0.00
N	751	521	751	521	751	521
Dep. Var. mean	112.49	120.43	64.71	64.53	47.79	53.92
st. dev.	136.87	134.73	97.58	91.23	71.46	72.74
r2_p	0.02	0.02	0.02	0.02	0.02	0.02
F	3.98	2.88	2.50	1.82	3.25	.

* p<0.10, ** p<0.05, *** p<0.01.

Note: Tobit estimates, Dependent variables: amount of bride price, *cadeau* or *bagage*, expressed in 1000 FCFA 2005.

Omitted occupation category is that of "independant or informal employee". Coefficients related to the occupation dummies "inactive" and "unknown" are not displayed because they are never significant, as well as the dummy "unknown" for "Same family" and the dummy "unknown" for "Fathers with same professional status". Standard errors clustered at the husband level in parentheses.

Sample: For the first, third and fifth columns, women who married between 1996 and 2006. For the second, fourth and sixth column, subsample of those who reside with their husband. Source: PSF1

3.4.2 The impact of transitory shocks

The literature has investigated the impact of transitory shocks on timing of marriage and marriage payments. The idea is that in societies where brice prices are paid at the time of marriage, parents could be tempted to marry their daughter off early when facing a negative income shock, so as to be able to use the pride price payment to smooth consumption. The results obtained suggest a wide variety of situations. If Corno and Voena (2016) show that drought can indeed accelerate the timing of the marriage and decrease bride price paid, Lowes and Nunn (2016) do not find this for Democratic Republic of Congo. We study here how the Senegal marriage markets reacts to transitory local income shocks.

We use weather shock at the time when women were at risk of being married for the first time, using rainfall deviation from the long term average. Rainfall data measured every month from 1982 to 2007 at the district level are matched to every individual in the survey, based on the district of residence of the wife at the time of the PSF survey[21]. This is the district she married into, so is likely to be a good proxy for the district of residence of the husband's family. It makes sense to use this, as the husband's family is the one who will have to pay the bride-price, and their capacity to do so might be affected by adverse shocks. The district of current residence of the wife is probably a noisier proxy of the exact localization of the wife's family. The district of birth of the wife is more appropriate to account for it, and would be the relevant one if indeed girl's parents adjusted marriage timing to cope with shocks. We also used it in an alternative specification, but it does not affect the results very much.

To construct a measure of rainfall shock, district and year rainfall averages are first computed, and long-term average is obtained by taking the mean of the yearly rainfall average over the twenty five years for which the information is available[22]. For each household and each year, we define positive (negative) rainfall shocks as situations where the rainfall average that year is more than one standard deviation above (below) the long-term average. Descriptive statistics on the occurrence of shocks are available in Table 3.6.

Since the timing of the marriage is endogenous, we look at the occurrence of a shock during the period when marriage risk is highest for girls, i.e. when the bride to be is 16, 17 and 18

[21] Data used are the CHIRPS Data. CHIRPS was created in collaboration with scientists at the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, in order to deliver reliable, up to date, and more complete datasets for a number of early warning objectives (such as trend analysis and seasonal drought monitoring), using satellite data and precipitation grids produced from station data. They can be downloaded at this address: http://chg.geog.ucsb.edu/data/chirps/

[22] We concentrate on the rainy season, that covers the June to October period

Table 3.6: Statistics on Rainfall Shocks

	count	mean	sd	min	max
Negative shock at 16, 17 or 18 years old	690	.2086957	.4066712	0	1
Positive shock at 16, 17 or 18 years old	690	.3391304	.4737576	0	1

Note: A negative (positive) shock is a rainfall level that is more than one standard deviation below (above) the long-term average any of the 3 years when the woman was age 16 to 18. Sample: Women married between 1996 and 2006.

years old. We are not able to have these data for the older women of the sample, as rain data starts only in 1982. Therefore, we run the model including those variables only for the sub-sample of 690 women for whom we can construct a measure of rainfall shock. Results indicate that dry years tend to delay marriages. We do not find any impact of rainfall shocks on the amount paid as bride price, but a negative one on the level of *cadeau*(Table 3.7). In this context, the adjustment to drought on the marriage market passes mainly through quantities (marriage postponement). It is consistent with the fact that the amount of the bride price has to respect a norm that is not easily be disregarded. People wait for better time to marry in order to be able to pay the required amount. At the same time, since the *cadeau* is not required, if the marriage happens in a bad year, as it might already have been difficult to collect the necessary bride-price, the husband seems to adjust his gift downwards[23].

[23]We did the same analysis using the department of birth of the wife, instead of her department of residence. We have the information only in the second wave of the panel: therefore we can have the rainfall deviations only for people which have been followed between the two waves. It restricts the sample to 622 women. Results using the department of birth of the wife are similar, except that negative rainfall shocks do not have a significant impact on the amount of gift. It seems reasonable since this is the groom that has to collect the gift. Results hold also if the sample is restricted to first marriages.

Table 3.7: Impacts of Rainfall Shocks

	Age at marriage	Amount of bride price	Amount of cadeau	Positive bride price	Positive Cadeau
Negative shock at 16, 17 or 18 years old	4.7971***	-3.3877	-16.6991*	-0.0377	-0.0051
	(0.48)	(14.04)	(10.11)	(0.04)	(0.05)
Positive shock at 16, 17 or 18 years old	-1.2838***	4.3967	-5.9810	0.0067	-0.0379
	(0.45)	(11.29)	(7.49)	(0.03)	(0.04)
Wife lives in a rural place	-1.7282***	26.2164**	25.3745**	0.0288	0.1027**
	(0.52)	(13.01)	(10.42)	(0.04)	(0.05)
Wife with some primary education	0.3394	26.3778**	40.7486***	-0.0688*	0.1719***
	(0.48)	(12.22)	(11.29)	(0.04)	(0.05)
Wife with secondary or superior education	1.3936**	137.1997***	66.2189***	0.0561	0.1623**
	(0.63)	(23.29)	(15.36)	(0.05)	(0.06)
Constant	19.4856***	138.2130***	66.0758***	0.8177***	0.4975***
	(0.75)	(22.41)	(18.88)	(0.06)	(0.08)
Region and marriage year FE	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes
N	690	690	690	690	690
Dep. Var. mean	20.54	120.23	67.78	0.84	0.62
st. dev.	5.47	139.67	99.33	0.37	0.49
r2	0.34	0.14	0.14	0.07	0.10

* p<0.10, ** p<0.05, *** p<0.01.

Note:The table reports estimates of the effects of rainfall shocks on the age at marriage and the marital payments. OLS estimates are reported in the first 3 columns, logit estimates in the last 2 columns. Amounts are expressed in 1000 FCFA 2005. All models include controls for the year of marriage, the wife's ethnic group and education. Standard errors in parentheses.
Sample: Women who married between 1996 and 2006, and who are born after 1966 (in order to have rainfall data when they were 16 years old).

In total, the results presented on the correlates of marriage payments are consistent with the interpretation that bride-prices are in large part determined by local norms while gifts seem more related to wife's and husband's characteristics. Unexplained variance could be ascribed to two non-exclusive factors: a first one is measurement error. Indeed, even if we restricted the sample to relatively recent marriages, the recall or reporting might be imperfect. The other possibility is that of the role of unobservable characteristics such as the kindness of the husband, the value he attaches to his wife to be, the outside options on the marriage market of this particular woman. Analyzing how those transfers correlate with welfare outcomes of the wife after marriage will help us assessing whether noise dominates or whether the payments recorded carry relevant signal, above and beyond the one contained in observable characteristics.

