Marriage, Commitment and Unbundling Gendered Norms*

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Abstract

The institutions and cultural norms surrounding marriage are, particularly in developing countries, a core determinant of women's economic and social well-being. We explore the *interaction* of these two broad forces. We focus on the role of marital institutions in constraining husbands in their socially excessive desire to exit the marriage, and we 'unbundle' gender norms into those concerning male dominance in the private sphere, *inside* the household, and the public sphere, *outside* the household. Our simple model illustrates how these two related dimensions of gendered norms have opposing effects on optimal marital institutions. We test these, and related, predictions by exploiting a feature of Islamic marriage contracts using household data from Egypt.

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> Since married women have been specialized to childbearing and other domestic activities, they have demanded long-term "contracts" from their husbands to protect them against abandonment and other adversities.
>
> - Becker (1991), Ch.2

> Although defining marriage and enforcing marriage rules were often difficult, there was substantial agreement across cultures on one point: Men were to be the dominant partner in the marriage or the heads of their families, and wives were to be subservient and obedient to their husbands.
>
> - Hill (2011), Ch.1

1 Introduction

The household is a central economic unit across all societies. The details of how households form and operate, for the reasons suggested in the above quotes, are particularly relevant for the well-being of women. The quotes also highlight the point that household outcomes are subject to two broad forces: *institutions* and *culture*. Our goal in this paper is to analyze how these two broad forces interact.

In terms of marital *institutions*, we take the commitment problem implicit in Becker's quote as central, and focus on those humanly devised rules that seek to constrain husbands in their socially excessive desire to separate. The central nature of this commitment problem is suggested by Becker's further observations that "Virtually all societies have developed long-term protection for married women; one can even say that "marriage" is defined by a long term commitment between a man and a woman."

In terms of *culture*, we focus on *gendered norms*. Central here, as suggested by Hill's quote, are the cultural norms surrounding the allocation of decision-making power across husband and wife.[1] Whereas this norm pertains to male dominance in the private sphere, *inside* the household, a related set of gendered norms pertain to male dominance in the public sphere, *outside* the household. These include attitudes toward women which result in differential treatment in the workplace, the legal system, and the political system.

[1] The literature in Economics tends to overlook the cultural component of decision-making power, instead focusing on the economic determinants (Anderson and Eswaran (2009), Majlesi (2016)) and the communication environment (Ashraf (2009)). Despite this, there is a growing appreciation that culture is an important contributor (Jayachandran (2015)), yet there is little work in this area. Lowes (2018) who studies the impact of culture (matrilineal vs. patrilineal kinship systems) on the related issue of spousal conflict. Bertrand et al. (2015) study how culture (gender identity and 'breadwinner' norms) affects marriage, labour force participation, and divorce.

In analyzing the *interaction* of marital institutions and culture, our specific goal is to explore, both theoretically and empirically, how gendered norms shape the extent to which societies optimally constrain husbands via marital institutions. Addressing this issue is important because, although marital institutions and gendered norms have been extensively studied in isolation, very little is known about the ways in which they interact. The nature of this interaction is subtle, requiring an 'unbundling' of gendered norms – inside and outside norms have opposing predicted effects on optimal marital institutions. These predictions, and the subsequent empirical validation, are perhaps surprising in light of a common wisdom that bundles these dimensions of gendered norms, treating them as related manifestations of women's empowerment in general.

To address these issues we first provide a simple model in order to clarify the marital commitment problem; to establish the role of marital institutions in ameliorating it; to highlight the role of inside and outside gendered norms; and to make predictions about the drivers of optimal marital institutions. In short, we consider a setting in which a couple marry, then learn their match quality, then face an opportunity to separate. Gendered norms shape payoffs in a straightforward manner: inside norms primarily affect the payoffs to continued marriage, whereas outside norms primarily affect the separation payoffs. In modelling marital institutions, we focus on the role of constraining the husbands' desire to exit the marriage. In particular, we parameterize the strength of marital institutions by the magnitude of a required divorce-contingent transfer from husband to wife.[2]

The marital commitment problem arises from the fact that the couple cannot commit ex ante to a state-contingent separation rule.[3] This produces an ex ante welfare loss because there will be states in which one side (typcially the husband) finds it privately optimal to separate even though total household welfare is larger under continued marriage. We show that the ex ante welfare loss arises because of a mismatch in spousal commitment to marriage, and how the optimal marital institution eliminates this mismatch. Culture affects optimal martial institutions because gendered norms affect this mismatch in spousal commitment and thus the extent to which additional institutional

[2]In practice, constraints on husbands' desire to exit the marriage are embedded in a variety of related rules (e.g. those concerning alimony, the allocation of marital property on divorce, and even the conditions under which divorce is permitted). A large literature is concerned with evaluating the consequences of such rules; e.g. property division laws (Voena (2015), Lafortune and Low (2019)), alimony (Chiappori et al. (2017)), prenuptual agreements (Bayot and Voena (2015), Rainer (2007)), and divorce laws (Stevenson and Wolfers (2006), Fernández and Wong (2017)).

[3]Ligon (2002) and Mazzocco (2007) also present models of the household in which limited commitment induces ex ante inefficiency. The focus in these papers is a limited ability to commitment to future allocations within marriage and the consequences for risk-sharing. We assume risk neutrality to allow us a cleaner focus on the limited commitment to separation decisions and marital institutions. See Chiappori and Mazzocco (2017) for a review of related models and issues.

constraints are required.[4] The key observation is that stronger inside norms raises the relative commitment of husbands whereas the opposite is true of outside norms.

The key methodological challenge in empirically exploring the model's predictions is that a household's optimal marital institution is unobserved. We overcome this by exploiting a feature of Islamic marriage contracts. In Islam, *mahr* (dower) is a mandatory payment, in the form of money or possessions, paid or promised to pay by the groom, or by the groom's father, to the bride at the time of marriage, that legally becomes her property. The marriage payment is separated into two parts: at marriage (prompt dower, or *muqaddam*) or at the time of divorce (deferred dower, or *mu'akhar*). The aim of the payment is to provide the bride with some financial independence within marriage and the deferred component in particular acts as a barrier to divorce (Ambrus et al. (2010), Chowdhury et al. (2019)). The *mahr* in any Islamic marriage contract is a legal right of the wife, and the husband may not reduce the promised amounts (Fluehr-Lobban and Bardsley-Sirois (1990)). We show how a household's chosen deferred dower reveals their optimal marital institution.

Our empirical setting is Egypt, which offers two advantages. First, it is a predominately Muslim country for which we have detailed data on marriage payments. Second, we also find significant within-country variation in measures of inside and outside gendered norms. These significant differences seem to stem from a deep historical persistence of cultural differences with regards to the subordination of women which are driven by the early patterns of Islamization and tribal norms. The Islamic context is also well-suited here as there is a cultural distinction between the "public" and "private" rights for women, whereby practicing seclusion does not necessarily imply low female bargaining power within the household. We show that our main theoretical predictions find robust support in the data.

Our work contributes to a literature that jointly analyses culture and institutions (for a survey, see Alesina and Giuliano (2015)), and in particular to work exploring the impact of culture on institutions.[5] The distinguishing feature of our work is the specific focus on the 'gendered norms' dimension of culture and on the 'marriage' dimension of institutions.[6]

Our work also relates to the literature concerned with the effects of gendered norms

[4]The argument is similar to Greif (1994), whereby strong formal legal institutions arise in societies with cultures that fail to foster alternative means of contract enforcement.

[5]There is also a literature that studies the reverse channel whereby institutions impact culture (e.g. Lowes et al. (2017)), and a theoretical literature concerned with the co-evolution of culture and institutions (Tabellini (2008), Bidner and Francois (2011), Bisin and Verdier (2017), Acemoglu and Jackson (2017)).

[6]As detailed in Alesina and Giuliano (2015), work in this literature typically examines the 'social capital/generalized trust', 'individualist/collectivist', 'family ties' or 'attitudes to work/poverty' dimension of culture, and the 'financial', 'legal' or 'political' dimension of institutions.

more broadly.[7] Work in this literature examines the role of gendered norms in affecting outcomes such as female labour force participation, fertility, and entrepreneurship; e.g. see Jayachandran (2019), Fernández and Fogli (2009), and Ashraf et al. (2019). Apart from our focus on a novel outcome (optimal marital institutions), we also contribute to this literature by demonstrating the importance of 'unbundling' such norms into those concerned with the private and public spheres.[8]

We also contribute to a literature that attempts to understand the nature of marital institutions. A body of work, set in a developing country context, studies various dimensions of marital institutions and practices, such as marriage payments, endogamy, consanguinity, *watta satta*, polygyny and so on.[9] Our work differs from this literature in our focus on marital institutions that aim to resolve the husband's commitment problem. There is very little work on the drivers of this fundamental dimension of marital institutions, with the closest work being that which explains the establishment and extension of wives' property rights as a result of economic transformations (Geddes and Lueck (2002), Doepke and Tertilt (2009), and Fernández (2014)). This work is concerned with the 'equity' role of marital institutions, whereas we are primarily interested in the 'efficiency' role.

A handful of papers focus on the deferred dower in Islamic marriage. Ambrus et al. (2010) look at the effect of legal changes. Chowdhury et al. (2019) look at the effect of income shocks. Our work differs from these papers in three ways. First is our focus on cultural drivers. Second is the empirical context, outside of South Asia. Finally, we are not interested in the payments per se. Rather, we are interested in what the payments reveal about optimal marital institutions, and as such, we see our analysis extending beyond Islamic marriage.

The structure of the paper is as follows. Our model is set up and the consequent empirical predictions are established in Section 2. Section 3 describes our empirical strategy and the main empirical findings. Section 4 concludes.

[7] For surveys of the impact on culture on economic outcomes more broadly, see Guiso et al. (2006) and Fernández (2011).

[8] Rainer (2008) presents a model in which 'outside' norms influence decision-making power inside the household. Stronger outside norms lower the return to the wife's investment in earning capacity, and the consequent lower earnings puts her in a weaker position inside the household. For these sorts of reasons, we would naturally expect male dominance outside and inside the household to move in the same direction.

[9] See Anderson (2007), Botticini and Siow (2003), Anderson and Bidner (2015), Bidner and Eswaran (2015), Jacoby (1995), Jacoby and Mansuri (2010), Ashraf et al. (2020), Tertilt (2005).

2 Theory

2.1 Simple Model

We begin with a stripped-down model with the aim of exposing the main arguments in as clear a manner as possible. These arguments are (i) optimal marital institutions boost welfare by raising husbands' commitment to marriage; (ii) gendered norms affect the optimal marital institution because such norms influence marital commitment; and (iii) the sign of the effect of norms on marital commitment, and thus optimal institutions, depends on whether norms describe male dominance over women 'inside' or 'outside' the household.

Commitment Problem. Consider a husband and wife entering into marriage. Once married, the couple learns of a match quality shock, which captures the possibility that the marriage ends up less (or more) desirable than expected. They are then presented with a one-time opportunity to separate. The key friction is that it is prohibitively costly to enforce contracts which propose a transfer in exchange for continuing the marriage. As such, the only decision that agents make is whether to separate. Separation occurs if at least one side prefers it.

Marital Institutions. We parameterize marital institutions by $\tau \in \mathbb{R}$; the amount that the husband must pay to the wife if separation occurs.

The *optimal* marital institution is that which maximizes expected household welfare (the sum of husband and wife payoffs). We have in mind a situation in which the couple can costlessly transfer utility ex ante via transfers. Here, both spouses agree that maximizing household welfare is optimal since any distributional consequences can be 'undone' ex ante. We assume it is costless to enforce ex ante contracts in which a payment is made in exchange for *establishing* the marriage, but that it is costly to enforce ex post contracts in which a payment is made in exchange for *continuing* the marriage.[10]

Illustrative Example. Once married, the couple experiences a mean-zero stochastic match quality shock, $\eta \in \mathbb{R}$. Continued marriage delivers a payoff to both husband and wife of $2 - \eta$. Separation delivers a gross payoff of 1 for the husband and 0 for the wife. Thus, the net payoff from separation for the husband is $1 - \tau$ and for the wife is τ.

[10] One argument is that negotiating the latter sort of contract incites acrimony that reduces the value of continued marriage. For a variety of reasons, any acrimony of this sort is far less severe in the former sort of contract. For instance, the couple has no history together, and thus there is no scope for conflicting accounts and interpretations of past events to stoke indignation and outrage. Furthermore, the prominent role of parents in such negotiations greatly reduces–or even eliminates–the role of the couple. In any case, our assumption appears empirically plausible insofar as ex ante marriage payments are very common across societies and time whereas the ex post version, as far as we can tell, has never been observed.

