Bargaining over Marriage Payments: Theory, Evidence, and Policy Implications

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Abstract

One unique aspect of the marriage tradition in Chinese society is the presence of bidirectional wealth transfers: bride price and dowry—a payment from the groom's family to the bride's family and from the bride's family to the couple, respectively. Under this institution, this article delves into the broad implication of a pro-women marriage law amendment related to property division in divorce in a society with high gender inequality. I first complement the existing marriage market models by relaxing the assumption of a single zero-sum payment. The model incorporates bargaining processes between the parents on the two sides and within the couple, relying on patrilocality and altruism as the rationales. Empirically, using a collective model and reduced-form evidence, I first find that a larger dowry improves the wife's bargaining power within the new conjugal household. Then with RDD estimation, I find that the 2001 amendment leads to discontinuities in the two prices. This article attests to a policy implication of how a one-sided targeting policy can lead to a Pareto improvement—the increase in the bride price and dowry benefits both the couple and the bride's family.

Key words

Marriage Payments, Gender Inequality, Intrahousehold Bargaining, Divorce

JEL Classification codes

J12, D13, J16, D15

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1. Introduction

In Chinese society, bidirectional payments of both bride price and dowry are widely observed as a marriage custom. Traditional theories of marriage payments provide insights into the existence of a bride price or dowry but not their coexistence. This limits the discussion of the implications of the unique institution observed in China. I propose a novel three-agent marriage market model to describe this unique institution and discuss the broad implication of a pro-women marriage law amendment introduced in 2001 aiming at solving the issue of property division in divorce.

I answer three questions in this article. First, how do patrilocality and altruism work as the rationales in the bargaining process of wealth transfers, including the one from the groom's family to the bride's family named bride price and the other from the bride's family to the couple named dowry? Secondly, as a behavior of altruism towards the daughter, how do dowries shift the bargaining power in the new conjugal household? Lastly, based on the conclusions from the first two questions, how would the marriage law amendment—a positive shock to the value of dowries as it helps a wife to secure property rights in divorce—affect the willingness to pay for the two prices and, consequently, the welfare of the families on the two sides in a society with high gender inequality?

The marriage payment custom is performed in such an order: after the betrothal and before the wedding, the bride's family signals to the groom's family how much they want as the bride price. As in modern China, this is typically a "take-it-or-leave-it" offer. The groom's family usually does not negotiate the price with the bride's family. If the groom's family chooses to pay the bride price to the bride's parents, the bride's parents will transfer part of their wealth to their daughter and let her bring it to the new family as her dowry.[1] The flowchart below shows the process:

[Insert Figure 1 here]

Hence, the first distinctive feature of this article is the modeling of the unique institution, which involves payments of both bride price and dowry. Bride prices and dowries have been prevalent in many societies throughout history, especially where women's social statuses are lower (Anderson, 2003). Nowadays, these traditions remain popular in many developing countries, notably East and South Asia and Sub-Saharan Africa (Anderson, 2007). Typically, a single society only sees a single

[1] Different regions may observe different formats and timelines. In this article, I only discuss the one regarded as the mainstream.

direction of the payments (i.e., either from the groom's side to the bride's side—bride price or from the bride's side to the groom's side—dowry); the direction heavily depends on the historical female role in agricultural activity (Botticini & Siow, 2003; Corno et al., 2020). Nevertheless, Greater China appears to be the only large society that sees both bride price and dowry in marriages (Anderson, 2007; Brown, 2009).[2] Traditional literature explains the occurrence and roles of marriage payments from different perspectives. Becker (1991) attributes them to the inflexibility in the division of joint products within the marriage. An upfront payment would arise to compensate for the loss of efficiency in the production of one side due to the marriage. Anthropological explanations claim that they function as the kind of property relations within the society (e.g., Goody (1973) and Schlegel & Eloul (1988)), where bride prices develop in a society's lack of social stratification and dowries are connected with social stratification.[3] However, the presumptions of both theories restrain wealth transfers as unidirectional and zero-sum. Thus, there have been limitations in discussing the scenario of bidirectional transfers.

In order to understand the coherence, I propose a three-agent model that involves the bride's and the groom's families and the new conjugal household. I take two main factors into account: patrilocality and parents' altruism. The model is partially related to the argument in Botticini & Siow (2003), where dowries are referred to as a pre-mortem inheritance. Their paper attributes the occurrence of dowries to the same two factors, regardless of the existence of bride prices. I complement the theory by incorporating the role of the bride price. Unlike the cases discussed in Botticini & Siow (2003), China sees a high labor force participation rate among women.[4] This leads to a necessity of compensation for losing productivity at the bride's family.

The parents' utility is altruistic and consists of three parts: the utility of their own consumption, the weighted utility of their children's consumption, and the loss or gain of a value due to their children's marriage. Considering the prevalence of patrilocality in marriages in China, the leave of their daughter induces a loss of utility in the bride's family, and the groom's family sees a positive gain. The marriage payment prices are based on a maximization problem of the bride's family. Because dowry occurs

[2] Muslim communities in the Indian Subcontinent traditionally require a payment from the groom to the bride named *mahr*. However, under the rule of the British Raj, dowry also became very popular. Nevertheless, *mahr* serves a different religious purpose and should not be treated the same as the bride price.

[3] The social stratification defined in their work is mainly associated with the economic status of women where strong social stratification restrains women from economic activities outside housework.

[4] This was also true in ancient China due to in some main agricultural activities such as tea picking, silk farming, and textile production, women, in fact, have advantages over men.

after the bride price is received, the bride's family has to decide the rule of dowry given any bride price and the consequent bride price amount to maximize their utility. In addition, the maximization process has constraints from both sides in terms of marriage decisions: the two marital transfers should satisfy the condition that getting married is better than any outside options for both sides of the parents.