3.5 Wives' wellbeing

3.5.1 Empirical strategy

The objective is here to study how various measures of women's individual welfare correlate with the various marital payments, controlling for observable characteristics. We estimate the

following linear equation:

$$Y_{i,h,m} = \alpha_0 + \beta_1 G_i + \beta_2 BP_i + \beta_3 T_i + \gamma X_{i,h,m} + \mu_r + \nu_t + \varepsilon_{i,h} \tag{3.3}$$

where subscripts i, h, m and r denote respectively individual, household, husband and region[24]. $Y_{i,h,m}$ represents an indicator of the wife's wellbeing in her household. G_i is the gift she received at marriage, BP_i, the bride-price paid and T_i the value of the trousseau. $X_{i,h,m}$ are controls on the wife, her household and her husband. μ_r are regional dummies and ν_t dummies for the marriage year. $\varepsilon_{i,h,m}$ is the error term, clustered at the husband level.

A first set of proxies for the wife's wellbeing measures her access to household's resources. As indicated in section 3.3, we look at two different variables. On the one hand, we consider the ratio of per adult-equivalent non-food consumption of the wife's cell to the mean per adult-equivalent non-food consumption of the household[25]. On the other, we use the share of the individual consumption of the wife's cell that is financed by the husband. For this latter outcome, we focus on women who are coresiding with their husband and limit the sample to wives who are not registered in the same cell as their husbands (mainly wives of household heads), as the survey design insures that their consumption is collected separately from that of their husband. A second set of outcomes includes a number of non-monetary proxies of the strength of the wife's position in the household: the probability to have become polygamous since marriage and the coresidence with in-laws (remaining monogamous and obtaining a dwelling independent from the in-laws are very clearly preferred living arrangements) and the time interval between marriage and firth birth, as a measure of fertility pressure. Given that women in this sample married rather recently, we cannot investigate the correlates of their children's educational outcomes.

We control for the logarithm of total consumption per capita of the household, the number of children and adults of the household and of the cell, the status of the wife in her household (wife of a monogamous man, first wife of a polygamous man, or wife of higher rank, except when we consider polygamy as an outcome), as well as for characteristics that appeared as important determinants of the marriage payments: education of the wife, the age at marriage and the type of activities of her father, and of the groom himself.

[24]There are 12 regions represented in our sample, out of a total of 14 in Senegal.

[25]Per adult equivalent consumption is computed using the following (arbitrary) equivalence scale: 1 for adults and 0.5 children 0-14 years old.

We are not claiming that the relation between the payments and the welfare measures of the wife should be causal. As underlined in the conceptual framework, unobserved characteristics of the wife and the husband might well affect both the existence and level of marriage payments and the access to household resources or generally the bargaining position of the wife. It is still of interest to exhibit regularities in these relations and use the conceptual framework developed above to interpret them.

3.5.2 Results

3.5.3 Main Specification

Table 3.8 shows that the wife's relative access to non-food consumption in the household is positively related to the value of the *cadeau* received, but neither to the bride-price paid or to the *bagage* brought in the household, once controlling for the wife's education and occupation of her father and husband[26]. For the sample of the women whose cell is not the one of their husband (Table 3.9), the results are qualitatively similar, but the significance of the coefficient of the *cadeau* disappears when we control simultaneously for other marital payments. When looking at the financial support of the husband, the correlation with the *cadeau* is positive and significant, including when we control for the other payments, while, here again, this is not the case for the bride price.

The magnitude of the association between the *cadeau* and the financial support of the husband is not negligible. A gift 100000 CFA Francs higher (about one standard deviation of the distribution of gift amounts, including zeros) increases the financial support of the husband by nearly 4.4 percentage points, i.e. 9% of the mean). This is true controlling for a number of variables that are likely to capture the income of the husband (household per capita consumption, husband's occupation, wife's father's occupation), and for any other significant correlates of the amount of the *cadeau*. The wealth of the husband's household of origin is probably not at play either here, as it would also generate a correlation with the bride-price. It rather suggests that this correlation is driven by unobserved characteristics explaining both the importance of the *cadeau* and the financial support provided by the husband to his wife. Those unobservables might relate to the specificity of the match between these two persons, such as her ex-ante

[26]Considering relative food consumption, as shown in table A-3.5 in the appendix, we do not find any significant difference, which is linked to the fact that, as noted above, food consumption is rather equally shared within the household.

bargaining power, or the love of her husband. The correlation between the husband financial support and the *bagage* is also strong, even if it looses statistical significance when other marital payments are controlled for. This might not come as a surprise since part of the gift can be used to fund the *bagage*. In any case, the correlation with the bride price is very low and never statistically significant.

The amount of the gift is correlated with a lower probability of coresidence with the in-laws (Table 3.10). It is not significantly (but positively) correlated with the probability of the husband having taken a new wife since the marriage and having thereby become a polygamist. Note that, on average, husbands take a second wife 10 years after their first marriage, so that the time interval we consider might be too narrow to detect a significant correlation[27]. Concerning time interval before first birth, we use a Cox model, including an interaction between the marital payments and the time (in years) since the proportional hazard assumption is not respected (Table 3.11). A higher *cadeau* is associated with a longer time between marriage and first birth (since the hazard ratio is inferior to 1), which implies a lower pressure on fertility. This effect decreases over time, as could be expected, since giving birth is one of the marital obligations. The same is true for the bride price, although the risk reduction is lower than that brought by a *cadeau*.

The conceptual framework presented above gives reading keys for those results. The *cadeau* is the marriage payment for which the husband benefits from some individual margin of manoeuvre, and through which he can express his kindness or endearment and/or through which he commits to future good behavior. It translates into rather positive outcomes for the wife, in particular a relatively good access to household's resources and better living arrangements. Since we control for various observable variables in the above regressions and in particular for the per capita consumption in the household, it suggests that unobservable variables, such as the husband's love for his wife, indeed play a role to explain both the level of the *cadeau* and the future welfare of the wife. Conversely, bride-price which appears to be strongly based on social norms and rather little individualized does not seem to correlate at all with the wife's bargaining power in her marital household. These results suggest that the *cadeau* is a more powerful predictor of the wife's position in her household than the bride-price.

[27] The probability of polygyny is estimated on all women who married as a monogamous in the first place, and hence are either still in a monogamous union or are the senior wife in polygamous unions at the time of the survey.

Table 3.8: Relative non food consumption of the wife's cell in the household

	(1)	(2)	(3)	(4)
Deflated amount of Cadeau	0.5982***			0.5810***
	(0.16)			(0.17)
Deflated amount of Bride price		0.1508		0.1489
		(0.12)		(0.12)
Deflated amount of Bagage			0.3826	0.1551
			(0.24)	(0.24)
Wife with some primary education	0.1040**	0.1178***	0.1166***	0.0999**
	(0.04)	(0.04)	(0.04)	(0.04)
Wife with secondary or superior education	0.1883***	0.1942***	0.2015***	0.1690***
	(0.05)	(0.05)	(0.05)	(0.05)
Age of the wife at marriage	0.0029	0.0025	0.0024	0.0035
	(0.00)	(0.00)	(0.00)	(0.00)
Log of the expenditures of the hh pc	-0.1119***	-0.1025***	-0.1029***	-0.1178***
	(0.03)	(0.03)	(0.03)	(0.03)
Wife lives in a rural place	0.0394	0.0501	0.0497	0.0335
	(0.05)	(0.05)	(0.05)	(0.05)
Constant	2.4489***	2.3369***	2.3445***	2.4857***
	(0.34)	(0.34)	(0.34)	(0.34)
Region and marriage year FE	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes
Controls Husband	Yes	Yes	Yes	Yes
Controls Composition	Yes	Yes	Yes	Yes
N	751	751	751	751
Dep. Var. Mean	1.01	1.01	1.01	1.01
St. Dev.	0.42	0.42	0.42	0.42
r2	0.18	0.16	0.16	0.18

* p<0.10, ** p<0.05, *** p<0.01.

Note: OLS estimates, Dependent variable: ratio of the wife's cell per equivalent adult non food expenditure on that of the household. Equivalence scale: 0.5 per child under 15 years old and 1 per adult.

Marital payments amounts are expressed in millions FCFA 2005. "Other Controls" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" cover the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household and in the cell, and whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parenthesis.