Given the costly nature of ex post transfers, the husband wants to remain married whenever $\eta \leq \bar{\eta}_m \equiv 1 + \tau$, and the wife wants to remain married whenever $\eta \leq \bar{\eta}_f \equiv 2 - \tau$. From an ex ante perspective, the values of $(\bar{\eta}_m, \bar{\eta}_f)$ capture the respective spouse's *commitment to marriage*: higher values imply they are more likely to prefer continued marriage. Naturally, a stronger marital institution–higher τ–raises the commitment of husbands. We see that, in the absence of institutions, the husband is less committed to marriage than is the wife (i.e. $\bar{\eta}_m < \bar{\eta}_f$ when $\tau = 0$). As such, without institutions, there are states in which spouses disagree in their desire for separation and in all such cases *only* the husband wants to separate. More generally, this is the case for all institutions sufficiently weak that $\tau < \bar{\tau} \equiv 1/2$. The spouses are *equally committed to marriage* at $\tau = \bar{\tau}$.

In the absence of institutions, the lower commitment to marriage on the part of husbands is welfare-reducing. To see this, note that continued marriage is welfare-maximizing if and only if $\eta \leq \eta^* \equiv 3/2$.[11]

What is the optimal marital institution—i.e. value of τ that maximizes expected household welfare? We argue that $\bar{\tau}$ is the optimal institution; indeed, it is the (unique) institution that induces welfare-maximizing separation choices for *any* value of η (and thus is optimal regardless of the how the shocks are distributed). This is easily verified by noting that $\bar{\eta}_m = \bar{\eta}_f = \eta^*$ when $\tau = 1/2$. This is not an artifact of the particular numbers chosen in the example. Rather, the underlying principle is that of equalizing spousal commitment to marriage. Doing so ensures that spousal preferences for remaining married are aligned in every state. Welfare-reducing separation is then impossible since this requires spousal disagreement on whether to separate.[12]

Introducing Gendered Norms. We now generalize the payoffs in order to embed gendered norms. *Inside norms* reflect the dominance of men over women in the private sphere inside the household. This norm, parameterized by ϕ, simply acts to shift marital surplus in favour of the man. *Outside norms* reflect the dominance of men over women in the public sphere, outside the household. This norm, parameterized by ψ, simply acts to shift separation surplus in favour of the man.[13] Payoffs for continued marriage are then:

[11] Thus, without institutions, spouses disagree in their desire to separate when $\eta \in (1, 2)$ and the resulting separation is welfare-reducing when $\eta \in (1, 3/2)$.

[12] More formally, we can generalize so that payoffs to continued marriage are $(u_m - \eta, u_f - \eta)$ and separation payoffs are $(\tilde{u}_m - \tau, \tilde{u}_f + \tau)$. Then one can show that $\bar{\eta}_m = \bar{\eta}_f$ implies $\bar{\eta}_m = \bar{\eta}_f = \eta^*$. As such, the optimality of institutions that equate spousal commitment is not due to the particular values of $(u_m, u_f, \tilde{u}_m, \tilde{u}_f))$ chosen in the example. For completeness, spousal commitment is equalized at $\bar{\tau} \equiv (1/2) \cdot [(\tilde{u}_m - \tilde{u}_f) - (u_m - u_f)]$.

[13] In the fuller model, outside norms are not restricted to leaving total separation surplus unchanged. Doing so here clarifies the argument since it ensures that norms have no direct effect on welfare.

$2-\eta+\phi$ for the husband and $2-\eta-\phi$ for the wife. Payoffs in the case of separation are: $1-\tau+\psi$ for the husband and $\tau-\psi$ for the wife.

The institution that equates spousal commitment now becomes $\bar{\tau} \equiv 1/2-\phi+\psi$, and the argument for why this is the optimal institution remains unchanged (see footnote 12). Notice that *inside and outside gendered norms have an opposing impact on the optimal marital institution.* Stronger inside norms reduce the optimal marital institution whereas stronger outside norms increase the optimal marital institution. Intuitively, marital institutions optimally boost the marital commitment of husbands. The need for institutional intervention is thus diminished when such commitment is provided by gendered norms. The husband's commitment to marriage is increasing in inside norms (remaining married becomes more attractive) but decreasing in outside norms (separation becomes more attractive).

Commentary. This simple model demonstrates the essential logic behind the argument that gendered norms will affect optimal marital institutions, and in a way that depends on the specific nature of the norm in question. A fuller model is needed to establish the robustness of this logic. We present such a model by generalizing payoff values and the impact of norms, generalizing match quality shocks to allow for spousal differences in realizations, and by relaxing the assumption that ex post transfers are always prohibitively costly. Furthermore, our fuller model is needed in order to explore the ex ante transfer in more detail, and to generate further predictions as to how this is affected by the different gendered norms. Although the ability of marital institutions to completely eliminate welfare losses (and the arguments that follow from this) is special to this simple model, the fuller model demonstrates that the 'equalize marital commitment' intuition behind the optimal institution persists, as does the gendered norms comparative statics. We also show that the impact of inside norms on the ex ante transfer is opposite that of the impact on optimal marital institutions.

2.2 Extended Model

We start with two agents, a male and female, indexed by $i \in \{m, f\}$. Agent i has characteristics, ω_i. The pair enters marriage, which unfolds according to the following timing.

Timing.

1. The married couple learn their match quality shock, $\eta = (\eta_m, \eta_f)$. The match quality shock is a mean-zero random variable, distributed on $\mathbb{R}^2$ according to the joint density f.

2. Each spouse then offers a costly (ex post) transfer in exchange for continued marriage. A transfer of t costs

$$\kappa(t) = \begin{cases} 0 & \text{if } t = 0 \\ \kappa & \text{if } t > 0 \end{cases} \tag{1}$$

where $\kappa > 0$ parameterizes transfer frictions.

3. Each spouse decides if they want to separate. Separation occurs if at least one side prefers it.[14]

4. If the couple remain married, a total household output of $\bar{U}(\omega_m, \omega_f)$ is produced. This total is then allocated across husband and wife, resulting in the allocation $\bar{u} = (\bar{u}_m, \bar{u}_f)$ where $\bar{u}_m + \bar{u}_f = \bar{U}$. We assume that this allocation is sensitive to prevailing norms that dictate the extent of male dominance within households. In particular, denoting the strength of these *inside* norms by $\phi \in [0, 1]$, we assume $\bar{u}_m = \bar{u}_m(\omega_m, \omega_f, \phi)$ where $\bar{u}_m$ is increasing in ϕ (implying that $\bar{u}_f = \bar{U} - \bar{u}_m$ is decreasing in ϕ).

5. If instead the couple separates, agent i produces an output of $\tilde{u}_i$. This output depends on the agent's characteristics (and potentially that of their spouse) but more importantly is influenced by the prevailing norms that dictate the nature of public life outside of households. Here ψ is a cultural parameter that captures the extent to which women face greater costs relative to men outside of the home. For instance it captures additional barriers to paid work arising from cultural values that emphasize the domestic role of women and promote seclusion, and differential access to the police, courts and local political representatives. In short, ψ captures *outside* norms. Separation output is given by $\hat{u}_m = \hat{u}_m(\omega_m, \omega_f, \psi)$ and $\hat{u}_f = \hat{u}_f(\omega_m, \omega_f, \psi)$,

[14] This approach is reasonable even in cases where divorce rights are formally one-sided, favouring the husband. As Becker points out, the divorce decision is effectively a unilateral one when the wife can 'pay' the husband in exchange for him terminating the marriage. These sorts of transfers are qualitatively different to the costly transfers in the previous step because the latter are payments in exchange for *continuing* the marriage. That is, payments made in exchange for terminating a marriage are less costly than those made in exchange for continuing a marriage, since damage to the quality of the relationship, as a result of negotiating transfers, is only relevant when the relationship persists after negotiations. Such issues are relevant for our empirical context of Islamic marriage since de jure divorce rights typicall favour husbands. The classic schools of Islamic jurisprudence do distinguish between two notions of divorce, *Talaq* and *Khul*. *Talaq* refers to the right of husbands to divorce his wife by making a pronouncement that the marriage is dissolved. Under *Talaq*, a wife has the right to divorce only if her husband has delegated this right to her. *Khul* instead gives women the right to divorce if she sacrifices the deferred dower to her husband.

where $\hat{u}_m$ is increasing in ψ and $\hat{u}_f$ is decreasing in ψ with at least one of these strict.[15]

Payoffs. When remaining married, an agent gets a payoff that incorporates their allocated household output, their match quality shock, and any ex post transfers. Specifically, the payoff to agent i from continued marriage in state η is

$$u_i \equiv \bar{u}_i - \eta_i + t_{-i} - t_i - \kappa(t_i) \tag{2}$$

Thus, in the case of no ex post transfers, household welfare (i.e. $u_m + u_f$) is

$$\bar{V}(\eta) \equiv [\bar{u}_m + \bar{u}_f] - [\eta_m + \eta_f]. \tag{3}$$

If there are ex post transfers, then household welfare is $\bar{V}(\eta) - [\kappa(t_m) + \kappa(t_f)]$.

When separated, an agent gets a payoff that incorporates their output as well as the impact of marital institutions. Specifically, the payoffs from separation are

$$\tilde{u}_m(\tau) \equiv \hat{u}_m - \tau \quad \text{and} \quad \tilde{u}_f(\tau) \equiv \hat{u}_f + \tau. \tag{4}$$

Household welfare in this case (i.e. $\tilde{u}_m(\tau) + \tilde{u}_f(\tau)$) is

$$\tilde{V} \equiv \hat{u}_m + \hat{u}_f. \tag{5}$$

It then follows that the maximal welfare available in state η is:

$$V^*(\eta) \equiv \max\{\bar{V}(\eta), \tilde{V}\}. \tag{6}$$

2.3 Analysis

This section derives the equilibrium expected payoffs, denoted $v = (v_m, v_f)$. This involves deriving the transfer and separation decisions that arise in each state, η. In order to characterize outcomes, it is useful to first introduce the notion of agent i's commitment to marriage. Consider agent i's choice between separating and continuing marriage without

[15] We view the opportunity to separate as being temporary, so that agents must anticipate future marital outcomes that do not unfold in the shadow of a divorce threat. In other words, the model is one of 'bargaining in marriage' (Pollak (2018)) and outside norms do not affect marital payoffs conditional on inside norms. One may be concerned that 'inside norms' are, in reality, a reflection of 'outside norms' whereby better treatment outside marriage bolsters the bargaining position within marriage. As will become clear, this sort of possibility works against our ability to empirically validate our main predictions, since we predict inside and outside norms to have opposing effects. Further, we can control for outside norms when examining the impact of inside norms.

any ex post transfers. Agent i prefers continued marriage without ex post transfers over separation whenever

$$\eta_i \leq \bar{\eta}_i(\tau) \equiv \bar{u}_i - \tilde{u}_i(\tau). \tag{7}$$

We say that $\bar{\eta}_i$ is agent i's *commitment to marriage*. Higher values imply that the agent is more likely to eschew separation in favour of continued marriage. Note that stronger marital institutions–i.e. a larger τ–raises the husband's commitment to marriage (and lowers that of the wife). Define

$$\Delta(\tau) \equiv \bar{\eta}_m(\tau) - \bar{\eta}_f(\tau) \tag{8}$$

as the spousal (husband-wife) difference in marital commitment. The spouses are equally committed to marriage (i.e. $\Delta(\tau) = 0$) at

$$\tau = \bar{\tau} \equiv (1/2) \cdot [(\bar{u}_f - \hat{u}_f) - (\bar{u}_m - \hat{u}_m)], \tag{9}$$

and the husband has the lower commitment to marriage for all marital institutions sufficiently weak that $\tau < \bar{\tau}$.

Armed with these definitions, we are now ready to derive equilibrium outcomes by classifying each state into one of four relevant cases, as follows.

I Efficient separation; The match quality shocks are sufficiently undesirable that separation is welfare maximizing. In this case it necessarily must be that at least one side wants to separate, and therefore separation always occurs when it is welfare-maximizing. This case arises when shocks satisfy

$$\bar{\eta}_m(\tau) - \eta_m + \bar{\eta}_f(\tau) - \eta_f \leq 0 \tag{10}$$

In this case, individual payoffs are the separation payoffs: $v(\eta) = (\tilde{u}_m, \tilde{u}_f)$. Household welfare is $V(\eta) = \tilde{V} = V^*(\eta)$.

II Efficient marriage without ex post transfers; Each of the match quality shocks are sufficiently desirable that each agent prefers continued marriage to separation even if they did not receive an ex post transfer. Continued marriage is welfare-maximizing in this case, and separation does not occur. This case arises when (10) does not hold,

yet

$$\min\{\bar{\eta}_m(\tau) - \eta_m, \bar{\eta}_f(\tau) - \eta_f\} \geq 0. \tag{11}$$

Payoffs are $v(\eta) = \bar{u} - \eta = (\bar{u}_m - \eta_m, \bar{u}_f - \eta_f)$. Welfare is $V(\eta) = \bar{V}(\eta) = V^*(\eta)$.