I prove economically, under the assumption of utility maximization, why the two payments more commonly occur in these two specific directions. In other words, why would a negative or zero "bride price" (wealth transfer from the bride's family to the groom's family) hardly happen, and how does it make the marriage unattractive to the bride's family? Meanwhile, even though less common, a positive bride price payment but no dowry is occasionally observed with an impecunious bride's family. The economic explanation is closely related to the two assumptions—patrilocality and altruism—derived from the historical background, even though modern marital transfers mostly do not rely on gender roles in agricultural activities.

I propose a collective form household model to answer the second question of how dowries shift the bargaining power within households in a society that traditionally sees high disparities in social and economic statuses of different genders. Dowry has been proven to have a significant role in raising a wife's bargaining power (e.g., J. Zhang & Chan (1999); Brown (2009); Anderson & Bidner (2015)). Thus, after knowing the two prices of the marriage payments, I further extend the model to examine the impacts of dowries on the Pareto weights of the spouses. This discussion serves two purposes. Firstly, it provides an understanding of the scale of intrahousehold inequality in China. Secondly, it reflects on which kind of scale the dowry helps to alleviate inequality. Both structural model and reduced-form estimation are adopted to investigate these two issues. In the structural model, I introduce the heterogeneity of the bargaining power across households by incorporating the dowry payment into the Pareto weights on individuals. The estimation indicates that, on average, a woman enjoys a much lower Pareto weight (~ 0.2) within the household. Meanwhile, a higher dowry or dowry-to-bride price ratio significantly raises the wife's bargaining power. From the empirical strategy, I use wives' and husbands' time spent on chores as proxies for the spouses' intrahousehold bargaining power. A higher dowry reduces the wife's time spent on chores and narrows the time gap between husbands and wives.

In the last part, I assess the policy implication of a pro-women marriage law amendment by examining how an external shock on the value of dowries changes the willingness to pay for the two families. I take advantage of a marriage law amendment introduced in the year 2001. The amendment is generally considered pro-women in the wake of the opening-up of society and rising divorce rates. The amendment clarifies the ownership of property obtained by individuals before the marriage and allows the spouses more flexibility to claim the right of post-wedding property. Since dowries are usually in the form of physical assets and bride prices are paid in cash, this law amendment provides a wife the advantage should a divorce happen. This could lead to two incentives for the bride's family. On the one hand, the external shock enlarges the value of the dowry, which lessens the need for the dowry to achieve the same level of bargaining power for the bride. On the other hand, the increasing marginal benefit of dowry provides the bride's family a higher incentive to transfer more wealth. We would expect a more interesting outcome when the second effect dominates since this would lead to increases in both prices and the consequential Pareto improvement in society with a high level of inequality. Therefore, I employ this amendment as the cutoff point in the RDD estimation to test if there are discontinuities of the two prices and the direction of the change. As a result, I find that the amendment caused 26% and 10% leaps in the bride price and dowry—benefiting both the bride's family and the couple; from this fact, we can conclude that even if a policy is set to benefit one side, in a society with excessive inequality, a Pareto improvement can be possibly achieved.

2. Institutional Background

2.1. Marital Transactions in Chinese Society

Marriage payment tradition has long been existing in China.[5] In a Chinese marriage, part of the pre-wedding rituals is the multiple transfers between the two families. Bride price (*Caili* or *Pinli*) is the payment or a few payments from the groom's family to the bride's family. Dowry (*Jiazhuang*) is the subsequent transfer from the bride's family. The original idea of the bride price was to compensate the daughter's leave for the bride's family(Zang & Zhao, 2017). The ancient society was predominantly patrilocal, and the brides had few chances to visit their parents after the wedding(McCreery, 1976). Hence, a high bride price was regarded as necessary to compensate for the loss of productivity in the

[5] Thatcher (1991) finds that the tradition can be dated back to the periods of the Spring and Autumn and the Warring States (770–256 BC). The *Classic of Poetry* (also *Shijing*, 11th to 7th centuries BC), which is the oldest existing collection of Chinese poetry, already documented the prevalence of the tradition.

bride's family. Dowries originated from the wish of the bride's parents for better treatment of their daughter in the new family(Parish & Whyte, 1980; Zang & Zhao, 2017). Due to the disadvantage of women in agricultural production, a wife tended to have a lower economic status(Wolf & Huang, 1980). A higher dowry could help to improve the situation and balance the bargaining power.

The amount of the bride price is usually signaled by the bride's family after the betrothal and before the wedding. During the ancient time, arranged marriages were common, and matchmakers worked as intermediaries who also helped negotiate bride prices(Ebrey, 1991). However, with the increasing pervasiveness of and the forbiddance of marriage arrangement as well as more information exchange between the two families before the wedding, it is easier for the bride's family to know more about the groom's family and make a rational and reasonable offer to the groom's family.[6] Even though "marriage by purchase" has been strongly and consistently discouraged by the government of the People's Republic of China, no law has been seen to prohibit all betrothal exchange but only "the exaction of money in connection with marriage"(Ocko, 1991). The groom's side usually does not negotiate the price to avoid leaving a bad impression(Zang & Zhao, 2017). Thus, the groom's family would either accept the offer or give up the marriage. The bride price is usually paid in the form of cash, but the process can go through one or several installments over the course of the engagement(Ocko, 1991; Brown, 2009).

After receiving the bride's price, the bride's family has to decide how much they want to retain and how much wealth to give their daughter as the dowry. Dowry does not need to be negotiated with the groom or groom's parents and is totally treated as an internal decision of the bride's family(Ocko, 1991; Brown, 2009; Zang & Zhao, 2017). Different from bride prices, dowries are usually in the form of physical assets such as furniture, electronics, bedding, vehicles, and clothing.[7] A bride is expected to have authority over the property she brings into the new conjugal household. However, in reality, the dowry could become a part of the common property in the marriage. In addition, before 2001, the law in China did not protect the right of the dowry that a bride brought into the household because the marriage payments are regarded as a tradition of feudalism (*Fenjian*)(Ocko, 1991; Brown, 2009).[8]

[6]For self-arrangement of marriages, see Zang & Zhao (2017). For bans on marriage arrangements, see Article 1042 of the Civil Law of the People's Republic of China states arrangement, selling, and intervention of marriages are illegal in China.