Sample: Women who married between 1996 and 2006. Source: PSF1

Table 3.9: Consumption Outcomes - Wives who are not in the cell of their husband

	Relative non food consumption of the wife's cell in the household				Share of wife's cell expenditures financed by the husband			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Deflated amount of Cadeau	0.3632*			0.2969	0.5068**			0.4440*
	(0.20)			(0.20)	(0.23)			(0.24)
Deflated amount of Bride price		0.1190		0.0702		0.2420		0.1951
		(0.14)		(0.14)		(0.16)		(0.16)
Deflated amount of Bagage			0.5491**	0.4232			0.6682**	0.4386
			(0.26)	(0.26)			(0.33)	(0.32)
Wife with some primary education	0.0838	0.0920*	0.0919*	0.0827	-0.0033	0.0068	0.0086	-0.0067
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)
Wife with secondary or superior education	0.1733***	0.1791***	0.1699**	0.1517**	-0.1117	-0.1120	-0.1124	-0.1479*
	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)
Age of the wife at marriage	0.0028	0.0027	0.0027	0.0033	-0.0082***	-0.0081***	-0.0084***	-0.0072***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Log of the expenditures of the hh pc	-0.1154***	-0.1122***	-0.1145***	-0.1211***	0.0102	0.0123	0.0126	0.0003
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Wife lives in a rural place	0.0273	0.0389	0.0296	0.0192	0.0725	0.0870	0.0778	0.0612
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)
Constant	2.4055***	2.3650***	2.3805***	2.4389***	0.5160	0.4751	0.4739	0.5767
	(0.40)	(0.40)	(0.40)	(0.41)	(0.48)	(0.48)	(0.48)	(0.48)
Region and marriage year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls Husband	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls Composition	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of married women	465	465	465	465	465	465	465	465
Dep. Var. Mean	0.98	0.98	0.98	0.98	0.49	0.49	0.49	0.49
St. Dev	0.40	0.40	0.40	0.40	0.44	0.44	0.44	0.44
r2	0.20	0.19	0.20	0.21	0.22	0.22	0.22	0.23

* p<0.10, ** p<0.05, *** p<0.01.

Note: OLS estimates. Dependent variable, columns (1) to (4): ratio of the wife's cell non food expenditure per equivalent adult to that of the household, equivalence scale: 0.5 per child under 15 years old and 1 per adult. Columns (5) to (8): share of wife's cell expenditures financed by the husband.

Marital payments amounts are expressed in millions FCFA 2005. "Other Controls" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" include the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household and in the cell, and whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Sample: Women who are not in the cell of their husband, and who married between 1996 and 2006. Source: PSF1

Table 3.10: Coresidence Outcomes

	Coresidence with in-laws	Polygamous union
Deflated amount of Cadeau	-2.2523**	1.2370
	(1.07)	(2.58)
Deflated amount of Bride price	0.3708	-2.9673
	(0.77)	(3.04)
Deflated amount of Bagage	5.7171***	3.7170
	(1.48)	(3.14)
Wife with some primary education	-0.2785	-2.7791***
	(0.25)	(1.01)
Wife with secondary or superior education	-0.2407	-2.0932**
	(0.41)	(0.95)
Age of the wife at marriage	-0.0529***	0.0559
	(0.02)	(0.04)
Log of the expenditures of the hh pc	-0.3783**	-0.4175
	(0.19)	(0.44)
Wife lives in a rural place	0.1618	-0.0509
	(0.30)	(0.65)
Constant	4.7936*	4.7753
	(2.62)	(6.35)
Region and marriage year FE	Yes	Yes
Other Controls	Yes	Yes
Controls Husband	Yes	Yes
Controls Composition	Yes	Yes
N	744	442
Dep. var. Mean	0.36	0.07
St. Dev.	0.48	0.25
r2_p	0.24	0.34
chi2	155.06	79.72

* p<0.10, ** p<0.05, *** p<0.01.

Note: Logit estimates. Dependent variables: column (1): dummy equals to 1 if the woman co-resides with the father or the mother-in-law; column (2): dummy equals to 1 for women currently in a polygamous union while having originally married as a monogamous.

Marital payments amounts are expressed in millions FCFA 2005. "Other Controls" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" include the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household and in the cell, and, in column (1) only, whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses

Sample: Women who married between 1996 and 2006. For column (2), women who married between 1996 and 2006 and who are first wives, the husband being in a polygynous union or not. Source: PSF1

Table 3.11: First birth

	First birth
Deflated amount of Cadeau	0.1929**
	(0.13)
Deflated amount of Bride price	0.3605*
	(0.21)
Deflated amount of Bagage	1.5528
	(1.42)
Cadeau*Time	1.0482***
	(0.02)
Bride Price*Time	1.0462**
	(0.02)
Bagage*Time	0.9949
	(0.03)
Wife with some primary education	1.2027
	(0.14)
Wife with secondary or superior education	1.3166
	(0.24)
Age of the wife at marriage	0.9688***
	(0.01)
Log of the expenditures of the hh pc	0.7381***
	(0.06)
Wife lives in a rural place	0.9113
	(0.13)
Region and marriage year FE	Yes
Other Controls	Yes
Controls Husband	Yes
Controls Composition	Yes
N	1666
Dep. Var. Mean	31.56
St. Dev.	23.21
r2_p	0.04
chi2	58285.75

* p<0.10, ** p<0.05, *** p<0.01.

Note: Cox estimates. Dependent variable: number of months between marriage and first birth.

Marital payments amounts are expressed in millions FCFA 2005. "Time" is the number of year since marriage. "Other Controls" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" include the occupation of the husband. "Controls Composition" include whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Sample: Women who married between 1996 and 2006. The number of observations corresponds for each wife to all the years since marriage and before the first birth or until survey year if still childless. Source PSF1

3.6 Robustness Analysis

The sample used in the main analysis includes all women, whose marriage took place in the 10 years preceding the survey. We chose to restrict ourselves to this period in order to limit recall difficulties. We can nevertheless conduct the same analysis extending the sample. Further, those women are very heterogeneous in terms of their marriage: for a number of them, the marriage we observed is not the first one, not all of them co-reside with their husband and finally some women, because their husband is not the household head and is monogamous are registered in his cell. Situation are not exogenous and might be associated with specific marriage payments patterns. We therefore repeat the previous analysis varying the sample used to check the robustness of the results obtained so far. The table 3.12 displays for the various outcomes the coefficients of the three types of marital payments obtained when replicating the analysis on different sub-samples. The first column repeats the main results.

3.6.1 Selection on the year of marriage

We first extend the sample to all women who married in the fifteen years before the survey. Results are extremely consistent. As shown in the second column of table 3.12, the *cadeau* is positively correlated with the relative non food consumption of the wife, and with the financial support of the husband for women heading their cell and not in the same cell as their husband. Results are also similar for the other outcomes (except for the duration between marriage and first birth, where the correlation is no more significant), the gift being linked positively with favorable welfare outcomes.

3.6.2 First marriages

For the main analysis of the paper, we focus on all marriages to avoid selection effects. Nevertheless, it mixes two situations than can be very different, the first marriage and further marriages. Indeed, second marriages are relatively frequent in Senegal, following widowhood or divorce. And women who remarry differ from women in their first marriage in a number of dimensions (see Table A-3.6 in the appendix). Furthermore, first marriages are characterized by a higher involvement of the family of both spouses in the match. For this reason, we expect them to go hand in hand with specific characteristics in terms of marital payments.