III Inefficient separation; Continued marriage is welfare maximizing, yet the welfare gain is insufficient to cover the cost of the ex post transfers that are required to dissuade separation. This case arises when neither (10) nor (11) holds, yet

$$\bar{\eta}_m(\tau) - \eta_m + \bar{\eta}_f(\tau) - \eta_f \leq \kappa \tag{12}$$

Payoffs are the separation payoffs; $v(\eta) = (\tilde{u}_m, \tilde{u}_f)$. Welfare is $V(\eta) = \tilde{V} < V^*(\eta)$.

IV Efficient marriage with costly ex post transfers; neither (10) nor (11) nor (12) holds. Continued marriage is welfare-maximizing, yet one side requires a positive ex post transfer in order to dissuade separation. The additional welfare from continued marriage is at least as great as the cost of making the required ex post transfer. If $\bar{\eta}_m(\tau) - \eta_m < 0$ (so that it is the wife that pays the husband to stay), then payoffs are $v(\eta) = (u_m, u_f)$ where $t_m = 0$ and $t_f = \eta_m - \bar{\eta}_m$. The analogous expression arises when $\bar{\eta}_f(\tau) - \eta_f < 0$ (so that it is the husband that pays the wife to stay). Regardless, welfare in this case is $V(\eta) = \bar{V}(\eta) - \kappa < V^*(\eta)$.

These four cases are illustrated in Figure 1. The figure illustrates a case where both husband and wife have a positive commitment to marriage yet the husband is less committed than the wife. Cases III and IV are shaded because these are the cases that involve a welfare loss. Using the computed welfare in each of the four cases above, $V(\eta)$, expected welfare is simply

$$V \equiv \int_{\eta} V(\eta) f(\eta) d\eta. \tag{13}$$

Expected individual payoffs are analogously defined using the derived expressions for $v(\eta)$.

Optimal Marital Institutions. To summarize, 'transaction costs' associated with ex post negotiations aimed at dissuading separation render household welfare lower than the first best (this is seen clearly by taking $\kappa \to 0$). Welfare is jeopardized only in states where only one side wants to separate. Marital institutions can raise welfare by manipulating separation payoffs in order to minimize this possibility.

We define the *optimal* marital institution as the τ that maximizes expected household

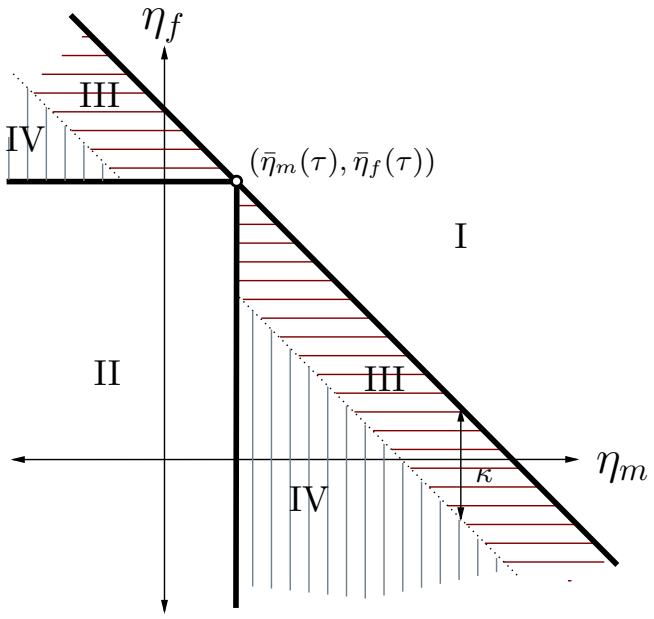

Figure 1: The Four Cases

welfare, V. This objective is justified by the existence of ex ante marital transfers (which we introduce and analyze below) that act to allocate total welfare across spouses. That is, utility is transferable ex ante so that both spouses agree that maximizing welfare is optimal.

To be clear about the role of marital institutions, it is useful to express welfare in terms of the expected deviation from the first best. In particular, let $\Lambda(\tau)$ denote the set of states corresponding to cases III and IV, and note that in such cases we can write $V(\eta) = V^* - L(\eta)$ where $L(\eta) \equiv \max\{\bar{V}(\eta) - \tilde{V}, \kappa\} > 0$ is the welfare loss in state η. Expected welfare can then be written:

$$V = V^* - \int_{\eta \in \Lambda(\tau)} L(\eta) f(\eta) d\eta \tag{14}$$

where V^* is the first-best welfare:

$$V^* \equiv \int_{\eta} V^*(\eta) f(\eta) d\eta. \tag{15}$$

Writing welfare this way emphasizes that marital institutions, τ, has no *direct* effect on welfare: $(\bar{V}(\eta), \tilde{V})$ and thus $(V^*(\eta), L(\eta))$, are all independent of τ. The only effect is an *indirect* one, whereby separation incentives are manipulated: only $\Lambda(\tau)$ is affected.

To provide some intuition for the nature of the problem, note that welfare losses can only arise in states with 'mismatch' whereby only one spouse wants to separate. It is generally not possible to *eliminate* the possibility of mismatch (except in cases, such as when there is a 'pure' match quality shock as in the simple version of the model), yet raising τ makes the husband less (and the wife, more) interested in separating on average. The objective of marital institutions then can be seen as an attempt to minimize the existence of mismatch 'on average'.

To make this point as clear as possible, it is useful to place structure on the distribution of match quality shocks. We assume that, for any *total* shock, $\eta_m + \eta_f$, the distribution of the *difference* in shocks, $\eta_m - \eta_f$, is symmetric and single-peaked at zero. Formally:

Assumption 1 *For any $\hat{\sigma} \in \mathbb{R}$, $f(\hat{\sigma} + \hat{\delta}, \hat{\sigma} - \hat{\delta})$ is decreasing in $|\hat{\delta}|$.*

This assumption generalizes the case of a 'pure' match quality shock (so that the shock applies to husband and wife equally), but in a way that does not introduce additional gender asymmetries. This affords us a cleaner perspective on the role played by the various other gender asymmetries in the model.[16] The 'single-peak' aspect is merely a regularity condition ensuring a well-behaved optimization problem. The assumption does not require that the shocks are positively correlated, although this seems reasonable.[17] Note too that it is the *total* shock, $\eta_m + \eta_f$, that matters for welfare and that the assumption places no restriction on how this total is distributed.

Proposition 1 *The marital institution, τ, affects welfare only via its effect on the spousal difference in commitment to marriage, $\Delta(\tau)$. Under assumption 1, the optimal marital institution, τ^*, equalizes the spousal commitment to marriage; i.e. $\Delta(\tau^*) = 0$ or equivalently $\tau^* = \bar{\tau}$.*

Figure 2 provides some intuition by considering the special case of a pure match quality shock (whereby husband and wife get the same shock). The 45-degree dashed line in each panel represents the set of match quality shocks that may arise. In the left panel we see that a subset of possible shocks (the bold dashed line) fall in the shaded region where welfare losses arise. The right panel illustrates how the optimal marital institution, τ^*, is the one that places the profile of commitments to marriage on the 45-degree line. In this case the welfare losses are *completely* eliminated, but this is not true for impure match

[16] Symmetry is also convenient since it ensures that $\bar{\eta}_i$ meaningfully captures agent i's commitment to marriage. That is, the ex ante probability that agent i prefers marriage (without ex post transfers) to separation is $F_i(\bar{\eta}_i)$, where F_i is the (marginal) distribution of agent i's match quality shocks.

[17] For instance the shocks could be normally distributed with mean zero and an arbitrary correlation, as long as the marginal variances take the same (arbitrary) value.

quality shocks. Nevertheless, τ^* remains the optimal marital institution in such cases (as long as Assumption 1 is maintained).

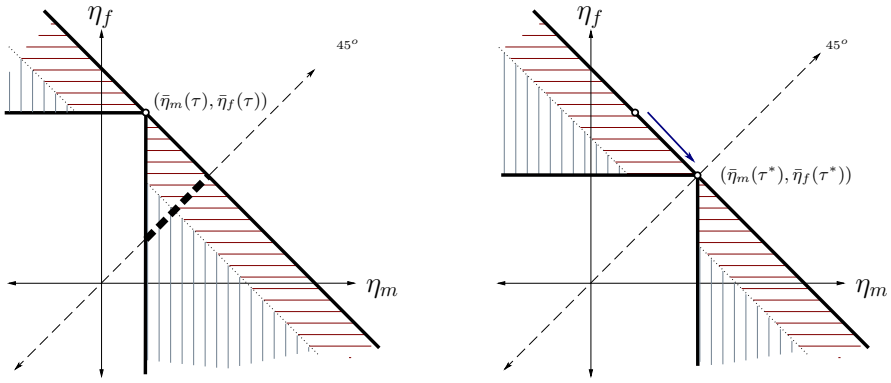

Figure 2: Optimality of Equalizing Marital Commitment

What factors affect the demand for commitment? To get a clear view at this, use the fact that $\tau^* = \bar{\tau}$ with (9) to write:

$$2 \cdot \tau^* = [\hat{u}_m - \bar{u}_m] - [\hat{u}_f - \bar{u}_f] \tag{16}$$

$$= \underbrace{[\hat{u}_m - \hat{u}_f]}_{\chi^{\text{outside}}} - \underbrace{[\bar{u}_m - \bar{u}_f]}_{\chi^{\text{inside}}}. \tag{17}$$

That is, the optimal marital institution is increasing in factors that boost the male advantage *outside* of the household, but is decreasing in factors that boost the male advantage *inside* of the household.

Proposition 2 *Under Assumption 1, the optimal marital institution, τ^*, is decreasing in inside norms, ϕ, and increasing in outside norms, ψ.*

The first part follows from the fact that larger ϕ raises $\bar{u}_m$ and reduces $\bar{u}_f$, thereby increasing the χ^{inside} component. The second part follows from the fact that a larger ψ lowers $\tilde{u}_f$ and therefore increases the χ^{outside} component. Intuitively, there is less need to constrain husbands from separation when they get more from marriage (stronger inside norms) and when wives get more from separation (weaker outside norms).

The comparative static with respect to inside norms holds more generally–in fact for any distribution of shocks (even if characterizing the optimal institution is less clear). The reason is that welfare depends on marital institutions and inside norms *only* through the effect of these variables on the spousal difference in commitment to marriage, $\Delta \equiv \bar{\eta}_m(\tau) - \bar{\eta}_m(\tau)$. This difference is decreasing in both τ and ϕ, and thus the two variables

move in opposite directions when holding Δ fixed (as the optimal value must be). The same generality also applies to 'welfare-neutral' parameterizations of outside norms: i.e. when changes in ψ keeps $\tilde{V} = \hat{u}_m + \hat{u}_f$ fixed.

2.3.1 Ex Ante Marriage Payments

We now take a step back, prior to marriage occurring, and allow the agents (or their parents) to negotiate a marriage payment from husband to wife, denoted T, in exchange for entering into marriage. Both sides then decide whether to enter into marriage. If at least one side does not want to enter into marriage, the agents get outside payoffs (U_{0m}, U_{0f}) and the game ends. Otherwise, the couple enters the marriage game analyzed above. Recalling that $v = (v_m, v_f)$ is the profile of expected payoffs in the marriage game, and given an ex ante marriage payment T, the expected net payoff to entering into marriage is simply

$$U_m \equiv v_m - T \tag{18}$$

$$U_f \equiv v_f + T \tag{19}$$

Thus the marriage payment T is simply a means to reallocate the expected welfare from marriage, V. Given V, bargaining over the ex ante transfer leads to

$$U_m = U_m(V, U_{0m}, U_{0f}) \tag{20}$$

(and therefore $U_f = U_f(V, U_{0m}, U_{0f}) = V - U_m(V, U_{0m}, U_{0f})$). The point is that an agent's net payoff to marriage depends on their outside option, their spouse's outside option, and the total welfare available within marriage. Both sides will prefer to take actions that maximize V, even if there are distributional consequences from doing so, since these are 'neutralized' via the ex ante marriage payment.

The above analysis tells us that inside norms do not affect welfare when institutions are set optimally. Yet, changes in inside norms *will* have consequences for how a given welfare is allocated across the spouses. In particular, stronger inside norms raise the expected payoff of husbands at the expense of wives. After all, stronger inside norms directly benefit the husband in the event that the marriage continues, and will also benefit the husband in separation because the optimal institution calls for a lower transfer. This direct benefit to husbands is offset by the ex ante transfer. From (18) and (20), the marriage

payment is:

$$T^* = v_m - U_m(V, U_{0m}, U_{0f}) \tag{21}$$

Since stronger inside norms raise v_m but leave V unchanged, we have the following.