[7]Ocko (1991) documents the change of the forms of dowry in the People's Republic of China era.

[8]Ocko (1991) documents numerous disputes regarding the division of property owned before marriage prior to the amendment.

Due to the nature of the forms of dowries, many types of property owned before marriage has no official certifications of ownership. Hence, in practice, dowry is treated as a shared resource in usage despite the actual ownership. However, because the wife has the right to the dowry, she may have more say in the property usage.

2.2. The 2001 Marriage Law Amendment

One of the main revisions reflected in the 2001 amendment to the 1980 PRC marriage law was the clarification of the property right of the individuals.[9] The amendment has critical implications regarding the division of property in divorces. The 1980 version of the marriage law did not specify the division rules primarily due to the extremely low divorce rate and relatively less wealth that people owned(Honig & Hershatter, 1988; Yi & Deqing, 2000). The rising divorce rate in the 1980s and 1990s saw the urgency of clarification. [10]

There were two major aspects with respect to the property division in divorces. The first part was that an individual would retain the ownership of the property that belonged to them prior to marriage (Chapter 3, Article 18). The second part was that the amended law gave the spouses more flexibility to declare the ownership of certain property obtained either before the marriage or during the marriage (Chapter 3, Article 19). In addition to the property right, the amendment clarified the process of dividing property in a divorce. If a divorce happens and an agreement cannot be reached in the negotiation for the division of property, a court has the ultimate power to decide the division based on the rule that children and the wife should be the priority of the concern (Chapter 4, Article 39). The amendment was a further extension of the protection of a wife in a marriage since the relaxation of the legal restrictions on granting divorce in the 1980 marriage law.

[9]The amendment was officially passed in the Standing Committee of the National People's Congress of the People's Republic of China in April 2001.

[10]The demographic data analysis provided by Yi & Deqing (2000) shows that the divorce rate increased by 42% from 2.01% to 2.86% between 1982 and 1990.

3. Theoretical Model and Predictions

3.1. A Three-agent Marriage Market Model

In this part, I propose a three-agent marriage market model that involves three sides: the bride's family, the groom's family, and the new conjugal household if the couple gets married. The model follows the same procedure as the institutional background and is set as a single-period problem. Both bride's and groom's families face two choices: get their children married or not. The order starts with a "take-it-or-leave-it" offer from the bride's side. Only if both families find that getting married is more beneficial than the outside options (e.g., staying single) can the marriage happen. Otherwise, both children rely on their individual income for consumption. If the couple gets married, a new household is formed, and the whole household's utility consists of both husband's and the wife's utility.

3.1.1. The Setup of Three Agents

This article focuses on payments instead of the problem of matching and mating. Consequently, we can simply treat the marriage market as the bargaining between a family with a daughter and a family with a son.

For the bride's and groom's families, their utilities both consist of three parts: the utility from their own consumption, weighted utility from their children, and a constant gain or loss due to their children's marriage. The bride's and groom's parents' consumption comes entirely from their wealth. The initial wealth for the bride's family is W^F. If the daughter gets married, their wealth gains the retained part of the bride price; otherwise, the wealth stays the same. The daughter's utility derives from her consumption as well. Following Corno et al. (2020), Corno & Voena (2021) and Han et al. (2015) and also considering the fact of the dominance of patrilocality being the form of marriage in China, I assume if their children get married, the groom's family experiences a constant value of utility gain, and the bride's family has to bear a value of a constant loss.

Specifically, the bride's family's utility U_m^F if their daughter gets married is:[11]

[11] In this article, a capital letter U defines a compound utility function. A lower-case u stands for an explicit form of the utility function. The subscript and superscript are used only to distinguish which individual the utility function reflects.

$$
\begin{aligned}
U_m^F &= \xi^F \cdot [u_1^F(c_m^{F,P})]^{\delta_1} \cdot [u_2^F(c_m^F)]^{1-\delta_1} \\
&= \xi^F \cdot [u_1^F(W^F + B - D)]^{\delta_1} \cdot [u_2^F(c_m^F)]^{1-\delta_1}
\end{aligned} \tag{1}
$$

where B and D are the notation for bride price and dowry. $0 < \delta_1 < 1$ is the weight on the utility from their own consumption, and $0 < 1 - \delta_1 < 1$ is the weight on the utility from their daughter's consumption. ξ^F represents the loss of utility because of the daughter's leave. $0 < \xi^F < 1$ is a multiplier of a constant value. This is compared to an exogenous outside option, including staying single and continuing searching. The idea is similar to the reservation utilities in Anderson (2003); nevertheless, I quantify the values considering that the model takes the two spouses' utilities into account separately. The outside option utility for the bride's family's utility U_s^F is:

$$
\begin{aligned}
U_s^F &= [u_1^F(c_s^{F,P})]^{\delta_1} \cdot [u_2^F(c_s^F)]^{1-\delta_1} \\
&= [u_1^F(W^F)]^{\delta_1} \cdot [u_2^F(c_s^F)]^{1-\delta_1}
\end{aligned} \tag{2}
$$

where the bride's parents' consumption is in the same value as their wealth, and there is no marriage-induced utility gain or loss. A similiar problem faces the groom's family. If their son gets married, his family's utility U_m^M is:

$$
\begin{aligned}
U_m^M &= \xi^M \cdot [u_1^M(c_m^{M,P})]^{\delta_2} \cdot [u_2^M(c_m^M)]^{1-\delta_2} \\
&= \xi^M \cdot [u_1^M(W^M - B)]^{\delta_2} \cdot [u_2^M(c_m^M)]^{1-\delta_2}
\end{aligned} \tag{3}
$$

where $0 < \delta_2 < 1$ is the weight on the utility from their own consumption and $0 < 1 - \delta_2 < 1$ is the weight on the utility of their son. ξ^M reflects the gain of utility because of the obtaining of the daughter-in-law. ξ^M is also a constant-value multiplier but larger than one. Groom's family's utility U_s^M based on the outside option is:

$$
\begin{aligned}
U_s^M &= [u_1^M(c_s^{M,P})]^{\delta_2} \cdot [u_2^M(c_s^M)]^{1-\delta_2} \\
&= [u_1^M(W^M)]^{\delta_2} \cdot [u_2^M(c_s^M)]^{1-\delta_2}
\end{aligned}
\tag{4}
$$