As visible in Table A-3.7 in the appendix, marital payments can more often be dispensed with in case of re-marriage. Bride price and *bagage* in particular are much less frequent in case of re-marriage than for first marriages. By contrast, the occurrence of *cadeau* is only slightly

Table 3.12: Wives' welfare outcomes and marriage payments, using different samples

	Main sample	15 years	First marriages	Coresident
	(1)	(2)	(3)	(4)
Relative consumption of the wife				
Deflated amount of Cadeau	0.581***	0.364**	0.587***	0.393*
	(0.17)	(0.15)	(0.18)	(0.21)
Deflated amount of Bride price	0.149	0.145	0.169	0.163
	(0.12)	(0.10)	(0.13)	(0.15)
Deflated amount of Bagage	0.155	0.050	-0.003	0.045
	(0.24)	(0.21)	(0.24)	(0.30)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	1.01	0.98	1.02	1.00
N	751	989	638	521
r2	0.18	0.13	0.18	0.22
Relative consumption of the wife, different cell				
Deflated amount of Cadeau	0.297	0.155	0.292	-0.111
	(0.20)	(0.17)	(0.21)	(0.21)
Deflated amount of Bride price	0.070	0.034	0.091	0.000
	(0.14)	(0.11)	(0.17)	(0.16)
Deflated amount of Bagage	0.423	0.354*	0.246	0.289
	(0.26)	(0.21)	(0.26)	(0.29)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.98	0.95	0.99	0.94
N	465	660	370	310
r2	0.21	0.15	0.21	0.32
Share of the wife's cell expenditures financed by the husband				
Deflated amount of Cadeau	0.444*	0.390*	0.478*	0.518**
	(0.24)	(0.20)	(0.25)	(0.25)
Deflated amount of Bride price	0.195	0.056	0.234	0.159
	(0.16)	(0.13)	(0.17)	(0.20)
Deflated amount of Bagage	0.439	0.340	0.410	0.030
	(0.32)	(0.27)	(0.34)	(0.38)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.49	0.49	0.54	0.61
N	465	660	370	310
r2	0.23	0.19	0.19	0.26
Coresidence with in-laws				
Deflated amount of Cadeau	-2.252**	-2.417**	-2.398**	-2.009
	(1.07)	(1.00)	(1.10)	(1.26)
Deflated amount of Bride price	0.371	0.436	0.283	-0.129
	(0.77)	(0.64)	(0.77)	(0.90)
Deflated amount of Bagage	5.717***	5.677***	5.121***	3.638*
	(1.48)	(1.33)	(1.52)	(1.93)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.36	0.34	0.41	0.46
N	744	982	632	514
r2_p	0.24	0.24	0.21	0.30
Polygamous household				
Deflated amount of Cadeau	1.237	0.824	1.638	3.304
	(2.58)	(1.68)	(2.77)	(2.98)
Deflated amount of Bride price	-2.967	-1.151	-1.821	-10.553
	(3.04)	(1.38)	(2.79)	(7.53)
Deflated amount of Bagage	3.717	-0.067	3.059	6.590
	(3.14)	(2.00)	(3.93)	(6.06)
Controls Individual	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.07	0.10	0.06	0.07
N	442	690	408	336
r2_p	0.34	0.27	0.33	0.52
Hazard ratio first birth				
Deflated amount of Cadeau	0.193**	0.542	0.146***	0.125**
	(0.13)	(0.29)	(0.11)	(0.11)
Cadeau*Time	1.048***	1.020+	1.052***	1.075***
	(0.02)	(0.01)	(0.02)	(0.03)
Deflated amount of Bride price	0.360*	0.852	0.514	0.291*
	(0.21)	(0.31)	(0.32)	(0.21)
Bride Price*Time	1.046**	1.007	1.039*	1.057***
	(0.02)	(0.01)	(0.02)	(0.02)
Deflated amount of Bagage	1.553	0.887	2.167	1.943
	(1.42)	(0.67)	(1.92)	(1.95)
Bagage*Time	0.995	1.019	0.986	0.995
	(0.03)	(0.02)	(0.03)	(0.03)
Controls Individual	Yes	Yes	Yes	Yes
Dep. Var. Mean	32.52	38.30	31.26	30.13
N	1680	2526	1366	1108
chi2	58,285.75	200.13	39,279.92	25,091.77

* p<0.10, ** p<0.05, *** p<0.01.

Note: *First panel*: OLS, Dependent variable: the ratio of the wife's cell non food expenditure per equivalent adult to that of the household. Equivalence scale: 0.5 per child under 15 years old and 1 per adult. *Second panel*: same as the first panel, but restricted to wives not recorded in the cell of their husband. *Third panel*: OLS, Dependent variable: share of wife's cell expenditures financed by the husband. *Fourth panel*: logit, Dependent variable: coresidence with the father or the mother-in-law. *Fifth panel*: logit, Dependent variable: probability to be in a polygynous union at the time of the survey while having married as a monogamous. *Sixth panel*: Cox Model estimates, Dependent variable: number of months between marriage and the first birth.

Marital payments amounts are expressed in millions FCFA 2005. Controls : age and education of the wife, year of marriage, occupation of the wife's father, wife's ethnic group, occupation of the husband, number of children (except in the last panel), number of adults in the household and in the cell, the logarithm of the household consumption per capita, and (expect in the 5th panel) whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Sample: Column (1): women who married between 1996 and 2006. Column (2): women who married between 1991 and 2006. Column (3), women who married between 1996 and 2006, observed in their first marriage. Column (4), women who married between 1996 and 2006, who coreside with their husband. The second and third panel are estimated only on wives not recorded in the cell of their husband, and the fifth on women of first rank whether polygamous or monogamous.. Source: PSF1.

decreased by the number of marriages.

Results on the correlation between marital payments and wife's welfare outcomes are presented for women in their first marriages in the third column of table 3.12. The correlation between the *cadeau* and the relative non food consumption of the wife is positive and significant in this sub-sample as well. As for the main sample, significance disappears when restricting the analysis to those who are registered in an independent cell[28]. The correlation between the *cadeau* and the financial support of the husband remains significantly positive. For these women, the *cadeau* is also correlated with lower fertility pressure and lower likelihood of coresidence with the in-laws.

3.6.3 Selection on the residence status

We also test whether the results obtained hold when restricting the sample to women coresiding with their husband. Non-coresidence happens either very early in the marriage, before the newlyweds are allowed to settle together (after the bride-price is fully paid and when the husband had the means to provide a home to his wife), or when the husband commutes between his rural home and his urban job, therefore having two separate households, or finally when the wife has obtained an independent dwelling, in particular when joining a polygamous household. It is to be expected that this set of women differs from co-residing ones. In fact, table A-3.8 in the appendix shows that non-coresiding women are older at marriage, more likely to reside with one of their parent and more likely to be in a polygamous union.

In addition, bride price and *bagage* are more frequently exchanged when the wife is coresiding with the husband, as seen in Table A-3.9 in appendix. It is consistent with qualitative interviews according to which one condition for the bride to join the conjugal home is that every payment has been made. They are also larger in case of co-residence. Interestingly, neither the occurrence nor the amount of the *cadeau* are significantly different according to coresidence status: it underlines that the logic explaining the amount of gift is very different of the one explaining the amount of bride price.

Results on the relation between marital payments and wife's welfare are replicated for the sample of co-residing wives in the last column of table 3.12. They are very close to those obtained with the original sample. The gift is positively and significantly related to the relative non food consumption of the cell of the wife (the correlation being even negative, although not sig-

[28] Women in their first marriage who are not head an independent cell are mainly either recently married and still residing with their parents or married to a man who himself is still a member of his parental household.

nificantly different from zero when considering only women who are not in the cell of their husband). The *cadeau* is also still positively and significantly correlated with the husband financial support. Qualitatively, the coefficients of marital payments in the regression describing the probability of coresidence with in-laws are similar to those obtained in the main sample, even if the coefficient attached to the gift lost its statistical significance. Fertility pressure is significantly reduced by a large gift to a similar extend in this sample, compared to the main one.

3.6.4 Selection on the relationship to the cell

To look at the husband financial support we need to consider women who are not registered in their husband's cell. It is noticeable that for this sub-sample, results on relative non food consumption of the wives are never statistically significant. We therefore compare wives who are in a different cell than the one of their husband and those who are registered with their husband. Number of differences emerge, as shown in the Table 3.13, that might explain why results are altered for this sample. Women who are not in the cell of their husband belong to richer households and have a lower relative consumption[29]. They are very often wives of household head and more frequently in a polygamous union. It could explain the different results.