Proposition 3 *Under optimal marital institutions, the ex ante marriage payment T is increasing in inside norms, ϕ.*

Intuitively, stronger inside norms makes marriage more attractive to husbands and less attractive to wives and this results in husbands paying more for marriage.

The impact of outside norms is less clear-cut. First, changes in outside norms may have a direct effect on available marital welfare, V (e.g. if costs imposed on women are increased). We could consider a 'welfare neutral' specification of outside norms whereby ψ does not affect separation welfare, $\tilde{V}$. Since stronger outside norms also, all else equal, raise the expected marital payoff of husbands, the prediction would again be that T increases in outside norms. However, outside norms will also have a direct effect on the outside options, (U_{0m}, U_{0f}). This presents an opposing force, whereby the husband's stronger ex ante bargaining position commands a lower ex ante payment.

2.4 Empirical Exploration: Islamic Marriage

The main qualitative implication of the model is that gendered norms will impact optimal marital institutions (in a specific direction depending on the nature of the norm). There are some obvious challenges in exploring this empirically. First, optimal marital institutions are not observed. Even if we had some proxy measure based on prevailing family law, it is not clear that institutional designers (e.g. religious authorities) have the objective of maximizing household welfare as we have defined it, nor that de jure laws accurately represent de facto constraints. Indeed, we have derived the optimal marital institution *for a particular household* – in practice, marital institutions must be applied to a society of heterogeneous households as a whole. This is the second main challenge: there is typically no variation in de jure marital institutions within a society at a point in time since everyone is subject to the same law.

These challenges are overcome if spouses are able to ex ante contract over the separation-contingent payment, τ. This contracting flexibility effectively allows households to design and customize their own marital institution. The amount that couples choose will vary with their circumstances, and will reveal their optimal marital institution (assuming the

ex ante transfer is also available). It is for this reason that traditional Muslim marriages are an empirically relevant context for our theoretical framework.

2.4.1 Islamic Marriage: Background

In Islam, *mahr* (dower) is a mandatory payment, contracted upon at the time of marriage. The marriage payment is separated into two parts: a prompt component (*muqaddam*) to be paid at the time of marriage, and a deferred component (*mu'akhar*) that is payable upon divorce. The aim of *mahr* is to provide the bride with some financial independence within marriage, and the deferred component in particular acts as a barrier to divorce (Ambrus et al. (2010), Chowdhury et al. (2019)). The *mahr* in any Islamic marriage contract is a legal right of the wife, and the husband may not reduce the promised amounts (Fluehr-Lobban and Bardsley-Sirois (1990)). The setting for our empirical analysis is Egypt. Early Islamic marriage contracts dating from the 9th century reveal the use of marriage payments (both the prompt and deferred portions) in Egypt beginning at this time (Rapoport (2000)). In present-day virtually all legal marriages stipulate a dower.

Connecting to the model, the prompt component is the ex ante transfer, T, and the deferred component is the optimal divorce-contingent payment, τ. In setting these payments optimally, the couple's preferences over the deferred dower are perfectly aligned. Since the prompt dower, T, serves to allocate a given household welfare, both husband and wife want to set the deferred dower, τ, so as to maximize household welfare.[18]

Given this background, we are now ready to summarize our main empirical predictions.

2.5 Empirical Predictions

Our first set of predictions concern the determinants of the deferred dower, τ. Since the optimal deferred dower is τ^*, from Proposition 2 we have:

Prediction 1 *A household's deferred dower, τ, is decreasing in the strength of inside norms.*

Prediction 2 *A household's deferred dower, τ, is increasing in the strength of outside norms.*

[18] Unlike the general treatment above, the deferred dower must be non-negative and equals zero in a non-trivial minority of cases. The non-negativity is not a binding constraint when husbands have lower commitment to marriage relative to wives, which seems plausible. Setting the deferred dower to zero is approximately optimal when changes in the deferred dower have little impact on household welfare – e.g. when there is little probability mass attached to the inefficient cases III and IV, for instance because the couple expects marriage to deliver payoffs far in excess of separation payoffs.

The model also makes predictions about the prompt dower. Since the deferred dower is optimally set, Proposition 3 applies. Thus we also have:

Prediction 3 *A household's prompt dower, T, is increasing in the strength of inside norms.*

Notice that these predictions are very tight: finding support for them requires a very specific and nuanced empirical relationship between gendered norms and marriage payments. That is, the two types of gendered norm have opposite predicted effects on the deferred dower (1 and 2), and inside norms have an opposite predicted effect on each type of marriage payment (Predictions 1 and 3).

3 Empirical Analysis

3.1 Empirical Strategy

We test the model's predictions using household-level data. Each household i resides in a geographic area *g(i)*. Our main outcomes of interest are marriage payments, both the deferred dower τ_i and prompt dower T_i. We estimate the following equation:

$$\mathrm{Y}_i = \alpha \cdot \mathrm{Z}_{g(i)} + X_i\beta + \varepsilon_i, \tag{22}$$

where $\mathrm{Y}_i = \{\ln(1+\tau_i), \ln(1+T_i)\}$. $Z_{g(i)}$ reflects gendered norms defined at the geographic unit, the governorate (*Muhafazah*).[19] X_i is a set of control variables and ε_i is the error term clustered at the geographic unit.

Our baseline set of control variables, X_i, include regional fixed effects[20], a rural-urban dummy variable, and the year of marriage. A set of household controls which are predetermined before marriage, and known to affect marriage payments, such as the education of husband and wives and their parents, the age of marriage of the wife, and the age difference between spouses.[21] We also include a measure of household wealth, which is

[19] Egypt is divided into 27 governorates which are administered by a governor who is appointed by the President of Egypt. The country is further divided into 351 municipalities (*kisms*). We can run our estimations aggregating our data up to this level instead, but we are often left with too few observations in each kism to compute reliable estimates. Present-day governorates often directly correspond to past administrative units throughout history, some even to the *nomes* of Ancient Egypt.

[20] These are the seven economic regions used for planning purposes, defined by the General Organization for Physical Planning (GOPP) of Egypt.

[21] Refer to Table A3 in Appendix A, which demonstrates which of these control variables significantly determine marriage payments.

not clearly exogenous to marriage negotiations but is a crucial determinant. All key estimation results follow through if we omit this wealth variable from the estimations.

We also include a set of geographic and environmental controls (which come from GIS data) to capture exogenous measures of the economic environment such as land and soil characteristics, light density, population density, distance to the nearest town and to amenities such as hospitals, health care centres, and schools.

Though not reported here, the estimation results are also robust to including a host of other controls which are not necessarily exogenous. These include measures at the household level such as employment outcomes of spouses, whether the marriage is between kin, and the number of children. At the geographic level, these include variables to capture the local economic environment such as overall employment patterns by gender and their respective industry shares.

In such an estimation, as described in (22), we are left with concerns of omitted variable bias and reverse causality with regards to our key explanatory variables of interest, gendered norms as represented by $Z_{g(i)}$. To address these concerns we will use measures of arguably exogenous variation which shift these norms and also employ an instrumental variable approach, discussed in detail in Section 3.4.

3.2 Data

Marriage Payments.

Our main data source is the Egypt Labor Market Panel Survey (ELMPS), which is a nationally representative household survey administered by the Economic Research Forum[22] in cooperation with Egypt's Central Agency for Public Mobilization and Statistics. Our study pools the two rounds from 2006 and 2012 and our final sample comprises roughly 12,600 married women.[23] Of key relevance for our purposes, the survey contains detailed information on payments at the time of marriage. All married women (between the ages 16 and 49) are surveyed with regards to all costs associated with their marriage. These include the prompt and deferred dowers which were stipulated in the marriage contracts, as well as additional gifts of jewellery or household goods, and also monetary contributions to housing costs and wedding preparations, from both the groom and bride sides of the families. Our analysis focuses only on the first two contractual payments (the prompt and

[22] OAMDI, 2013. Labour Market Panel Surveys (LMPS), http://www.erf.org.eg/cms.php?id=erfdataportal. Version 2.1 of Licensed Data Files; ELMPS 2012. Egypt: Economic Research Forum (ERF). Even though the survey excludes Frontier governorates (Matruh, New Valley, Red Sea, North and South Sinai), data administrators employed appropriate sampling weights to ensure the representativeness of each round.

[23] We exclude the 56 women in polygamous households, as marriage payments and household decision-making may be specific to such unions.

deferred dowers) without which the marriage is not legal. Though not reported here, all of our estimation results are robust to including these other monetary contributions at the time of marriage as additional control variables.

Summary statistics on the value of deferred dower and prompt dower are listed in Table A1 in Appendix A. Reported amounts are deflated using the CPI index corresponding to the reported year of marriage, 2000 being the baseline year.[24] The amount of the deferred dower is almost three times greater than that of the prompt dower, and is equal to roughly three times the average household expenditures per capita in 2012. Across the governorates of Egypt (the principal administrative unit), roughly 95% of the marriages in our sample transacted marriage payments. Marriage payments are equally prominent across rural and urban areas. In both greater Cairo and Alexandria, approximately 93% of marriages entailed a dower. There is one governorate, Damietta, a port city located on the Mediterranean Sea for which only 60% of marriages transacted dowers. In our estimations we use a logarithm transformation of the two dower payments to address the zeros in our data and our results are also robust to excluding this low incidence governorate, Damietta, from the analysis. Figures A1 and A2 in Appendix A depict the geographic variation in the two dower payments across Egypt.

Control Variables.

The ELMPS survey is also our source for our baseline set of control variables defined at the household level. These include the educational attainment of wives and husbands and their parents, age at marriage, spousal age difference and household wealth. Table A1 in Appendix A includes summary statistics on these variables. In our sample, women received on average 8 years of schooling and their husband 9 years. Only 22% of women have a literate mother and 47% a literate father - very similar statistics follow for the parents of their husbands. Household wealth is captured by an index based on asset ownership and housing characteristics using Principal Components Analysis. On average women marry at 20 years old and have a 6 year age gap with respect to their spouse. Indicators of education, wealth, and age at marriage are also somewhat higher in urban areas compared to rural.

Local geographic controls on soil quality, weather conditions, and distance to towns and amenities come from various sources of geo-spatial data. These are described in detail in Appendix A. Table A2 in Appendix A provides summary statistics on these control variables. All these geographic variables are averaged up to the *kism* level, the second administrative unit of Egypt (of which there are 351 across the country). We do this to

[24]The CPI index is obtained from the International Monetary Fund, World Economic Outlook Database, October 2013. To reduce concern about outliers, we remove the top percentile of each payment.

match our GIS data to our household level data. The kism is the smallest unit that we can geo-locate in the household level data. There are on average 90 households residing in each kism in our sample.

Gendered Norms.

To define measures of gendered norms, we use measures of perceptions and opinions from individuals and aggregate these to the local level (governorate). Based on the responses to several related questions, we construct a set of indicies. For the perceptions/opinions variables we rely on three different data sources, the ELMPS (2006, 2012), the Demographic Health Survey (DHS) of Egypt (2014, 2015), and the Afrobarometer Survey of Egypt (2015, 2016). In the ELMPS survey, all ever-married women were asked detailed information on participation in household decision-making and views on whether women should work outside of the home. The DHS survey asks directly related questions regarding household decision making power. The Afrobarometer survey contains information on how women are treated in society.

Inside Male Dominance Norms

Our main measure of *inside* male dominance norms comes from the responses regarding household decision making power in the ELMPS survey. Ever-married women (above 15 years old) are asked about who usually has the final say on several decisions including: making large purchases, purchases for daily needs, visiting family and friends, cooking, their own health and buying clothes for themselves. For each of these propositions, we define a variable that takes on the value one if the husband has the final say alone and zero otherwise. We assume that these variables serve as observed proxies of a latent variable, male dominance inside the household. We derive a summary measure of inside male dominance norms from a data-driven weighting scheme based on principal component analysis, with relative weights based on the correlation system of proxies with respect to male dominance.[25] We next compute weighted averages of these individual measures of inside male dominance norms at the local (governorate) level.[26] Table A2 in Appendix A reports summary statistics on this key index of interest, called "Husband Decides". There is substantial geographic variation in this measure of inside male dominance, ranging from a low of 10.39 (Cairo) to a high of 42.0 (Qena). Figure A3 in Appendix A illustrates this geographic variation.

[25] Alternatively, we can reproduce the results using equal-weighting between indicators of husbands' dominance.

[26] We can alternatively construct these averages at a more disaggregated level, the lower level administrative unit (kism) and the results follow through. However, for a number of kims, the population numbers are low and we have too few individual-level observations (i.e., less than 10) to construct averages with sufficient accuracy.