The third part exists if the first part of the marriage payments (bride price) occurs, which requires getting married is better for both sides:

$$
U_m^M \geq U_s^M, \qquad U_m^F \geq U_s^F \tag{5}
$$

When the two conditions are satisfied, the second payment (dowry) enters into the new conjugal household's budget constraint. The household utility of the married couple is the combination of the weighted utility of the husband and wife:

$$
U^H = \max_{c_m^M, c_m^F} [u_2^M(c_m^M)]^{\delta_3(D)} \cdot [u_2^F(c_m^F)]^{1-\delta_3(D)} \tag{6}
$$

s.t.

$$
c_m = c_m^M + c_m^F = w^M + w^F + D \tag{7}
$$

where w^M and w^F are the incomes of the husband and wife. The incomes are set to be exogenous. Thus, individuals' income is not affected by the decision to get married. If the son or daughter does not get married, their consumption is entirely from their own income.

The Pareto weigt of the husband as a function of dowry D satisfies the conditions that $\delta_3'(D) < 0$ and $\delta_3''(D) > 0$. This follows the same fashion in Chiappori & Mazzocco (2017), Lise & Seitz (2011) and Lise & Yamada (2019); additionally, I futher incorporate the diminishing marginal returns of dowries.

3.1.2. Equilibrium under a basic utility function form

To search for the equilibrium prices and conduct the comparative static analysis, I adopt a basic risk-averse utility function form:

$$u = c^{\gamma} \tag{8}$$

where the degree of relative risk aversion is set as $0 < \gamma < 1$.[12]

The actual marriage rituals follow an order of the bride's family's decision, the groom's family's decision, and the consequent effects on the newly conjugal household if the agreement of marriage payments is reached. However, to solve the equilibrium, we need to look at the problem backwards.

3.1.2.1. Intrahousehold Allocations within the New Conjugal Household

In the first step, the new conjugal household maximizes the utility based on the dowry given:

$$log(U^H) = \max_{c_m^F, c_m^M} \gamma\{\delta_3(D)log(c_m^M) + [1-\delta_3(D)]log(c_m^F)\} \tag{9}$$

s.t.

$$c_m = c_m^F + c_m^M = w^M + w^F + D \tag{10}$$

There is also an underlying constraint from the spouses' side that getting married is better for either of them, and the decision of resource allocations is reached ahead of the marriage. Different from constraints for the parents' side, this assumption is logically easier to meet. First, the spouses will share the endowed dowry. Second, the analysis is based on the fact that the match has happened, which means the couple has found that the marriage benefits them. As a result, the first-order conditions lead to the solutions for both c_m^M and c_m^F:

$$c_m^M = \delta_3(D) \cdot (w^M + w^F + D) \tag{11}$$

$$c_m^F = [1-\delta_3(D)] \cdot (w^M + w^F + D) \tag{12}$$

[12]This assumption implies moderate risk aversion of individuals. Previous literature suggests an elasticity in a range of $[1, 2]$ is reasonable for CRRA utility function (e.g. Chetty (2006), Morten (2019), and Corno et al. (2020)) The solution of the subsequent model will not largely depend on this assumption.

3.1.2.2. Maximization Problem of the Bride's Family

The consumption of the spouses is also the rule of allocation of resources within the newly-formed household. Considering the wages of the wife and husband are exogenous in the model, once the dowry is decided, the consumptions of both the wife and husband are decided. Thus, we can take the solutions back to the utility maximization problem of the bride's family. The problem for the bride's family transforms into the maximization of utility with regard to the dowry given any bride price.

Theoretically, the value of dowry D is not bounded by any restriction in this tradition since borrowing is also allowed. However, it is straightforward to conclude that the optimum is strictly less than the bride's family's wealth plus the bride price under the values of the parameters.

After knowing dowry D is a function of bride price B, the control variable in the bride's family's maximization problem becomes B:

$$log(U_m^F) = \max_B log(\xi^F) + \gamma\{\delta_1 \cdot log(W^F + B - D(B)) + (1 - \delta_1) \cdot log(c_m^F)\} \tag{13}$$

Hence, the bride's family wants the bride price as high as possible. The derivative of the utility function of the bride's family with respect to the bride price is always a positive value (see the proof in Appendix A.1). This means the bride's family will want the bride price as high as possible as long as the groom's family accepts.

3.1.2.3. Marriage Payments under Equilibrium

The Upper Limit of the Bride Price for the Groom's Family: The maximization problem presents a result that the bride's family's utility is monotonically positively correlated with the bride price received. However, they cannot ask for an unlimited bride price due to the constraint that the groom's family would find the marriage not attractive if the bride price required is too high. Thus, the utility of getting married for the groom's family must satisfy being no smaller than the outside option (e.g., staying single and continuing searching):

$$\xi^M \cdot [u_1^M(W^M - B)]^{\delta_2} \cdot [u_2^M(c_m^M)]^{1-\delta_2} \geq [u_1^M(W^M)]^{\delta_2} \cdot [u_2^M(c_s^M)]^{1-\delta_2} \tag{14}$$

The upper limit of the bride price is achieved when the LHS equals the RHS. Due to the fact that the bride price offered to be take-it-or-leave-it, equality should be achieved.