3.6.5 Heterogeneity by consumption level

A natural question is whether the correlations presented so far differ for richer and poorer households. When considering separately households whose consumption per capita is below ("poor") or above ("rich") the median, we see in particular that bride prices are paid as often in both groups, while there are many more occurrence of no-gift in poor households. This is graphically apparent in the figures 3.2 and 3.1, that represent the density of the amount of bride price and gift paid, separately for the two groups of households. The discrepancy between the two samples is higher for the gift, with in particular a greater distance between the two curves at 0 for the *cadeau* (figure 3.2) than for the bride price (figure 3.1). It is in line with the existence of a quasi-obligation to pay a bride price that does not apply to the *cadeau*, for which the grooms have more room for manoeuvre. This is also consistent with the greater impact of husband's income on the gift (prediction (2)).

[29]The Table A-3.10 in appendix presents the same descriptive statistics for the sample of coresiding women. Results are similar.

Table 3.13: Characteristics of the wives according to whether they are recorded in the same cell than their husband or not

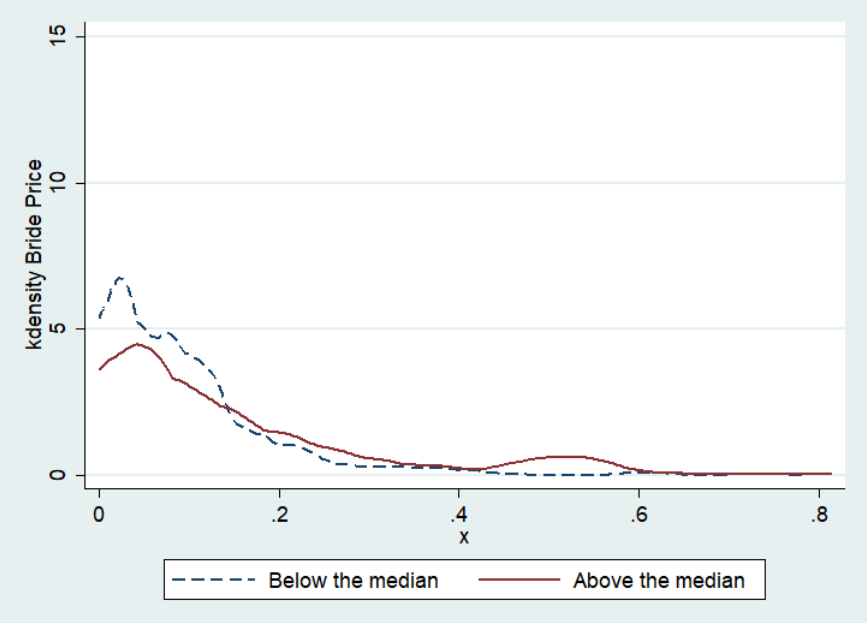
Variables	Different cell	Same cell	Diff.
Household head's wife	0.62	0.01	-0.61***
			(0.00)
Wife with some primary education	0.23	0.24	0.02
			(0.55)
Wife with secondary or superior education	0.12	0.12	0.00
			(0.98)
Age of the wife at marriage	23.18	21.19	-1.99***
			(0.00)
Age Difference between spouses	13.19	9.00	-4.19***
			(0.00)
Relative non food consumption of the wife	0.98	1.05	0.07**
			(0.04)
Log of the expenditures of the hh pc	12.40	12.19	-0.21***
			(0.00)
Wife lives in a rural place	0.52	0.48	-0.04
			(0.25)
In a monogamous union	0.65	0.93	0.29***
			(0.00)
In a polygamous union, first rank	0.06	0.00	-0.06***
			(0.00)
In a poly. union, sec. or further rank	0.29	0.06	-0.23***
			(0.00)
N	465	286	751

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women married between 1996 and 2006.

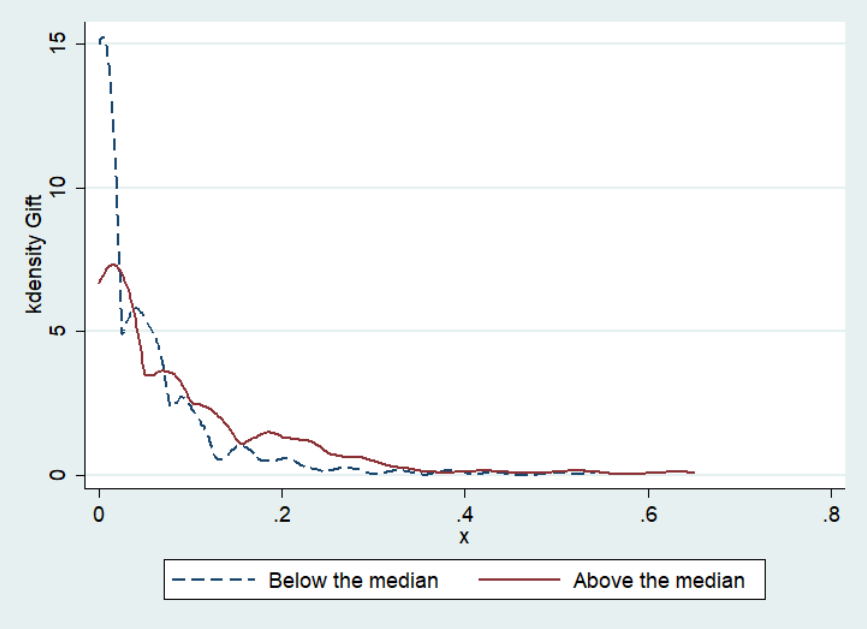
Standard errors in parentheses.

Figure 3.1: Density function of the bride price according to 2-quantile of household per capita consumption



Note: Density function of the amount of bride price, separately for individuals whose household consumption per capita is below the median and above. Sample: Women married between 1996 and 2006, observed in their first marriage.
Source: PSF1.

Figure 3.2: Density function of the gift according to 2-quantile of household per capita consumption



Note Density function of the amount of *cadeau*, separately for individuals whose household consumption per capita is below the median and above. Sample: Women married between 1996 and 2006, observed in their first marriage.
Source: PSF1.

Running our main analysis on those two samples separately, the positive link between the *cadeau* and the relative non food consumption of the wife appears significant for both groups. The bride price plays in opposite direction for both group, positively and significantly for the richest group, negatively, but not significantly so, for the poorest (Table 3.14). Focusing on the husband support (Table 3.15), results are significant only for the wealthiest group (and at the 12% level), which is consistent with the fact that it is easier for richer husbands to send the signal, since they have enough financial resources to pay a *cadeau* once the mandatory bride price is paid.

Table 3.14: Relative non food consumption of wife's cell according to household consumption level

	All women		Not in the cell of their husband	
	Below the median of hh conso.	Above	Under the median of hh conso.	Above
Deflated amount of Cadeau	0.8805***	0.5519**	0.1162	0.4004
	(0.32)	(0.22)	(0.29)	(0.30)
Deflated amount of Bride price	-0.2890	0.2695*	-0.1632	0.1349
	(0.19)	(0.15)	(0.22)	(0.21)
Deflated amount of Bagage	-0.4569	0.4795	-0.1661	0.4907
	(0.38)	(0.34)	(0.48)	(0.35)
Wife with some primary education	0.1600**	0.0623	0.1166	0.0428
	(0.06)	(0.06)	(0.07)	(0.07)
Wife with secondary or superior education	0.1331	0.1205*	0.3787***	0.0807
	(0.15)	(0.07)	(0.15)	(0.09)
Age of the wife at marriage	0.0010	0.0057**	0.0006	0.0037
	(0.00)	(0.00)	(0.00)	(0.00)
Log of the expenditures of the hh pc	-0.0900	-0.1302***	-0.1091	-0.1221*
	(0.06)	(0.05)	(0.08)	(0.07)
Wife lives in a rural place	0.0699	-0.0146	0.0924	-0.0320
	(0.07)	(0.08)	(0.09)	(0.09)
Constant	2.2901***	2.6026***	2.4187**	2.5524***
	(0.72)	(0.64)	(0.96)	(0.86)
Region and time FE	Yes	Yes	Yes	Yes
Other Controls Wife	Yes	Yes	Yes	Yes
Controls Husband	Yes	Yes	Yes	Yes
Controls Composition	Yes	Yes	Yes	Yes
Number of married women	377	374	233	232
Mean	1.01	1.00	1.00	0.96
Standard Deviation	0.41	0.43	0.38	0.42
r2	0.23	0.23	0.26	0.30

* p<0.10, ** p<0.05, *** p<0.01.