We construct two alternative measures of inside male dominance. The first, from the ELMPS survey, is just a local average of a dummy indicator variable which is equal to one if a woman responded yes (as opposed to no) to the question "Are you often or generally afraid of disagreeing with your husband". We see from Table A2, that the vast majority of women fear their husbands, more than 60%. The second measure is analogous to the "Husband Decides" index using instead data from the DHS survey. We see from Table A2, that these two measures (from the two different data sources) are very similar.

Outside Male Dominance Norms

Measures of outside male dominance norms are meant to capture the overall treatment of women in society outside of their home (or in public). For this purpose we focus on three types of norms. The first is to do with attitudes towards women working outside of the home. Despite relatively, high education levels in Egypt, formal female labour force participation is extremely low (less than 15%). This is likely in large part due to customs of seclusion and gender segregation. To construct an average measure of these attitudes, we use information from the ELMPS survey which asks women a series of questions regarding their attitudes towards women working outside of the home, like whether women should be allowed to work, whether having a job interferes with a woman's duties to her husband and children, and whether women who work should be pitied. We again average this index up to the governorate level. This variable is increasing in women's negative attitudes towards work and is referred to as "No Women Work" in Table A2. The geographic variation in this variable is depicted in Figure A4 in Appendix A.

A second index comes from the Afrobarometer survey which asks a series of questions regarding whether women are treated unequally (relative to men) by employers, local political leaders, police and courts. We construct an index equal to one if respondents state either "always" or "often" compared to "rarely" or "never". We compute an average index of these different measures at the governorate level. This variable termed, "Unequal Treatment" is increasing in the degree of unequal treatment towards women and is described in Table A2. The majority of women perceive unequal treatment in society, where the measure is higher for treatment from local political leaders and employers compared to the police and courts.

A third measure comes from the DHS survey and reflects attitudes towards female genital mutilation. Women are asked whether or not they think the custom of female genital mutilation should continue or be stopped. We construct a dummy variable equal to one if they believe the custom should continue and average up this variable to the governorate level. Despite being illegal since 2008, female genital mutilation is extremely widespread in Egypt. According to the 2017 Census, more than 90% of females between

ages (15-47) have been circumcised. The custom is traditionally believed to constrain women's sexuality by ensuring her virginity before marriage and her fidelity afterwards. The custom has been present in Egypt since ancient times, there is evidence dating back to as far as fifth century B.C. (Kouba and Muasher (1985)). As a consequence, researchers believe that the custom did not originate in Islam but was adopted by it around 640 AD - the time of the Arab conquest of Egypt (Hansen (1972/1973), Hayes (1975)). Research emphasizes that the custom gained strength under Islam because of the religion's emphasis on virginity, chastity, seclusion and protecting the honour of women. We posit that beliefs in this custom makes the relative separation costs for women to be larger - in line with the other two outside male dominance norms. The variable "Support FGM" is described in Table A2, where we see that on average 72% of women support the tradition.

Aside from relying on self-reported perceptions of societal gendered norms, as discussed above, we also consider two other explanatory variables which we interpret as historical shifters of outside norms. One shifter affects the relative male economic advantage and another the relative separation costs, which from the model, both have similar predictive effects as outside male dominance norms on optimal marital institutions.

The first shifter of outside male dominance norms borrows from the work of Alesina et al. (2013) who test the hypothesis that traditional agricultural practices influenced the historical gender division of labour and in turn the persistence of norms and beliefs regarding the appropriate role for women in society. Boserup (1970) originally put forth the hypothesis that certain cultivation practices (which accord with certain crops) are relatively more suited to female labour. In particular those that employ heavy machinery like the plough, which requires upper body strength, are more suited to male labour inputs. Whereas more labour intensive crops, which instead rely on handheld tools, are correspondingly more female labour intensive. To this end, Alesina et al. (2013) compute the average suitability of "female" and "male" crops within a land area and demonstrate how this variation is correlated with positive beliefs regarding women's role in society. Following their methodology, we construct a measure of average suitability of "male crops" (rye, wheat, and barley) and a corresponding value for "female crops" (millet and sorghum). To the female crops we add cotton for our context, which is a primary crop in Egypt that employs female labour.[27] The information on the suitability of a location for cultivating particular crops is taken from the FAOs GAEZ 2002 database.[28] This database reports these measures for 5 arc-minute by 5 arc-minute grid-cells. The data are constructed using information on a location's precipitation, temperature, weather conditions, soil slope and

[27] Our results do not qualitatively change if we instead exclude cotton.
[28] Refer to: http://www.fao.org/nr/gaez/en/.

soil characteristics. These characteristics are combined with the specific growing requirements of crops to produce a measure of whether each crop can be grown in each location and if so, how productively. The FAO models for crop growth are based solely on requirements and constraints for crop specific growth, the measures of suitability are not affected by which crops are actually grown in a particular location. This feature of the data is important for concerns over causality. Summary statistics on our measure of relative male to female crop suitability are reported in Table A2 of Appendix A. We expect that this variable shifts beliefs that render a higher relative economic advantage for men - in line with the predictions regarding outside male dominance norms.

The second shifter we consider affects the relative separation costs and comes from historical geographical variation within Egypt with regards to the prevailing school of religious law. There are four major schools of thought with respect to Islamic jurisprudence within Sunni Islam: Hanafi, Maliki, Shafi'i and Hanbali. It was mandated that all rules of law, applied by judges (*qadis*) across the Muslim territories, should be based on the holy sources, the Quran and Hadith. The four schools (*madhhab*), attributed to four early jurists (of the 7th and 8th centuries), differ with respect to interpretations of these holy texts. The different schools of thought recognize each other's validity and have interacted in legal debate over the centuries. Unlike the three other nucleus of the Islamic Empire (Hijaz, Syria, and Iraq), Egypt did not produce a leader nor did it develop a judicial system of its own. Instead it became the first region outside al-Hijaz which opted for the Maliki school of law, formerly the ancient school of Medina (today's Saudi Arabia) and was then considered the spiritual centre of the Muslim Empire (Mansour (1981)). With the Arab conquest, the Maliki school of law soon spread to the rest of North Africa and Spain and later to West Africa beginning in the 10th century. Maliki remains the central school of religious law in most of North and West Africa today, but only persists in the southern part of Egypt. By the time of the third Islamic caliphate of Egypt, at the end of the 8th century, the country was a semi-autonomous province of the Abbasid Empire (who ruled from Baghdad) dominated by an exclusive class of Arab notables who followed the Maliki School of Law. However, Egyptian Malikism faced growing challenges from the Hanafi School of Law (of modern-day Iraqi origins) which predominated in the Abbasid Court in Baghdad. The officials dispatched to the provinces were Hanafis and Hanafism began to take a foothold in Egypt. The influence of the Abbasid Caliphate (from 750 to 969) however did not extend to the southwestern part of the country, which remains under the Maliki School of Law to this day. It is this geographic variation that we will exploit.

Secular law has prevailed in Egypt since the 19th century, with the arrival of the European colonists. However, personal and family law and thus regulations relevant to

marriage still follow religious doctrine and marriage contracts are legally enforced in the Sharia courts (Fluehr-Lobban and Bardsley-Sirois (1990)). Relevant for our purposes here, is that the two schools of religious law, Hanafi and Maliki, differ with respect to the conditions for which a woman has rights to divorce.[29] Under the Hanafi school, a man is entitled to repudiate his wife unilaterally without justification and without legal proceedings, the only way a woman could seek divorce was to convince her husband, she had no judicial means of her own. The Maliki school, on the other hand, introduced some grounds for dissolution of marriage where the wife did not require her husbands' approval. These include: defects and disease of the husband (after marriage), non-provision of maintenance by the husband (unless proved destitute), absence (without justification for more than one year) or imprisonment of the husband, and serious injury of the wife by the husband. We posit that these more lenient terms of divorce for women lower their relative social costs associated with separation (Mashhour (2005)). In this regard, the traditional presence of the Hanafi School of Law compared to Maliki should shift beliefs that render the relative separation costs for women to be larger - in line with the predictions regarding outside male dominance norms.

We define a variable "Hanafi" equal to one if an individual resides in an area where Hanafi religious law historically prevailed and zero if Maliki did. Table A2 in Appendix A reports the summary statistics on this variable, where 63% of our sample live in a region with Hanafi marriage laws.

3.3 Baseline Estimations

We begin with OLS estimations of (22) using our different measures of gendered norms, $Z_{g(i)}$. We first consider our two exogenous shifters of outside male dominance norms, relative male to female crop suitability and the presence of Hanafi law.

The first three columns of Table 1 below report the results from estimating equation (22), where $Z_{g(i)}$ is equal to a measure of male to female crop suitability. As we move along the columns, additional controls are included. We see a robust positive and significant relationship between deferred dower and male to female crop suitability, consistent with Prediction 2.

[Table 1 Here]

The last three columns of Table 1 above report the results from estimating equation

[29] The Shafii School of Law was also present in the eastern part of the country, it was the official school for the Ayyubid dynasty which ruled from 1218 to 1250. During the Ottoman rule, Hanafi replaced Shafii in Egypt. Hanafi and Shafii do not differ with regards to conditions for divorce.

(22) where $Z_{g(i)}$ is the Hanafi variable. Across the columns, additional controls variables are included sequentially. We see that, consistent with Prediction 2, Hanafi law is significantly positively related to the deferred dower.

We now turn to our direct measures of gender biased norms from self-reported beliefs. The first three columns of Table 2 below present OLS estimation results from estimating equation (22) where $Z_{g(i)}$ reflects our measures of inside male dominance norms, as described in Section 3.2. We acknowledge the potential endogeneity issues associated with such an OLS estimation and will demonstrate robustness of these results using an IV strategy in Section 3.4. We see from the results that inside male dominance norms are significantly negatively related to the deferred dower, consistent with Prediction 1.

[Table 2 Here]

The last three columns of Table 2 above present OLS estimation results from estimating equation (22) where $Z_{g(i)}$ is instead equal to our measures of outside male dominance norms, as described in Section 3.2. We see that outside male dominance norms are a significantly positive determinant of deferred dowers, as consistent with Prediction 2 from our model.

Before turning to the IV estimations of the effects of these measures of gendered norms, we first provide two sets of robustness checks on the OLS results. The first three columns of Table 3 below show that the opposing effects on the deferred dower of the two types of gendered norms (presented in Table 2), are robust to including the two types of norms together in the estimations.

The last three columns of Table 3 below present a type of Placebo test, by demonstrating that other types of norms (not directly pertaining to gender) do not have any significant impact on deferred dower payments. For this purpose, we use information from the Afrobarometer survey to capture three different types of social norms. The first variable, that we term "Political Islam", is constructed from a series of questions which ask respondents whether they agree to a system of governance ruled by Islamic Law without elections or political parties, whether they think that democracy contradicts the teachings of Islam, whether a state runs better if religious people hold the public positions, and whether non-Muslims should have fewer political rights than Muslims. The second variable, we term "Mistrust", reflects the standard trust questions of whether most people can be trusted, and how much trust respondents have for different categories of people. A third variable, "Authoritarnism", is an average index made up of a host of questions relating to freedom of the media, freedom to demonstrate and protest, voting rights, gov-

ernment accountability, and political competition. More details on the precise definition of these indices is found in Appendix A.

[Table 3 Here]

3.4 Unbundling Gendered Norms

The previous estimation results demonstrate how inside and outside male dominance norms have opposing effects on deferred dowers. That these two types of norms do not move in the same direction in our estimations helps to identify our empirical predictions. A potential concern with the OLS estimations of the effects of gendered norms (as measured by aggregated self-reported beliefs) on marriage payments is that locations with male biased beliefs are possibly also characteristic of some key unobservable direct determinant of marriage payments. The most obvious one being systematic differences in levels of economic development. To this end, we have included as controls a host of measures directly related to the economic environment at the very local level. But more to the point, one would expect that any unobservable that is positively correlated with economic development would in turn be negatively correlated with both male biased inside and outside norms and should thus not predict the opposing effects on marriage payments that we observe in the data analysis. Additionally, it would be difficult to conceive of an unobservable directly correlated with both norms and marriage payments that would have opposing predictions for the deferred and prompt components of the dower payments (i.e., consistent with Predictions 1 and 3).

In this section we aim to make sense of this unbundling of gendered norms that we observe in the data. To this end, we turn to the Arab conquest of Egypt and the subsequent adoption of Islam across the country to explain the historical persistence in cultural differences with regards to the subordination of women inside and outside the household. We isolate relevant historical patterns that make sense of this unbundling of gendered norms, and can also be in an IV estimation strategy to further support the main empirical findings.