The Reservation Bride Price for the Bride's Family: Once the bride's family knows the upper limit of the bride price and the distribution of the resources for the couple given any value D, they also need to consider their own constraint that their daughter getting married is better than the outside option:

$$\xi^F \cdot [u_1^F(W^F + B - D)]^{\delta_1} \cdot [u_2^F(c_m^F)]^{1-\delta_1} \geq [u_1^F(W^F)]^{\delta_1} \cdot [u_2^F(w^F)]^{1-\delta_1} \tag{15}$$

When the equal sign is achieved, the bride price is the minimum value for the bride's family to agree on the marriage. Meanwhile, if the inequality holds, the difference between the LHS and RHS: $U_m^F - U_s^F$ is the surplus the bride's family will get from their daughter's marriage.

In other words, we can treat the rule deciding the bride price as a bargaining process where the weight on the groom's side is zero. This would leave no surplus for the groom's family, and the upper limit will be the exact bride price the bride's family would ask for if the reservation price condition is met.

In addition, a comparative static analysis of how family characteristics influence the equilibrium of the two prices is also provided in Appendix A.3.

3.1.3. Implications of Model under Equilibrium

Since we have derived the forms of the marriage payments, we can further investigate the directions and scales of the two prices. There are two transfers between the two families and the parents and children. Under the assumption of patrilocality and altruism in the model, this part provides some logical evidence that in a general case, marital transfers occur in the direction that the groom's family pays to the bride's family in a positive amount, and the bride's family transfers a positive amount to the couple. In other words, it would be a rare case where the bride's family transfers a positive amount of money to the groom's family or the bride's family transfer no money to the couple.

LEMMA: An exogenous increase in the bride price increases the dowry: $\partial D / \partial B > 0$.

Proof: *see Appendix A.2*

Given a fixed set of family characteristics, both the bride price and the dowry will be decided. In addition, when all other exogenous factors are also decided, every single value of the bride price corresponds to a single value of the dowry. In other words, any exogenous factor that increases the bride price and does not directly affect the bride price raises the dowry, even though the relationship might not be linear.

PROPOSITION 1: The bride price is always positive (in a direction from the groom's family to the bride's family)

Proof: *see Appendix A.2.1.1*

A transfer from the groom's family to the bride's family is easier to occur because of the positive gain of utility for the groom's family. Since the transfer from the bride's family to the groom's side does not bring direct utility gain to the prior, the marriage would not be attractive to the bride's family unless the gain of their daughter's utility is larger enough to compensate for the loss of utility from the daughter's leave and the payment of the "bride price". Additionally, this means the groom brings much more income to the household than the bride, which makes his consumption less than before the marriage and contradicts the presumption. Thus, intuitively, this combination is impossible to achieve unless the marriage is arranged in which the groom's family "sells" their son for their benefit.

In addition, given a non-negative boundary constraint for the bride price ($B \geq 0$), a zero payment of the bride price ($B = 0$) is still unusual if we also impose a non-negative constraint for the dowry amount ($D \geq 0$). The groom's family does not pay the bride price because their son is much wealthier than the bride, so the bride benefits much more from the marriage. This is the same situation facing us for a "negative bride price". Meanwhile, given the fact of receiving no bride price, the only reason the bride's family would want to transfer wealth to the couple is that the spouses are relatively poor and they are wealthy enough. Thus, the two conditions contradict each other.

Proof: *see Appendix A.2.1.2*

In conclusion, since the situation leads to a worse-off situation for the groom because of the marriage, intuitively, the matching of the two spouses would be rare to occur in the first place.

PROPOSITION 2: A zero transfer of dowry ($D = 0$ and $B > 0$) may occur when W^F is small and w^M and w^F are large.

Proof: *see Appendix A.2.1.3*

Intuitively, being compensated with the bride price but no need to transfer wealth makes the marriage attractive to the bride's family. The only reason the bride's family does not want to transfer wealth to the couple is that the bride's family is relatively poor, so they cannot afford to give away any money to their daughter (high marginal cost); meanwhile, their daughter earns enough. This situation appears to be less common considering the combination.

PROPOSITION 3: Dowry exceeds the bride price ($D > B$) when the bride's side is wealthier, and the couple has low income

Proof: *see Appendix A.2.1.4*

When the groom's family is not as wealthy as the bride's family, low payment of the bride price would be observed. This leads to relatively higher payment of dowry from the bride's family. Intuitively, the bride's family can take advantage of this situation to harvest more bargaining power for their daughter. We have to pay attention that Proposition four and one reflect two different aspects and do not contradict each other. Given any family characteristics, a higher bride price is always linked to a higher dowry. However, when the bride price is low, it is possible that the dowry can exceed the bride price.

PROPOSITION 4: A higher patrilocal gain for the groom's family increases their willingness to pay

In addition to family characteristics, patrilocality plays an exogenous factor in shifting the bride price. The higher patrilocality gained (ξ^M) as a result of the marriage for the groom's family, the higher they will pay for the bride price. The previous analysis is about how marriage payments are correlated with family characteristics based on fixed utility gain or loss due to patrilocality. The next analysis instead focuses on how would the bride price change when there are different levels of gain due to the patrilocal tradition given the fixed family and individual wealth.

Proof: *see Appendix A.2.2*

This is a general rule that applies to all cases regardless of family characteristics. At the same time, even though the patrilocal gain means a loss to the bride's family, the loss does not directly affect the rule of deciding the amount of bride price or dowry. However, the increase in the bride price due to the patrilocal gain for the groom's family would naturally increase the dowry amount. On the other hand, even though the model does not reflect how the patrilocal tradition impacts the intrahousehold bargaining power directly, the intuitive explanation for the increase in dowry attributes to the fact that the more the bride contributes to the groom's family, the less connection she may have kept with her natal family. In that case, her parents would want to give her more protection by transferring more wealth to her.