Note: OLS estimates. Dependent variable: ratio of the wife's cell non food expenditure per equivalent adult to that of the household. Equivalence scale 0.5 for a child under 15 years old and 1 for an adult.

Sample: Two first columns: Women who married between 1996 and 2006. Two last columns: Wives not recorded in the cell of their husband who married between 1996 and 2006. Odd columns: women in households whose per adult equivalent consumption is below the median; Even columns: those with consumption above the median.

Marital payments amounts are expressed in millions FCFA 2005. "Other Controls Wife" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" include the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household, and whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Source: PSF1.

Table 3.15: Heterogeneity according to HH conso - Wives not in the cell of their husband

	Financial Support of the Husband	
	Under the median of hh conso.	Above
Deflated amount of Cadeau	0.4115	0.5028+
	(0.36)	(0.31)
Deflated amount of Bride price	0.4457*	0.0565
	(0.25)	(0.20)
Deflated amount of Bagage	1.0861	0.3735
	(0.74)	(0.34)
Wife with some primary education	0.1090	0.0031
	(0.09)	(0.07)
Wife with secondary or superior education	-0.2010	-0.1464
	(0.14)	(0.09)
Age of the wife at marriage	-0.0035	-0.0099**
	(0.00)	(0.00)
Log of the expenditures of the hh pc	0.1292+	-0.0871
	(0.08)	(0.07)
Wife lives in a rural place	0.2139**	0.0392
	(0.11)	(0.09)
Constant	-1.0751	1.6543*
	(0.97)	(0.99)
Region and time FE	Yes	Yes
Other Controls Wife	Yes	Yes
Controls Husband	Yes	Yes
Controls Composition	Yes	Yes
Number of married women	233	232
Mean	0.52	0.47
Standard Deviation	0.44	0.44
r2	0.36	0.31

+ $p<0.12$, * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Note: OLS estiamtes. Dependent variable: share of the wife's expenditures financed by her husband. First column: women in households whose per adult equivalent consumption is below the median; Second column: those with consumption above the median.

Marital payments amounts are expressed in millions FCFA 2005. "Other Controls Wife" include dummies for the occupation of the father of the wife and for the ethnic group of the wife. "Controls Husband" include the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household, and whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Sample: Wives not recorded in the cell of their husband who married between 1996 and 2006. Source: PSF1

3.7 Conclusion

This paper analyzes the links between the different marriage payments and the welfare of the wife in her marital household, as measured by her access to household resources, the marital living arrangements, and the fertility pressure she faces. Using a dataset that uniquely records all the payments exchanged between the families and the future spouses at the time of marriage, we dig into the multiplicity of marital payments in Senegal and exhibit clear differences in both the way they are determined and the way they correlate with married women's welfare.

We show that the *cadeau* received directly by the wife from her husband and the bride-price paid to the bride's family depart from each other in the fact that the first one is rather individualized, while the level of the bride-price seems to respond to social norms that cannot easily be escaped. Our conceptual framework rationalizes how those differences translate into contrasting patterns of correlation with the wife's welfare: while there exist a clear link between the *cadeau* the wife received from her husband at marriage and our various measures of her current welfare, no such a link can be exhibited for the bride price.

Obviously, the amount of the marital payments are endogenous and regarding the *cadeau*, it seems that the unobserved source of endogeneity is positively correlated with both the size of the gift and the woman access to household's resources, or more generally her welfare in the household. Guided by our conceptual framework, we interpret this as to be mainly due to how strong is the amity or the love of the husband for his wife. As a result, because it reflects better the relation between spouses, the *cadeau* is likely to be a better proxy of wife's bargaining power than the bride-price in the context studied in this paper.

Acknowledgments

We are grateful to Richard Akresh and Catherine Guirkinger for detailed comments and to participants at Paris School of Economics seminar and CSAE 2018 for insightful discussions.

Appendix

Table A-3.1: Correlation coefficients between the different marital payments

	Marital payments		
	Bride-Price (1000 FCFA 2005)	Cadeau (1000 FCFA 2005)	Bagage (1000 FCFA 2005)
Bride-Price (1000 FCFA 2005)	1.00		
Cadeau (1000 FCFA 2005)	0.06*	1.00	
Bagage (1000 FCFA 2005)	0.26***	0.26***	1.00
Observations	751		

Note: Sample: Marriages having occurred between 1996 and 2006. Source: PSF1

Table A-3.2: Frequency of marital payments

	Number	Percentage	Cumulated Percentage
All type of marital payments	244	32.49	32.49
Bride Price and Bagage but No Cadeau	109	14.51	47.00
Cadeau and Bagage but No Bride-price	41	5.46	52.46
Cadeau and Bride Price but No Bagage	117	15.58	68.04
Only a Bride Price	141	18.77	86.82
Only a Cadeau	53	7.06	93.87
Only a Bagage	8	1.07	94.94
No marital payment	38	5.06	100.00
Total	751	100.00	

Note: reading: line 1: in 32,49% of the cases, the marriage gave rise to all types of marital payments.
Sample: Marriages having occurred between 1996 and 2006. Source: PSF1

Table A-3.3: Probability of Positive Marriage Payments - Coresident Wives

Marriage Payment	Bride Price Coresident	Cadeau Coresident	Bagage Coresident
Women-to-men ratio in the department	-3.75**	1.09	0.55
	(1.61)	(0.81)	(0.88)
Average of the logarithm of the hh consumption per cap by department	1.98**	-0.43	0.44
	(0.95)	(0.56)	(0.58)
Wife is wolof	0.20	0.06	0.40
	(0.40)	(0.29)	(0.29)
Wife is poular	-0.11	0.54*	0.09
	(0.39)	(0.28)	(0.30)
Characteristics of the Match			
Couple from the same family	0.22	0.27	-0.12
	(0.31)	(0.24)	(0.24)
Couple from the same ethnic group	-0.23	-0.69**	-0.54
	(0.41)	(0.34)	(0.34)
Characteristics of the Families			
Professional status Wife's Father (*ref. independent/informal employee*)			
..... Farmer	0.62	-0.25	-0.58*
	(0.39)	(0.30)	(0.30)
..... State employed/employer	-0.00	0.05	-0.19
	(0.40)	(0.33)	(0.34)
..... Other	-0.97	-1.36	0.00
	(1.28)	(1.11)	(.)
Number of siblings of the wife alive	-0.09	0.10**	0.03
	(0.06)	(0.04)	(0.04)
Parents of the wife alive at marriage	0.27	-0.01	-0.18
	(0.61)	(0.54)	(0.55)
Characteristics of the Wife			
Education (*ref. no education*)			
..... Primary	-0.20	0.51*	0.15
	(0.32)	(0.30)	(0.28)
..... Secondary	0.60	0.12	-0.19
	(0.58)	(0.39)	(0.39)
Age of the wife at marriage	-0.05*	-0.01	-0.02
	(0.03)	(0.02)	(0.02)
Wife lives in a rural place	-0.45	0.06	0.29
	(0.50)	(0.35)	(0.39)
Characteristics of the Husband			
Professional status (*ref. independent/informal employee*)			
..... Farmer	-0.07	0.65*	0.59*
	(0.56)	(0.34)	(0.34)
..... State employed/employer	-0.35	0.30	0.16
	(0.40)	(0.32)	(0.30)
..... Other	-0.56	-0.07	-0.09
	(0.49)	(0.38)	(0.36)
Constant	-17.31	4.00	-5.25
	(11.68)	(7.31)	(7.65)
Region and date FE	Yes	Yes	Yes
Pval_region+date	0.02	0.01	0.00
N	509	513	517
Dependent variable: mean	0.85	0.61	0.63
.....: standard deviation	0.35	0.49	0.48
r2_p	0.16	0.11	0.14
chi2	73.46	64.80	72.72

* p<0.10, ** p<0.05, *** p<0.01.