Roman Egypt (then part of the Byzantine Empire) was invaded by the Rashidun Caliphate in 639 CE. A force of roughly 4000 troops, where most soldiers belonged to two main tribes of Arabia, crossed over the Egyptian border, first taking siege of a town on the eastern extremes of Egypt's Nile Delta. From the time of this initial conquest, Arab tribal immigrants were continually dispatched to reinforce the army but also encouraged to settle. Estimates suggest the settlement of roughly 5000 Arab families in the eastern Nile Delta by about 727 CE (O'Sullivan (2006)). These settlement patterns were under the direct order

of the reigning Caliph. Families were granted land (previously occupied by the Christian Copts[30]), began to practice agriculture, animal breeding, and trade. Coinciding with the forced migration were systematic campaigns of Islamization among subject Christians, who were promised exemption from rising poll-taxes. Most of the women of the settled Muslim families were descended from the Christian Coptic population. This early group of assimilated Arabs in the Delta grew wealthy and came to represent the social and political elite of Egypt. Tribal loyalties were dissolved in favour of merit-based positions of leadership (Awad (1954)). Accompanying these large-scale authorized immigrations, were the unauthorized waves of nomadic tribes who immigrated into the country subsequently. By the middle ages almost all of Egypt was Islamized and these nomadic tribes had assimilated as well but typically had emigrated further into the heart of the Rif (the southern part of the country). It is argued that because these nomadic tribes settled later and into somewhat more remote areas, tribalism is still central to the social organization (Baron (2006)). Of particular note, are the use of traditional arbitration councils and the "Law of the Arabs" to resolve disputes in lieu of codified laws (Nielsen (2006)). Areas where these nomadic tribes settled are known for their patriarchal clan system, autocratic elders and feuds. This cultural distinction between the "sophisticated" Islamic elite who arrived early in the forced immigration process, during the initial conquest, and the later nomadic tribes residing in the more remote areas has implications for the persistence of gendered norms.

The tribal institutions of pre-Islamic Arabia were highly unfavourable to women. Most economic tasks necessary for nomadic societies favoured men. Women were typically forced into marriage, by capture or purchase, and female infanticide as well as honour killings were common. The Quran introduced reforms to customary tribal law relevant to the status of women by mandating both marriage and inheritance laws. Marriage became a contractual agreement which required the consent of both parties and was legally enforced. Upon marriage, women were to receive a dower (as protection against divorce) and men were obligated to economically maintain their wife throughout the marriage, regardless of her own personal wealth. Women were also given the right to inherit from her parents and were allocated half of the amount given to sons (Esposito (1975)). At the time, these rights allotted to women were far superior to those in Western Europe, where women would be granted property rights centuries later. Customs of seclusion, originally practiced in Byzantium and Persia, gained common acceptance. They were originally meant to give

[30]Christianity was introduced into Egypt around 42 CE and by the third century, Christians constituted the majority of the population. The scriptures were translated into the local language, known as Coptic. Soon the Church of Alexandria was formally recognized as one of Christendom's four Apostolic Sees and its followers were known as Coptic Christians (or Copts).

honour and distinction to women, and were adopted by Islam as an additional precaution against the immoral conditions that prevailed in pre-Islamic Arabia (Saleh (1972)).

By the middle ages, Egyptian urban clusters had developed into major cultural centres. Political power was located in households rather than in more formal mechanisms and structures of centralized bureaucratic states (Fay (2012)). Despite following the strict rules of seclusion, the women within these elite families held significant decision making power (Hatem (1986)). In large part, due to Sharia law, which allowed them to inherit and own property (Russell (2004)). There was therefore a contrast between the public and private spheres of life for these women. On the one hand, they were prevented from engaging with the public realm (through veiling and seclusion) but were active in the private realm. In the context of our model, *outside* male dominance norms are strong amongst these elite women but *inside* male dominance norms are weak. This is in contrast to elements of the tribal culture that persisted to this day from the influence of the more remote nomadic tribes, where all gendered norms were strongly to the detriment of women (both strong inside and outside male dominance norms).

Taking this history into account, we posit two instrumental variables which distinguish the more "sophisticated" cultural norms from the "tribal". The first instrument is the distance to the North-West Africa historical trade route dating from the 6th century. These data come from the geo-referenced Old World Trade Routes (OWTRAD) database across the territories of North Africa (Ciolek 2006).[31] We posit that present-day locations closer to this historical trade route of the initial conquest are more likely to be exposed to the "sophisiticated" cultural norms.[32] We therefore expect this instrument, distance to the historical trade route to be positively related to inside male dominance norms and negatively related to outside male dominance norms. As a second instrument, we use the relative suitability to nomadic pastoralism, which we expect to be positively related to more "tribal" norms. To construct this instrument, we follow a similar strategy to Becker (2019) and create a land suitability for nomadic pastoralism relative to sedentary animal husbandry using the geo-referenced grid cell level data from Beck and Sieber (2010).[33] We posit that relative suitability to nomadic pastoralism positively predicts both inside and

[31] Refer to http://www.ciolek.com/owtrad.html.

[32] This IV strategy is related to that of Michalopoulos et al. (2018) who use the proximity to the pre-600 CE trade network to predict todays Muslim adherence.

[33] Becker (2019) constructs the grid cell level average suitability for sedentary animal husbandry and nomadic pastoralism relative to agriculture suitability. Our strategy slightly differs for two reasons. First, for Egypt we have no variation in agricultural suitability using this data. Second, for our purposes we aim to capture the likely presence of nomadic tribes compared to sedentary ones. These data from Beck and Sieber (2010) use climate and soil conditions and ecological niche modelling (ENM) to derive spatial predictions of the suitability to four landuse traits (agriculture, sedentary animal husbandry, nomadic pastoralism, and hunting-and-gathering) for the Old World.

outside male dominance norms, in accord with early nomadic tribal norms. The geographic variation in these two instruments are depicted in Figures A5 and A6 respectively in Appendix A.

By using these instruments, we are assuming that these two variables, which arguably determined settlement patterns before the middle ages, do not have their own direct effect on marriage payments, except via the posited channel here, that of persistent gendered cultural norms. As already emphasized, almost all of Egypt was Islamized by the 12th century and that Islam in turn does not prescribe the magnitude of marriage payments. Research focused on the persistence of the described tribal norms in some areas of the country, emphasize that these strong cultural distinctions are based on the fact that inhabitants of these regions see themselves as direct descendants of the original nomadic tribes from the Arabian peninsula (Watson (1907), Hopkins and Saad (2004), and Nielsen (2006)). It is particularly striking that this "tribal" identity can prevail today even in large urban centres such as Cairo (Hopkins and Saad (2004)).

Aside from cultural identity, these two instruments would have also predicted degrees of geographic remoteness and other consequent economic outcomes for the early settlers. However, since this early era, which dates to before the 12th century, Egypt has experienced a series of occupations, massive economic and technological changes, as well as extensive social reforms, that would have minimized these initial differences with regards to economic outcomes. Including our host of economic and geographic controls at the very local level should control for what systematic differences remain. Our exclusion restriction is threatened if we posit that there is some unobservable variable that is significantly correlated by say distance to the historical trade route that in turn has a positive relationship with inside male dominance norms and a negative relationship with outside male dominance norms. Conceiving of such an unobservable factor seems somewhat difficult. Moreover, Table A4 in Appendix A demonstrates that our two instrumental variables are not significantly correlated with household or community level measures of economic well-being today.

The tables below present the results from a two-stage least-squares estimation procedure. Table 4 demonstrates that the two instruments above discussed are indeed significant determinants of our gendered norms variables and that the signs are as expected - distance to the historical trade route positively predicts inside male dominance norms and negatively predicts outside male dominance norms. Nomadic suitability positively predicts both types of male dominance norms.

[Table 4 Here]

Table 5 shows the second stage estimation results, which demonstrate that Predictions 1 and 2 are confirmed - inside male dominance norms are negatively related to deferred dowers and outside male dominance are positive determinants.[34]

[Table 5 Here]

3.5 Prompt Dower

In this section we test Prediction 3 that the prompt dower, T, is increasing in the strength of male dominance inside household norms. Table 6 below presents both OLS and IV estimation results where we see the predicted positive relationship. The first three columns show the OLS results, adding controls sequentially, the last three columns show the analogous 2SLS results.

[Table 6 Here]

4 Conclusions

Our goal in this paper has been to draw connections between two forces that loom large in the lives of women: marital institutions and gendered norms. The independent influence of each dimension is well-appreciated, but here we provide a fuller picture by analyzing the way in which these dimensions of culture and institutions *interact*. We show how the nature of the interaction is nuanced, requiring an 'unbundling' of gendered norms. In particular, we show how optimal marital institutions call for less constraint on husbands when there are stronger norms of male dominance 'inside' the household, but for more constraint on husbands when there are stronger norms of male dominance 'outside' the household.

Our analysis and results can be extended in a variety of directions. First, it would be interesting to probe other situations in which 'unbundling' of gendered norms is illuminating. One possibility relates to attempts at promoting the financial independence of wives, as in Ashraf et al. (2019). Outside norms of male dominance simultaneously incentivize wives to eschew formal employment in favour of entrepreneurship, and place a barrier to the profitability of such a strategy by restricting access to credit and other services. These

[34] The IV estimated coefficients on outside male dominance norms are substantially higher than the corresponding OLS coefficients (reported in Table 3). This may be due to heterogenous or non-linear impacts of our two instrumental variables across different samples of the population, which cause the estimated LATE to be larger than the ATE.

barriers are somewhat weakened if the husband gets involved, but the desirability of this is contingent on the state of inside norms.

Second, the analysis could be extended to shed light on the origins of gendered norms surrounding marriage. Whilst the origins of outside norms have received attention,[35] less has been devoted to understanding the drivers of inside norms. Indeed, the most interesting observation from Hill's quote is the reliability with which cultures allocate power to husbands over wives. This systematic pattern might be partially explained by our finding that inside norms 'substitute' for marital institutions, suggesting that inside norms flourish when it is costly to constrain husbands via marital institutions.

Finally, whilst we have exploited a convenient feature of Islamic marriage in our empirical implementation, we emphasize that the lessons to be drawn are broader. Thus, it would be interesting to explore the empirical validity of our predictions in other settings. Our empirical framework extends readily to other Muslim populations, but it would be particularly valuable to find ways to extend the empirical framework to non-Muslim populations. The challenge here of course is quantifying the strength of marital institutions though alimony rules could be a proxy.

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Table 1: OLS Estimations on Deferred Dower: Economic and Separation Advantage

	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$
Relative Male to Female	0.71**	0.88**	0.94**			
Crop Suitability	(0.38)	(0.40)	(0.48)			
Hanafi Law				1.09**	0.93*	1.48*
				(0.54)	(0.51)	(0.82)
Fixed Effects	✓	✓	✓	✓	✓	✓
Household Controls		✓	✓		✓	✓
Local Controls						✓
Observations	11,667	11,667	11,667	11,667	11,667	11,667

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level,* * at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources.

Table 2: OLS Estimations on Deferred Dower: Male Dominance Norms

	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$
Husband Decides	-0.12***					
	(0.03)					
Fear of Husband		-0.04**				
		(0.02)				
Husband Decides			-0.10**			
(DHS)			(0.05)			
No Women Work				0.96**		
				(0.46)		
Unequal Treatment					1.69***	
					(0.53)	
Support FGM						0.03*
						(0.02)
Observations	10,649	10,649	10,649	10,649	10,649	10,649

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level, ** at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources. All estimations include fixed effects, household and local controls.

Table 3: OLS Estimations on Deferred Dower: Male Dominance Norms - Robustness

	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$
Husband Decides	-0.11***	-0.11***	-0.11***	-0.11**	-0.10**	-0.11***
	(0.03)	(0.02)	(0.03)	(0.05)	(0.05)	(0.03)
No Women Work	0.89***			0.75*	0.77*	0.91**
	(0.34)			(0.41)	(0.43)	(0.36)
Unequal Treatment		1.53***				
		(0.24)				
Support FGM			0.04***			
			(0.01)			
Political Islam				-0.46		
				(0.46)		
Mistrust					0.48	
					(0.54)	
Authoritarianism						0.38
						(0.33)
Observations	10,589	10,589	10,589	10,589	10,589	10,589

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level,** at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources. All estimations include fixed effects, household and local controls.

Table 4: First-Stage Estimations on Male Dominance Norms

	Husband Decides	No Women Work	Unequal Treatment	Support FGM
Distance to Trade Route	0.11***	-0.003***	-0.006***	-0.13***
	(0.003)	(0.0001)	(0.0002)	(0.005)
Nomadic Suitability	5.30***	0.04***	0.02**	4.80***
	(0.13)	(0.003)	(0.009)	(0.11)
F-statistic	853.1	229.1	190.7	1561.0
R-squared	0.72	0.32	0.25	0.60
Observations	10,589	10,589	10,589	10,589

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level, ** at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources. All estimations include fixed effects, household and local controls.