3.2. Dowry and Intrahousehold Bargaining Power

In this part, I delve into another question what are the impacts of the marriage payments on the new conjugal household? In analyzing the factors affecting the bargaining of the two prices, the primary focus is on the parent's side. Nevertheless, we know that the dowry transfer to the couple originates from the incentives of the bride's parents wishing for more bargaining power for their daughter. Therefore, it is necessary to look further at how marriage payments can shape the bargaining power of individuals. Due to the cultural background that only dowry will enter into the couple's budget constraint as a part of the endowment, but the bride price works as a role to compensate for the loss of a daughter for the bride's family, we only need to consider the part of dowry in shifting bargaining power.

In the previous setting, a person's bargaining power is reflected in the individual's Pareto weight in the whole household's utility. This is achieved by introducing the heterogeneity of the bargaining power across different households where the Pareto weight is a function of dowry. In addition, I also revisit the form of the utility function by incorporating home production and leisure time. The purpose of doing so is to inspect the allocations of different resources between the spouses, which reflect the weights of each individual in the household.

The framework of the following model is built upon the literature of collective models with a process of intrahousehold allocations such as Chiappori et al. (2002), Chiappori & Mazzocco (2017) and Lise & Yamada (2019). Within the newly-formed household, an individual's utility consists of consumption of final goods c_m^G and home production q_m^G, and leisure ℓ^G ($G = M$ or F):

$$U^H = \max_{c_m^M, c_m^F, q_m^M, q_m^F, \ell^M, \ell^F} [u_2^M(c_m^M, q_m^M, \ell^M)]^{\delta_3(D)} [u_2^F(c_m^F, q_m^F, \ell^F)]^{1-\delta_3(D)} \tag{16}$$

Both wife's and husband's time are divided into three parts: work, home production, and leisure.

The final goods do not require a home production process. However, to consume home-produced goods, an individual has to spend time on home-production. Home production involves individuals' time spent on home production h^G and an input of the intermediate goods g:

$$q_m^G = q_m^G(g, h^G) \tag{17}$$

Thus, the control variables in the maximization problem are each individual's consumption of final goods, their time spent on home production and leisure, and expenditure on intermediate goods. The household budget constraint is subject to:

$$c_m^M + c_m^F + g = \omega^M \cdot t^M + \omega^F \cdot t^F + D \tag{18}$$

where ω^M and ω^F are the husband's and wife's total incomes divided by their annual working hours: t^M and t^F. For the convenience of analysis, I normalize the total time as 1 for each individual:

$$t^M + h^M + \ell^M = 1, \qquad t^F + h^F + \ell^F = 1 \tag{19}$$

3.3. External Shock on Bargaining Power and the Marriage Payments

With the amendment, dowries become more valuable in shifting power to the wife's side. This can be achieved by a constant gain in the Pareto weight (because the bride's family now has the belief that their property will be better protected by law after getting into the marriage) or a higher marginal benefit from dowries (the impact of every single *yuan* becomes larger). These two channels result in similar results in terms of the changing direction of the marriage payments.

The impacts of the amendment on dowry are in two different directions since dowry enters into both consumption and the bargaining power of the spouses. First, regarding the dowry rule, given the same amount of the bride price, the bride's family now only needs to transfer less wealth to maintain the same level of bargaining power for their daughter. This is directly reflected in the dowry rule. With the new dowry rule, the groom's family will also adjust the bride price. On the other hand, because dowry becomes more valuable (higher marginal benefits), the bride's family will find it more attractive to transfer a little more to their daughter. Hence, with the positive shock on dowry, theoretically, the change of the amounts of the two prices is uncertain.

Depending on the parameters, the change of the two prices could only occur in two main directions presented below:[13]

		Bride price	
		Increase	Decrease
Dowry	Increase	✓	✗†
	Decrease	✗	✓

†May be true under a less common condition.

Proof: *see Appendix A.2.3*

When both prices increase, which is a more interesting case since it will be a Pareto improvement, it indicates the increase of the marginal benefits of dowries on consumption exceeds the impact on the bargaining power. Hence, both families are more willing to transfer more wealth to their children since they both can get more utility from the altruistic part—both spouses' consumption will increase. For the bride's maiden family, not only will they get higher utility from the altruistic part, but they also obtain it through higher consumption. Since the groom's family always gets the outside option level, they are not hurt by the amendment. On the other hand, when both of the two prices decrease after the amendment, on the contrary, it shows the increased marginal benefits from the altruistic part for the bride's family are comparatively small. In the case of both prices decreasing, even though we know the groom will have less consumption, the change in the bride is uncertain.

4. Empirical Analysis

This part presents empirical evidence to test the models raised in the previous section with survey data. The analysis comprises two parts: the first part examines the intrahousehold inequality and the relationships between dowries and the wife's bargaining power with empirical evidence and a structural model; the second part tests the effects of the marriage law amendment.

[13]The less condition is based on: a zero payment of dowry before the amendment, the amendment providing the bride's family to transfer a small amount of wealth, and the effect being through increasing marginal value of dowries. See Appendix A. for the proof.

4.1. Data and Summary Statistics

Estimation requires marriage payments from both sides, family characteristics information for both brides and grooms as well as their parents, and the allocation of resources and time for the married couple. A unique dataset that meets these requirements is the 2018 China Labor force Dynamics Surveys (CLDS).[14]

4.1.1. Description of CLDS data

The surveys cover 29 provinces (or equivalents) in total, and the data includes three parts: community, household, and individual surveys.[15] As the name suggests, the surveys involve only potential labor force aged between 15 and 64 (whether they actually work or not). The household and individual datasets can be linked by the household ID. Due to the purpose of my research, I select only the households of married (or engaged) couples in which one of the spouses is regarded as the household head.

For the individual-level data, the surveys ask the individuals' information as well as their parents'. For the main variables of interest, the marriage payment questions are:

- Marriage Payments
  - How much did your family spend for your first marriage (such as betrothal gifts and bride price or dowry) _____$yuan$?
  - How much did your spouse's family spend _____$yuan$?