Note:Logit estimates. Dependent variables: dummies equal to 1 if the marital payment occurred.

Omitted occupation category is that of "independant or informal employee". . Coefficients related to occupation dummies "inactiv" and "unknown" are not displayed because they are never significant, as well as the dummy "unknown" for "Same family" and the dummy "unknown" for "Fathers with same professional status". Standard errors clustered at the husband level in parentheses.

Sample: Women married between 1996 and 2006 and who reside with their husband. Source: PSF1

Table A-3.4: Amount of Marriage Payments - Coresident Wives

Marital Payment	Bride Price Coresident	Cadeau Coresident	Bagage Coresident
Women-to-men ratio in the department	-171.12***	67.45	-1.16
	(54.16)	(54.10)	(32.84)
Average of the logarithm of the hh consumption per cap by department	57.99	-26.21	47.21
	(38.09)	(34.96)	(33.02)
Wife is wolof	37.33*	15.11	15.08
	(19.56)	(16.89)	(14.17)
Wife is poular	-1.82	40.64**	-6.27
	(16.77)	(17.22)	(13.87)
Characteristics of the Match			
Couple from the same family	-19.15	14.42	-3.88
	(14.44)	(14.89)	(11.14)
Couple from the same ethnic group	11.96	-59.07***	-30.80*
	(20.43)	(21.15)	(16.23)
Characteristics of the Families			
Professional status Wife's Father (*ref. independent/informal employee*)			
..... Farmer	9.95	-2.11	-24.88*
	(14.21)	(16.27)	(13.29)
..... State employed/employer	33.98	4.87	-4.81
	(22.64)	(18.29)	(18.69)
..... Other	-28.15	-125.17**	-685.26
	(54.95)	(60.12)	(.)
Number of siblings of the wife alive	-0.36	3.36	-0.28
	(2.62)	(2.24)	(1.94)
Parents of the wife alive at marriage	53.30**	-17.62	3.82
	(20.79)	(34.76)	(21.16)
Characteristics of the Wife			
Education (*ref. no education*)			
..... Primary	7.91	29.06*	11.62
	(16.20)	(15.20)	(12.96)
..... Secondary	111.39***	37.81	12.21
	(28.24)	(26.45)	(22.51)
Age of the wife at marriage	-4.00***	-2.07**	-0.83
	(1.00)	(0.98)	(0.82)
Wife lives in a rural place	-0.36	9.75	28.81*
	(19.31)	(19.59)	(16.05)
Characteristics of the Husband			
Professional status (*ref. independent/informal employee*)			
..... Farmer	38.73**	53.76***	11.11
	(18.04)	(18.84)	(12.45)
..... State employed/employer	24.56	36.73**	19.60
	(20.85)	(17.91)	(16.52)
..... Other	46.80**	8.27	-0.01
	(23.62)	(18.16)	(17.09)
Constant	-402.76	315.71	-537.53
	(493.82)	(454.83)	(422.89)
sigma	135.20***	120.07***	97.30***
	(7.32)	(8.28)	(6.48)
Region and date FE	Yes	Yes	Yes
Pval_region+date	0.02	0.00	0.00
N	521	521	521
Dependent variable: mean	120.43	64.53	53.92
.....: standard deviation	134.73	91.23	72.74
r2_p	0.02	0.02	0.02
F	2.97	1.78	.

* p<0.10, ** p<0.05, *** p<0.01.

Note: Tobit estimates. Dependent variable: amount of marital payments (1000 FCFA 2005).

Omitted occupation category is that of "independant or informal employee". . Coefficients related to occupation dummies "inactiv" and "unknown" are not displayed because they are never significant, as well as the dummy "unknown" for "Same family" and the dummy "unknown" for "Fathers with same professional status". Standard errors clustered at the husband level in parentheses.

Sample: Women married between 1996 and 2006 and who reside with their husband. Source: PSF1

Table A-3.5: Wife's Access to Household Food Consumption

	Food Expenditures of the wife cell per adult eq. / Food Expenditures of the household per adult eq.					
	All women			Women not in their husband's cell		
Deflated amount of Cadeau	0.0049	0.0061	0.0004	-0.0311	-0.0349	-0.0350
	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)	(0.06)
Deflated amount of Bride price			-0.0443			-0.0521
			(0.05)			(0.07)
Deflated amount of Bagage			0.0208			-0.0147
			(0.05)			(0.08)
Log of the expenditures of the hh pc	0.0007	-0.0025	-0.0014	-0.0041	-0.0073	-0.0055
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wife lives in a rural place	-0.0068	-0.0066	-0.0054	0.0071	0.0071	0.0086
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wife with some primary education		-0.0043	-0.0035		-0.0065	-0.0055
		(0.01)	(0.01)		(0.02)	(0.02)
Wife with secondary or superior education		0.0135	0.0181		0.0178	0.0242
		(0.02)	(0.02)		(0.02)	(0.03)
Age of the wife at marriage		0.0010*	0.0008		0.0004	0.0002
		(0.00)	(0.00)		(0.00)	(0.00)
Constant	1.0119***	1.0305***	1.0232***	1.0453***	1.0824***	1.0700***
	(0.11)	(0.12)	(0.12)	(0.16)	(0.17)	(0.17)
Region and marriage year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other Controls Wife	Yes	Yes	Yes	Yes	Yes	Yes
Controls Husband	No	Yes	Yes	No	Yes	Yes
Controls Composition	Yes	Yes	Yes	Yes	Yes	Yes
N	749	749	749	464	464	464
Dep. Var. mean	0.99	0.99	0.99	0.99	0.99	0.99
st. dev.	0.12	0.12	0.12	0.13	0.13	0.13
r2	0.05	0.06	0.06	0.10	0.11	0.11

* p<0.10, ** p<0.05, *** p<0.01.

Note: OLS estimates. Dependent variable: ratio of the wife's cell per adult equivalent food expenditure to that of the household. Equivalence scale: 0.5 per child under 15 years old, 1 per adult. Marital payments amounts are expressed in millions FCFA 2005. "Other Controls Wife" include dummies for the occupation of the wife's father and for the wife's ethnic group. "Controls Husband" include the occupation of the husband. "Controls Composition" include the number of children and the number of adults in the household and in the cell, and whether the wife lives in a monogamous union, is the first wife of a polygamous husband, or is of a higher rank. Standard errors clustered at the husband level in parentheses.

Sample : Three first columns: all women married between 1996 and 2006. Three last columns: Sub-sample of those who are cell's head and not in the cell of their husband.

Table A-3.6: Characteristics of the wives according to whether observed in their first marriage or not

Variables	First Marriage	Not First Marriage	Diff.
Household head's wife	0.38	0.41	-0.02
			(0.62)
Wife with some primary education	0.23	0.25	-0.02
			(0.69)
Wife with secondary or superior education	0.13	0.06	0.07**
			(0.04)
Age of the wife at marriage	20.25	34.67	-14.42***
			(0.00)
Age Difference between spouses	11.27	13.50	-2.23**
			(0.01)
Relative non food consumption of the wife	1.02	0.96	0.06
			(0.19)
Log of the expenditures of the hh pc	12.32	12.31	0.01
			(0.89)
Wife lives in a rural place	0.51	0.50	0.00
			(0.97)
In a monogamous union	0.81	0.43	0.38***
			(0.00)
In a polygamous union, first rank	0.04	0.04	-0.01
			(0.74)
In a poly. union, sec. or further rank	0.15	0.52	-0.37***
			(0.00)
N	638	113	751

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women married between 1996 and 2006.