Table 5: 2SLS Estimations on Deferred Dower: Male Dominance Norms

	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$	$\ln(1+\tau_i)$
Husband Decides	-0.11**	-0.11**	-0.16***
	(0.05)	(0.05)	(0.04)
No Women Work	4.23*		
	(2.44)		
Unequal Treatment		2.63***	
		(0.90)	
Support FGM			0.08**
			(0.04)
Observations	10,589	10,589	10,589

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level, ** at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources. All estimations include fixed effects, household and local controls.

Table 6: Estimations on Prompt Dower: Inside Male Dominance Norms

	OLS $\ln(1+T_i)$	OLS $\ln(1+T_i)$	OLS $\ln(1+T_i)$	2SLS $\ln(1+T_i)$	2SLS $\ln(1+T_i)$	2SLS $\ln(1+T_i)$
Husband Decides	0.06**	0.05*	0.05*	0.08*	0.09**	0.08**
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Fixed Effects	✓	✓	✓	✓	✓	✓
Household Controls		✓	✓		✓	✓
Local Controls			✓			✓
Observations	9,355	9,355	9,355	9,355	9,355	9,355

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level, ** at 5%, and * at 10%. Refer to Appendix A for details on the variables definitions and data sources. All estimations include fixed effects, household and local controls.

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Appendix

A Data Appendix

A.1 Tables

Table A1 below describes summary statistics of the mean and standard deviation (in parentheses) for the variables from the household-level data used in our empirical analysis. The first column is for the whole sample, the next two columns describe the urban and rural samples separately.

Table A1: Summary Statistics - Household Data

	Whole Sample	Urban Areas	Rural Areas
Log Deferred Dower	6.6 (2.9)	7.0 (2.7)	6.3 (3.0)
Log Prompt Dower	2.4 (3.6)	2.0 (3.4)	2.7 (3.7)
Wife Education	8.2 (5.4)	9.8 (4.9)	6.9 (5.4)
Husband Education	9,2 (5.0)	10.4 (4.6)	8.2 (5.1)
Wife Age	30.1 (7.5)	31.3 (7.6)	29.1 (7.2)
Wife Age Married	20.7 (3.9)	21.8 (3.5)	19.8 (3.5)
Husband-Wife Age	6.3 (5.1)	6.2 (5.0)	6.4 (5.2)
Household Wealth	4.0 (0.8)	4.3 (0.8)	3.7 (0.7)
Wife mother Literate	0.22 (0.41)	0.32 (0.47)	0.13 (0.34)
Wife father Literate	0.47 (0.50)	0.59 (0.49)	0.37 (0.48)
Husband Mother Literate	0.19 (0.40)	0.29 (0.45)	0.10 (0.30)
Husband Father Literate	0.45 (0.50)	0.57 (0.49)	0.33 (0.47)
Urban	0.46 (0.50)	1 (0)	0 (0)
Observations	12,639	5,818	6,821

Data Sources: Egypt Labor Market Panel Survey (ELMPS) 2006 and 2012.

Table A2 below describes summary statistics on the mean and standard deviation (in parentheses) for the variables defined at the local level used in our empirical analysis. The geographic variables such as crop suitability and soil quality measures, temperature, precipitation, light and population density, and distance to amenities are all averaged to the kism level.[36] The norms variables are aggregated up to the governorate level. The first column presents the averages for the whole sample, the next two columns describe the urban and rural samples separately.

The "Husband Decides" index is based on women's reported exclusion from the following types of household decisions: large purchases, daily purchases, visits to friends and family, own health, purchasing own clothing, and daily cooking. The "No Women Work"

[36] We do this to match our GIS data to our household level data. The kism is the smallest unit that we can geo-locate in the household level data.

index is based on an individuals agreement to the following statements: "A thirty year old woman who has a good job but is not married is to be pitied", "A woman who has a full-time job cannot be a good mother", "Having a full-time job always interferes with a woman's ability to keep a good life with her husband"; and disagreement with: "Women should continue to occupy leadership positions in society" and "A woman's place is not only in the household but she should be allowed to work".

The "Mistrust" index reflects the degree of defiance of individuals towards people they know. It is based on three variables: answering not at all or just a little to "How much do you trust each of the following types of people: Your relatives?", "Your neighbors?", and "Other people you know?". The support of "Political Islam" index includes any proposition involving Islam in political matters. It is based on four variables: approving or strongly approving of the following statement "A system governed by Islamic law without elections or political parties?", agreeing or strongly agreeing with "Democracy is a system that contradicts the teachings of Islam", with "In a Muslim country, non-Muslims should enjoy less political rights than Muslims", and with "The country is better off if religious people hold public positions in the state". The "Authoritarianism" index reflects support for authoritarian political regimes. It is based on eight variables: agreeing or strongly agreeing with "The government should have the right to prevent the media from publishing things that it considers harmful to society", approving or strongly approving on "Elections and Parliament are abolished so that the President can decide everything", agreeing or strongly agreeing with "Since elections sometimes produce bad results, we should adopt other methods for choosing this country's leaders", with "The President should be able to devote his full attention to developing the country rather than wasting time justifying his actions", with "Once election is over, opposition parties and politicians should accept defeat and cooperate with government to help it develop the country", with "Too much reporting on negative events, like government mistakes and corruption, only harms the country", "Since the President represents all of us, he should pass laws without worrying about what Parliament thinks", and with "There should be no constitutional limit on how long the President can serve".

Indicators of soil quality are derived from the FAO's Global Agro-Ecological Zones (GAEZ).[37] "Soil rooting conditions" correspond to the soil depth/volume limitations of a soil unit, constraining yield formation. It is measured by seven class values. "Soil terrain slope" corresponds to the terrain slope gradient (from 0 to 100%). "Soil workability" refers to the soil workability constraints to cultivation. It is measured by seven class values. From the PRIO-GRID dataset[38], we compute the average of yearly total amounts of "precipitation" (in milimeters) and the average of yearly mean "temperature" (in degrees Celsius) between 1950 and 2005. "Light density" has been repeatedly shown as a good proxy for human economic activity (see Henderson et al., 2012). Our measure is based on satellite data from the National Geophysical Data Center. Digital archives begin in 1992, which is the year we retain for our variable. The intensity of nighttime lighting is reported as a digital number varying from 0 (no light) to 63. The log of "population

[37] FAO/IIASA, 2010. Global Agro-ecological Zones (GAEZ v3.0). FAO, Rome, Italy and IIASA, Laxenburg, Austria.

[38] http://www.prio.no/CSCW/Datasets/PRIO-Grid/

density" is obtained from the PRIO-GRID for the year 2000 and originally extracted from the Gridded Population of the World (Version 3). "Travel-time to the nearest city" is obtained from the PRIO-GRID and corresponds to the travel time (in minutes) by land transportation to the nearest city of more than 50,000 inhabitants. Distance and time to health and educational facilities come from the ELMPS Surveys.

Table A2: Summary Statistics - Local Area Data

	Whole Sample	Urban Areas	Rural Areas
Relative Male to Female Crop Suitability	6.0 (0.3)	6.1 (0.4)	6.0 (0.2)
Hanafi Law	0.63 (0.48)	0.71 (0.45)	0.56 (0.50)
Husband Decides (Inside Male Dominance Norm)	21.7 (9.2)	19.4 (9.2)	23.6 (8.8)
Fear of Husband (Inside Male Dominance Norm)	61.5 (14.2)	57.6 (14.3)	64.8 (13.2)
Husband Decides (DHS) (Inside Male Dominance Norm)	21.7 (7.9)	20.6 (7.3)	22.7 (8.3)
No Women Work (Outside Male Dominance Norm)	3.1 (0.4)	3.0 (0.41)	3.2 (0.4)
Unequal Treatment (Outside Male Dominance Norm)	1.5 (0.5)	1.5 (0.4)	1.5 (0.5)
Support FGM (Outside Male Dominance Norm)	71.7 (13.6)	67.1 (14.9)	75.6 (11.1)
Political Islam (Placebo Norm)	6.9 (60.4)	-1.0 (60.1)	13.5 (59.8)
Mistrust (Placebo Norm)	7.8 (60.1)	-6.2 (56.9)	-10.6 (48.1)
Authoritarianism (Placebo Norm)	-5.4 (60.4)	29.8 (65.4)	-4.8 (63.1)
Distance to Historic Trade Route	71.5 (55.2)	71.8 (62.2)	71.1 (48.4)
Nomadic Suitability	2.6 (1.4)	2.5 (1.4)	2.7 (1.4)
Soil - Terrain Slope	95.9 (5.0)	94.4 (5.7)	97.2 (3.9)
Soil - Workability	2.0 (1.2)	2.4 (1.4)	1.6 (0.9)
Soil - Rooting Conditions	1.7 (1.2)	2.1 (1.5)	1.4 (0.8)
Light Density	29.7 (17.9)	38.3 (20.9)	22.3 (10.3)
Log Population Density	6.8 (1.4)	7.1 (1.3)	6.5 (1.5)
Average Precipitation	3.4 (3.0)	3.5 (3.3)	3.2 (2.8)
Average Temperature	17.6 (0.8)	17.6 (0.8)	17.5 (0.9)
Distance to Hospital	23.7 (5.1)	22.1 (5.1)	25.1 (4.6)
Distance to Health Clinic	14.7 (1.8)	14.5 (1.9)	14.9 (1.7)
Distance to Nearest City	74.2 (47.0)	66.5 (45.2)	80.8 (47.5)
Time to Nearest Primary School	11.0 (6.9)	10.5 (6.3)	11.3 (7.2)
Time to Nearest Preparatory School	13.0 (8.3)	12.6 (7.4)	13.3 (9.0)
Time to Nearest Secondary School	19.0 (12.7)	16.4 (12.4)	21.2 (12.6)
Observations	12,636	5,818	6,821

Data Sources: Egypt Labor Market Panel Survey (ELMPS) 2006 and 2012; Demographic Health Survey (DHS) of Egypt (2014, 2015); Afrobarometer Survey of Egypt (2015, 2016); GULF/2000 map project; FAOs GAEZ 2002 database; PRIO-GRID dataset; Global Land Use Database; Beck and Sieber (2010); (OWTRAD) database.

Table A3 below presents OLS estimation results on the deferred dower (first column) and the prompt dower (second column) as a function of the baseline household-level controls. We see that husband's education and household wealth, as well as wife's father's education, all positively determine deferred dower payments. For the prompt dower pay-

ments, wife's education is a negative determinant and husband-wife age difference is a positive determinant.

Table A3: OLS Estimations on Deferred and Prompt Dower: Household Controls

	$\ln(1+\tau_i)$	$\ln(1+T_i)$
Wife Education	-0.004 (0.019)	-0.04 (0.02)**
Husband Education	0.036 (0.017)**	-0.005 (0.01)
Wife Age	-0.033 (0.032)	-0.10 (0.08)
Wife Age Married	0.016 (0.036)	0.12 (0.08)
Husband-Wife Age	-0.005 (0.008)	0.03 (0.01)**
Household Wealth	0.17 (0.08)**	-0.02 (0.13)
Wife Mother Literate	0.04 (0.11)	-0.07 (0.15)
Wife Father Literate	0.36 (0.10)***	0.02 (0.10)
Husband Mother Literate	-0.044 (0.13)	0.09 (0.12)
Husband Father Literate	0.08 (0.11)	0.02 (0.11)
Fixed Effects	✓	✓
Observations	11,667	11,667

Notes: Clustered standard errors at the governorate level are in parentheses.
*** reflects statistical significance at the 1% level, ** at 5%, and * at 10%.

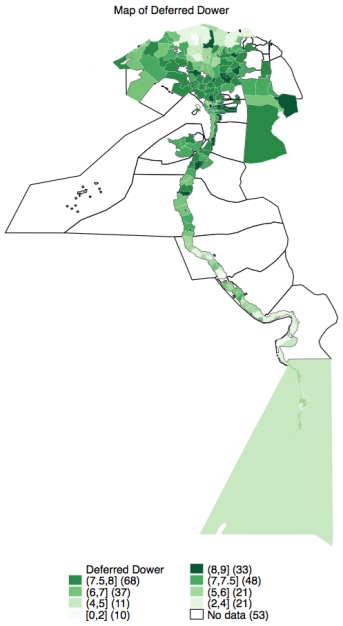
Table A4 below presents OLS estimation results, with varying dependent variables, as a function of our two instrumental variables, used in the analysis of Section 3.4. The list of dependent variables is found in the first column of Table A4. The estimated coefficients for each separate regression on the respective instruments, distance to the historical trade route and nomadic suitability, for each dependent variable are separate entries of the table. All estimations include the baseline set of fixed effects (regional, urban/rural, and year of marriage). We see that our two instrumental variables are not significant determinants of any of the dependent variables reflecting economic outcomes at the household or community level.