We can access the answers from both sides and drop the observations whose payment amounts are not consistent.[16] Other information at the individual level includes their demographic information, *hukou* status, wedding years, education levels, occupations, incomes, allocations of time on working

[14] CLDS data is a panel dataset that was conducted in 2011, 2012, 2014, 2016, and 2018. However, only the 2018 one has complete information on the marriage payments. Previous surveys asked only about the total expenditures from the groom's parents (bride prices). The 2018 survey asked not only both the groom and bride about their betrothal payments from their parents (bride price and dowry, respectively) but also their spouse's parents' marriage payments (dowry and bride price, respectively), which helps us to have a double-check on whether the payments are consistent between the spouses.

[15] The community part mainly surveys the development of the villages or neighborhoods, so I will not focus on this part.

[16] I allow a tolerance of a 10% difference.

and chores, and migration history.[17] For parental information, an individual is asked about their demographic information, *hukou* statuses, education levels, and occupations if they are still in the labor force. However, the disadvantage is that the surveys do not ask about individuals' parents' wealth or income.

The household part mainly surveys the household member structures, living conditions, income, and expenditures. Every household has a one-member registered as the household head in *hukou*. This helps to select the sample for the analysis. The main variables we are interested in are the expenditure or consumption-related ones, which reflect the allocations of the resources. The surveys ask not only about the total consumption but also the subcategories. Combined with individuals' time allocation information, this helps to construct home production information.

4.1.2. Summary Statistics

After dropping single-member families, the observations of two-spouse households with complete individual-level data are $1,196$, among which 651 have complete household-level information. Table 1 presents the summary statistics of the main variables at the individual level (Panel A) and household level (Panel B).

[Insert Table 1 here]

The average ages for female and male samples are 46.16 and 47.77 years old. Among these married couples, the percentages of couples married in the 1980s, 1990s and after 2000s are 31.4%, 37.6% and 31.0%. Due to the relaxation of *hukou* obtention laws in the 1990s—people can choose to switch to their spouses' *hukou*—and the age range of the sample after selection, over 95% of the couples hold the same types of *hukou*.[18] The surveys cover both rural and urban areas. Among the sample, around 17% of the households hold urban *hukou*.

Both men and women in the sample see high labor force participation rates, consistent with the continuing trend of comparatively high labor force participation rates among Chinese women

[17] *Hukou* or household registration system is a national segregation policy in China. This system categorizes Chinese citizens as either "rural" or "urban" *hukou*. *Hukou* is associated with the welfare, benefits, and opportunities provided by the government. Local governments decide what benefits residents with local *hukou* and migrants can enjoy. The public service and welfare are attached to a person's *hukou* status instead of their physical location. Typically, residents without local *hukou* can enjoy no or very limited resources provided by the local government.

[18] The rules of *hukou* obtention through marriage vary differently from places to places. Larger and wealthier cities see tighter rules on the obtention. For instance, megacities such as Beijing and Shanghai require at least 10 years of marriage and applicants ages over 40 years old. Smaller cities, towns, or villages may approve right after the marriage registries.

(Maurer-Fazio et al., 2011). At the same time, only 3.5% of men are out of the labor force, while the rate is proximate 18% for women. On average, a man works twice as long as a woman in the labor market. However, as for chore participation, a much lower rate can be observed among husbands. Only 2.2% women do not do any chores, but the rate reaches 32% among men. In addition, a woman spends 15 hours weekly on chores on average, while these hours are just 4 among husbands.

For the household level, the average bride price and dowry for the sample are $9,867$ and $5,234$ *yuan*.[19] We have to keep in mind that the majority of the sample got married 30 or 40 years before the surveys when China was at the beginning of the economic reform and transitioning from a planned economy to a market economy. These two values should be treated as considerable at that time.

In addition, the empirical evidence on testing the comparative static analysis on how family characteristics influence the equilibrium of the two prices is provided in Appendix B.1 and B.2.

4.2. Dowries and Intrahousehold Bargaining Power

This part provides empirical evidence to answer the question: what are the outcomes of higher dowries, and how are they related to inequality at the household level?

4.2.1. Reduced-form Evidence on the Impacts of Dowries

In order to find an indicator to reflect the bargaining power of an individual within the family, following the strategy in J. Zhang & Chan (1999), I look into individuals' participation in chores at home. As mentioned in the data summary, the disparity between chore participation and time investment between the two genders is substantial. Considering that almost all of the women in the sample participate in chores regardless of their income or education levels, but a third of men do not engage in any housework, I test whether there is a positive relationship between dowry amount and an individual's chore participation. The specification is below:

$$Chores_{i,k} = \boldsymbol{X}_{i,k}\boldsymbol{\beta}_1 + \kappa_k + \varepsilon_{i,k} \tag{20}$$

The measure chore participation, I construct three indicators: a wife's time spent on chores, the ratio of time spent on chores and working time for working women, and the time difference between

[19] All prices involved in this paper are CPI adjusted to the 2000 values in each province.

the husband and the wife on chores. The primary explanatory variable is the value of dowries. Different from J. Zhang & Chan (1999), I do not incorporate the bride price because the data from their surveys show dowry is significantly higher than bride price in Taiwanese society, which is a different situation to the surveys that I use to some extent.[20] Table 2 presents the estimation results:

[Insert Table 2 here]

We can notice that dowries have significant impacts on all three indicators, and the results direct to less time on chores for women and more participation of husbands. First, a 1% increase in dowry leads to a $9 - 10\%$ reduction in the wife's time spent on chores. The conclusions still hold when individuals' *hukou* and education levels are taken into account, and provincial fixed effects are controlled. Secondly, for those working women, dowry also has a significant role in shifting their time scheduling. A 1% increase in dowry is associated with an $8 - 10$ percentage points decrease in the weekly chore-to-work ratio for working women when the provincial fixed effects are not controlled. Furthermore, when we take husbands into account, a higher dowry helps to reduce the deficit of time on chores of husbands and wives, where nearly 9% is lessened with a 1% increase in dowry. However, the deduction of the deficit is mainly from the power gaining of the wives, presumably because of the already low participation rate of the husbands.