Standard errors in parentheses

Table A-3.7: Marital Payments, according to whether women are observed in their first marriage or not

Variables	First Marriage	Not First Marriage	Diff.
Positive Bride Price	0.85	0.60	0.25***
			(0.00)
Positive Cadeau	0.62	0.53	0.09*
			(0.08)
Positive Bagage	0.57	0.35	0.21***
			(0.00)
Deflated amount of Bride price	124.50	44.66	79.84***
			(0.00)
Deflated amount of Cadeau	71.04	28.94	42.10***
			(0.00)
Deflated amount of Bagage	52.15	23.18	28.96***
			(0.00)
Number of married women	638	113	751

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women married between 1996 and 2006. Amounts are expressed in 1000 FCFA 2005.

Standard errors in parentheses.

Table A-3.8: Characteristics of the wives according to coresidency status

Variables	Coresiding	Non Coresiding	Diff.
Wife with some primary education	0.22	0.26	-0.04
			(0.23)
Wife with secondary or superior education	0.10	0.15	-0.05*
			(0.06)
Age of the wife at marriage	20.88	25.91	-5.03***
			(0.00)
Coresides with at least one parent	0.05	0.38	-0.33***
			(0.00)
Age Difference between spouses	11.66	11.34	0.32
			(0.68)
Log of the expenditures of the hh pc	12.33	12.31	0.02
			(0.80)
Wife lives in a rural place	0.51	0.50	0.01
			(0.83)
In a monogamous union	0.77	0.71	0.06*
			(0.08)
In a polygamous union, first rank	0.05	0.02	0.03**
			(0.04)
In a poly. union, sec. or further rank	0.18	0.26	-0.08***
			(0.01)
Number of married women	521	230	751

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women married between 1996 and 2006.

Standard errors in parentheses.

Table A-3.9: Marital Payments according to coresidency status

Variables	Coresiding	Non Coresiding	Diff.
Positive Bride Price	0.86	0.71	0.14***
			(0.00)
Positive Cadeau	0.62	0.58	0.04
			(0.30)
Positive Bagage	0.63	0.33	0.30***
			(0.00)
Deflated amount of Bride price	120.43	94.50	25.93**
			(0.02)
Deflated amount of gift	64.53	65.12	-0.59
			(0.94)
Deflated amount of Bagage	53.92	33.90	20.01***
			(0.00)
Number of married women	521	230	751

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women married between 1996 and 2006.

Marital payments amounts are expressed in millions FCFA 2005. Standard errors in parentheses.

Table A-3.10: Characteristics of the wife according to whether she is recorded in the same cell than her husband or not - Coresiding wives

Variables	Different cell	Same cell	Diff.
Household head's wife	0.93	0.01	-0.91***
			(0.00)
Wife with some primary education	0.21	0.24	0.03
			(0.46)
Wife with secondary or superior education	0.10	0.11	0.02
			(0.53)
Age of the wife at marriage	21.68	19.69	-1.99***
			(0.00)
Age Difference between spouses	13.68	8.69	-4.99***
			(0.00)
Relative non food consumption of the wife	0.94	1.09	0.15***
			(0.00)
Log of the expenditures of the hh pc	12.40	12.22	-0.18***
			(0.01)
Wife lives in a rural place	0.54	0.46	-0.08*
			(0.07)
In a monogamous union	0.63	0.98	0.35***
			(0.00)
In a polygamous union, first rank	0.08	0.00	-0.08***
			(0.00)
In a poly. union, sec. or further rank	0.29	0.02	-0.27***
			(0.00)
Number of married women	310	211	521

* p<0.10, ** p<0.05, *** p<0.01.

Note: Sample: Women who married between 1996 and 2006 and who reside with their husband.

Standard errors in parentheses.

Conclusion

This PhD dissertation provides some answers to the question: how does women's welfare and parental welfare vary with marriage entry conditions in West Africa? The first and the second chapter investigate potential determinants of the choice of the partner, namely parental demand for insurance and education. The second and third chapter look at other characteristics, beyond the choice of the partner, that can influence women's welfare during their married life: more precisely education and marital payments exchanged before the ceremony.

In the first chapter, we show that parental demand for insurance can partly explain the frequency of marriages within the kin-group in the context of Senegal. The choice of the partner seems therefore to be impacted by parental preferences. It is potentially affected by other characteristics, such as education. In the second chapter, in the context of Benin, we do not find a significant effect of a school construction program on characteristics of the husband, but there is a clear impact in terms of women's wellbeing. Following the school construction program, the age at marriage of women in rural area increases, and their tolerance to domestic violence in Benin decreases on average. Education seems to impact substantially marital welfare. Other characteristics could be correlated with marital well-being. Indeed, in the third chapter, we show that among the different payments, the gift received by the wife is more linked to women's relative consumption in the household than the bride price that goes to the parents, in the context of Senegal.

This thesis has therefore potential implications in terms of public policy. The second chapter calls of course for an extension of education, which seems to be a priority in political agendas. Achieving universal primary education was the second Millenium Development Goal, whereas now, the emphasis is more on the quality of education which constitutes the fourth Sustainable Development Goal. The first chapter shows that parental demand for insurance is linked with endogamy. Marriage within-kin group means potentially for the child a restriction in the choice of the potential partner: it could be an argument for introducing a public safety net. This asks of course the question of what would occur if a new system, for instance, of pub-

lic insurance, is put in place: will the frequency of this kind of marriage be reduced? What will be the impacts on parents and children, and how the traditional network of insurance will be modified? This is a part of the big question of crowding-in and crowding-out effects of public policies, which has been documented in various contexts(Cox and Jimenez (1992) for instance). In any cases, policy makers must take into account the involvement of these traditional mutual assistance networks in many aspects of life, for example when setting up public insurance policies, in order to correctly assess the potential effects of new reforms. Understanding what happens within the family, the household and the couple is therefore crucial.

This thesis has also methodological implications: the third chapter calls for a more precise analysis and collection of data on marital payments. Methodologically, in some context, taking bride price as a proxy of wife's welfare is not relevant. The gift seems a better measure of unobservable variables at time of marriage that predicts well the wife's welfare years later. It underlines above all also the necessity to consider the context of each country separately, and to avoid abusive generalization in the analysis. Among countries that practice bride prices, customs are very different and potential impacts in terms of welfare could also be very different. We find for example that drought tend to delay marriages in Senegal, when it is not the case for example in rural Tanzania (Corno and Voena (2016)).

Future research

In the first chapter of this PhD thesis we have studied the question of within-family marriages from the parental point of view only. It calls for a study of the impact of marriage within the family from the child's point of view, since the impact can also not be neutral for her.

Furthermore, following this first project, I would also like to extend my research to the analysis of network (family or not) in developing countries, and the links between these networks and personal welfare. We started to collect data for a project with Karine Marazyan, in which we exploit a specific feature of marriage in Senegal. Ceremonies are characterized by the exchange of gifts with kin and neighbors, addressed in majority to the mother of the bride. Interestingly, all these gifts are precisely registered in a notebook and we believe that they are a good representation of the mother's network. We think that road constructions could represent an exogenous shock on the network, as they often imply housing displacements. We plan to look at the impact of road constructions on these women networks using these notebooks.

Finally and more generally, I would also like to investigate the question of assortative matching (in terms of education, but also ethnic group and family). It has been very scarcely studied in the context of developing countries, while the question arises in the same terms as in developed countries. This is also a major question, since it is strongly related to inequalities, and to their transmission and potential amplification over generations.

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