Table A4: OLS Estimations: Exclusion Restriction

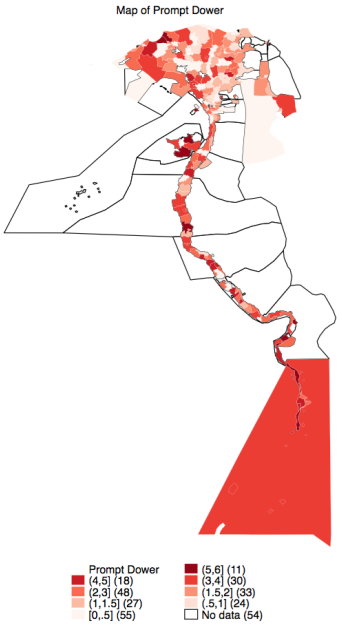
	Distance to Historic Trade Route [Estimated Coefficient]	Nomadic Suitability [Estimated Coefficient]	Observations
Wife Education	0.22 (0.23)	-0.002 (0.01)	12,639
Husband Education	0.16 (0.17)	-0.003 (0.002)	12,639
Wife Age Married	-0.005 (0.11)	-0.001 (0.002)	12,639
Household Wealth	-0.01 (0.06)	-0.001 (0.001)	12,639
Distance to Hospital	0.24 (0.52)	-0.02 (0.02)	12,636
Distance to Health Clinic	0.30 (0.27)	0.01 (0.01)	12,636
Time to Nearest Primary School	-0.19 (0.19)	-0.01 (0.01)	12,636
Time to Nearest Preparatory School	-0.05 (0.19)	-0.003 (0.01)	12,636
Time to Nearest Secondary School	-0.13 (0.57)	-0.02 (0.02)	12,636

Notes: Clustered standard errors at the governorate level are in parentheses. *** reflects statistical significance at the 1% level, ** at 5%, and * at 10%. All estimations include fixed effects.

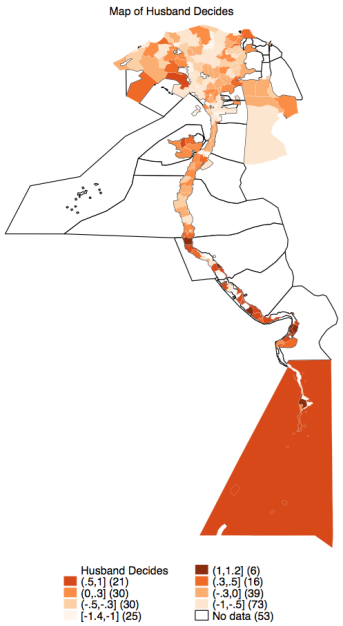
A.2 Figures



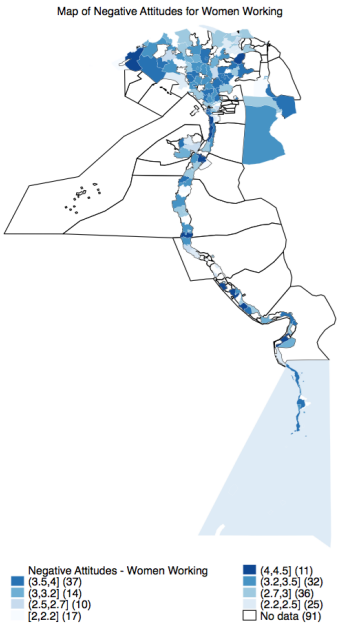
(a) Map of Deferred Dower



(b) Map of Prompt Dower

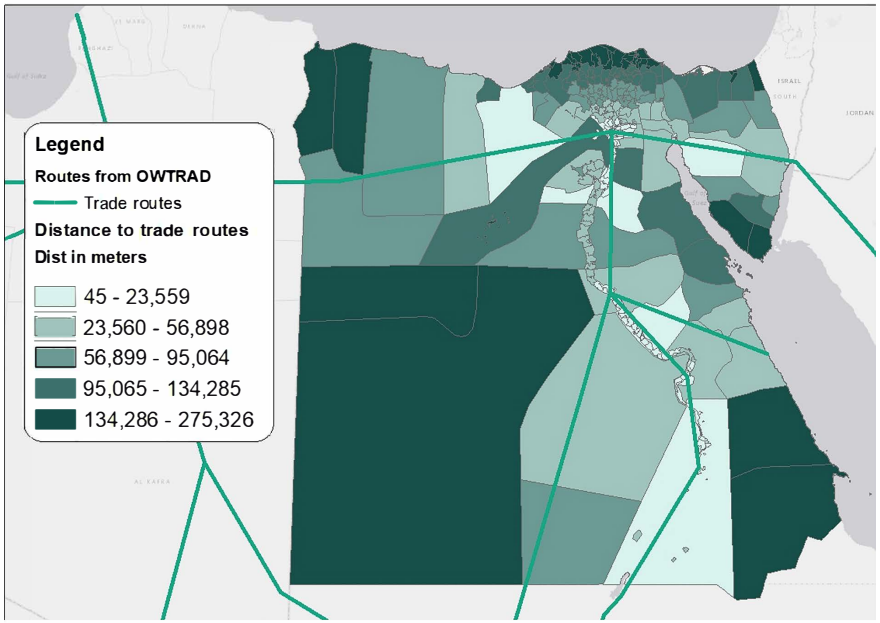


(c) Map of Husband Decides (Inside Male Dominance Norms)

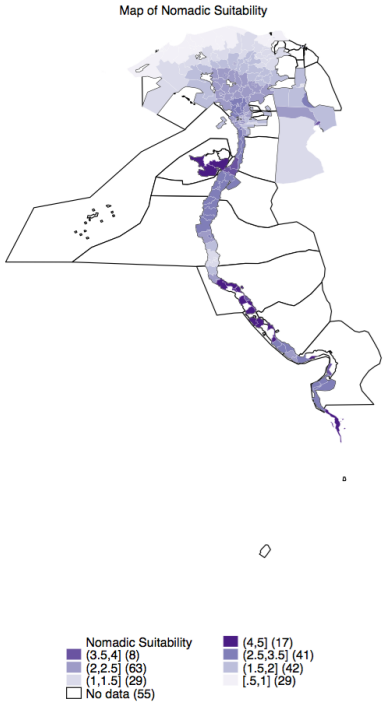


(d) Map of Negative Attitudes to Women Working (Outside Male Dominance Norms)

Figure A1: Maps



(a) Map of Historical Trade Routes



(b) Map of Nomadic Suitability

Figure A2: Maps

B Model Appendix

Proof of Proposition 1.

Define the random variables $\sigma \equiv \eta_m + \eta_f$ and $\delta \equiv \eta_m - \eta_f$. These are distributed with a density $g(\sigma, \delta) = (1/2) \cdot f[(1/2) \cdot (\sigma + \delta), (1/2) \cdot (\sigma - \delta)]$. Notice that marital welfare depends on σ but not δ: $\bar{V}(\eta) = \bar{u}_m + \bar{u}_f - \sigma \equiv \mathcal{V}(\sigma)$. Thus, this is also true of the welfare loss term: $L(\eta) = \min\{\mathcal{V}(\sigma) - \tilde{V}, \kappa\} \equiv \mathcal{L}(\sigma)$. Define $\eta^* \equiv \bar{\eta}_m(\tau) + \bar{\eta}_f(\tau) = (\bar{u}_m + \bar{u}_f) - (\hat{u}_m + \hat{u}_f)$, noting that η^* is independent of τ (and ϕ).

Lemma 1 *Given the spousal difference in commitment to marriage, $\Delta \equiv \bar{\eta}_m(\tau) - \bar{\eta}_f(\tau)$, expected welfare can be expressed as $V = V_0 + V_1(\Delta)$ where*

$$V_0 \equiv V^* - \int_{-\infty}^{\eta^*} \left\{ \int_{-\infty}^{\infty} g(\sigma, \delta) d\delta \right\} \mathcal{L}(\sigma) d\sigma \tag{23}$$

is independent of τ (and ϕ), and

$$V_1(\Delta) \equiv \int_{-\infty}^{\eta^*} \Omega(\Delta, \sigma) \cdot \mathcal{L}(\sigma) d\sigma \tag{24}$$

where

$$\Omega(\Delta, \sigma) \equiv \int_{\Delta - (\eta^* - \sigma)}^{\Delta + (\eta^* - \sigma)} g(\sigma, \delta) d\delta. \tag{25}$$

Thus expected welfare depends on τ (and ϕ) only via their effect on Δ.

Proof of Lemma 1.

From the text, we need to characterize the conditions under which the state falls in case III or IV. In order for (10) to not hold, we need

$$\eta_m + \eta_f \leq \bar{\eta}_m + \bar{\eta}_f. \tag{26}$$

This can be written

$$\sigma \leq \eta^*. \tag{27}$$

In order for (11) to not hold, we need

$$\eta_m > \bar{\eta}_m \quad \text{or} \quad \eta_f > \bar{\eta}_f. \tag{28}$$

Using the fact that $\eta_m = (1/2) \cdot [\sigma + \delta]$ and $\eta_f = (1/2) \cdot [\sigma - \delta]$, this is:

$$\delta \notin [\sigma - 2 \cdot \bar{\eta}_f, 2 \cdot \bar{\eta}_m - \sigma] \tag{29}$$

Using the fact that $2 \cdot \bar{\eta}_f = (\bar{\eta}_m + \bar{\eta}_f) - (\bar{\eta}_m - \bar{\eta}_f) = \eta^* - \Delta$ and $2 \cdot \bar{\eta}_m = (\bar{\eta}_m + \bar{\eta}_f) + (\bar{\eta}_m - \bar{\eta}_f) =$

$\eta^* + \Delta$, this becomes:

$$\delta \notin [\Delta - (\eta^* - \sigma), \Delta + (\eta^* - \sigma)]\,. \tag{30}$$

Thus case III or IV arises whenever (σ, δ) is such that (27) and (30) both hold. In such cases the welfare loss is $\mathcal{L}(\sigma) > 0$. Thus we have

$$V = V^* - \int_{-\infty}^{\eta^*} \left\{ \int_{-\infty}^{\Delta-(\eta^*-\sigma)} g(\sigma, \delta) d\delta + \int_{\Delta+(\eta^*-\sigma)}^{\infty} g(\sigma, \delta) d\delta \right\} \cdot \mathcal{L}(\sigma) d\sigma. \tag{31}$$

The result follows by expressing the term in braces as:

$$\int_{-\infty}^{\infty} g(\sigma, \delta) d\delta - \int_{\Delta-(\eta^*-\sigma)}^{\Delta+(\eta^*-\sigma)} g(\sigma, \delta) d\delta \tag{32}$$

□

Lemma 2 *Under assumption 1, for any $\sigma \leq \eta^*$ we have that $\Omega(\Delta, \sigma)$ is maximized at $\Delta^* = 0$.*

Proof of Lemma 2.
By Assumption 1, $g(\sigma, \delta)$ is decreasing in $|\delta|$. Taking the derivative of Ω with respect to Δ gives

$$\Omega'(\Delta|\sigma) = g(\sigma, \Delta + (\eta^* - \sigma)) - g(\sigma, \Delta - (\eta^* - \sigma)). \tag{33}$$

If $\Delta \leq 0$, then since $(\eta^* - \sigma) \geq 0$ we have $|\Delta + (\eta^* - \sigma)| \leq |\Delta - (\eta^* - \sigma)|$ and therefore $\Omega'(\Delta|\sigma) \geq 0$ by Assumption 1. Similarly, if $\Delta \geq 0$ since $(\eta^* - \sigma) \geq 0$ we have $|\Delta + (\eta^* - \sigma)| \geq |\Delta - (\eta^* - \sigma)|$ and therefore $\Omega'(\Delta|\sigma) \leq 0$ by Assumption 1. It follows that $\Omega(\Delta|\sigma)$ is maximized at $\Delta = 0$. □

Proposition 1 then follows since Lemma 1 immediately implies that the optimal marital institution is the one that delivers the Δ which maximizes $V_1(\Delta)$, and Lemma 2 immediately implies $V_1(\Delta)$ is maximized at $\Delta^* = 0$, and thus τ^* satisfies $\bar{\eta}_m(\tau^*) = \bar{\eta}_f(\tau^*)$. □

Proof of Proposition 3.
Beyond the arguments in the text it remains to show that welfare under *optimal* marital institutions is independent of inside norms. Separation welfare, $\tilde{V}$, is clearly independent of ϕ, but so too is marital welfare without transfers, $\bar{V}(\eta)$, since inside norms serve to reallocate a given total payoff. This implies the maximal welfare, $V^*(\eta)$, and the welfare loss term, $L(\eta)$, is therefore also independent of inside norms. Turning to the characterization of welfare offered in Proposition 1, we have that V^* and $\mathcal{L}(\sigma)$ are therefore independent of ϕ, and we showed there that η^* is also independent of ϕ. The only impact of ϕ is to change Δ, but under optimal marital institutions this is fixed at zero (i.e. changes in ϕ are offset by changes in τ^* so that Δ remains at zero). □