4.2.2. Structural Estimation on Pareto Weights and Inequality

This part follows the second section in the theoretical model to estimate dowry's impacts on individuals' bargaining power. The theoretical model introduces the heterogeneity in Pareto weights by assuming that a higher dowry raises the wife's weight. Thus, if we know the actual allocation of resources within a household, the maximization problem focuses on the adoption of the weights on spouses to maximize the whole utility of the family.

The previous model presents the utility function as an egoistic form, where an individual only cares about their own consumption and leisure. However, in reality, it is difficult to observe the division of consumption among household members. The surveys that I adopt in the analysis provide only the total expenditures on consumption and its subcategories. Nevertheless, it is more practical to obtain individuals' information on their time spent on work, home production, and leisure, which is

[20] In addition, their research finds only dowry has impacts on husbands' participation in chores while bride price sees minor and insignificant coefficients.

accessible from the surveys. Thus in order to tackle this issue, I revisit the original household utility maximization problem in the form below:

$$V^H = \max_{c_m^H, q_m^H, \ell^M, \ell^F} [u_2^M(c_m^H, q_m^H, \ell^M)]^{\sigma_3(D)} [u_2^F(c_m^H, q_m^H, \ell^F)]^{1-\sigma_3(D)} \tag{21}$$

where V^H is the revised household utility. The individual utility is in the form of:

$$u^G = (c_m^H)^{\tau_1^G} (q_m^H)^{\tau_2^G} (\ell^G)^{\tau_3^G}, \qquad \tau_1^G + \tau_2^G + \tau_3^G = 1, G = M \; or \; F \tag{22}$$

I replace the consumption of final goods and home production of individuals with the total consumptions: c_m^H and q_m^H. Home production involves the input of both husband's and wife's time on chores and intermediate goods. The production function is below:

$$q_m^H = (h^M)^{\rho_1} \cdot (h^F)^{\rho_2} \cdot (g)^{(1-\rho_1-\rho_2)} \tag{23}$$

The budget constraint becomes:

$$c_m^H + g = \omega^M \cdot t^M + \omega^F \cdot t^F + D \tag{24}$$

To reflect the role of dowries influencing a wife's bargaining power, I parametrize the heterogeneity in Pareto weights δ_3 and $1 - \delta_3$ in terms of the dowry value D. For the convenience of structural estimation, I adopt the exponential form of the Pareto weights, considering the nature of the data. The weight on the husband's utility is:

$$\delta_3(D) = \frac{exp(\nu_0 + \nu_1 D)}{1 + exp(\nu_0 + \nu_1 D)} \tag{25}$$

The specification normalizes the sum of the weights of the husband and wife to 1. I adopt two indicators for the dowry payment variable: the actual value of the dowry and the dowry-to-bride price ratio. Even though the bargaining of marriage payments between the two families shows the uncertainty of the directions of the dowry-to-bride price ratio, it should not affect our analysis of its role in impacting intrahousehold bargaining between the married couple. In addition to the role as an endowment in the couple's budget constraint, the dowry amount also shows the bride's parents' support for her bargaining power in the new conjugal household. Table 3 below presents the estimation results:

[Insert Table 3 here]

The estimation of Pareto weight is based on the sample average. Overall, the husbands see much higher bargaining power than the wives, with a weight of 0.73. In addition, for a woman who brings the mean value of dowry, a $1,000$ *yuan* increase in dowry results in a 0.37% percentage point increase in her bargaining power. When measured with the dowry-to-bride price ratio, a woman whose family retains the mean value of the ratio sees 0.4% percentage point higher bargaining power if the ratio increases by 1 percentage point.

4.3. The Impacts of the Marriage Law Amendment on Marriage Payments

4.3.1. RDD estimation

In this part, I test whether the marriage law amendment would lead to a discontinuity of the marriage payment with empirical data. The theoretical part suggests two directions of change may occur under different situations. Thus, if the theory is valid, in a case of a less equal family, the law amendment should induce higher incentives for the bride's family to transfer wealth to the couple and for the groom's family to pay more bride price. Hence, we should be able to observe a positive discontinuity of dowry payment in the year when the amendment was introduced. First, I examine the graphic evidence of discontinuity by looking into the time trends of two prices. For the dowry's part, I also calculate the ratio of the dowry to the bride's income. The two scatterplots in Figure 2 and Figure 3 present the average bride price and dowry and the average dowry-to-bride income ratios through the sample years.

[Insert Figure 2 here]

[Insert Figure 3 here]

There is an upward trend for both marriage payments because society is getting wealthier. However, there is a clear discontinuity in the year of the amendment, where an upsurge can be observed. The interesting phenomenon about the dowry-to-bride income ratios is that before the introduction of the amendment, the flat regression line is consistent with the dowry being relative to the income per capita. However, after the year of amendment, not only do we notice a jump in the ratio but also a continuously increasing trend afterward. In addition, evidence of the direct impacts of the amendment on property values is provided in Appendix B.

In order to test the magnitude of the discontinuity due to the law amendment, I adopt a Regression Discontinuity Design(RDD) strategy to analyze the scale of the effect. The basic specification is below:

$$Price_{i,t} = \boldsymbol{\beta}_2 + \boldsymbol{\beta}_3 D_i + \boldsymbol{\beta}_4 T_{i,t} + \boldsymbol{\beta}_5 D_i \cdot T_{i,t} + \varepsilon_{i,t} \tag{26}$$

$Price_{i,t}$ is either the bride price or the dowry indicators. D_i is a dummy variable that indicates whether the year when the couple got married was after the amendment (1 if after 2001 and 0 if before 2001). $T_{i,t}$ stands for the wedding year measured relative to 2001, which captures the time trend. The specification also includes the interaction term of the dummy variable, the time trend term, and the error term. Hence, the estimand $\boldsymbol{\beta}_4$ reflects the discontinuity: $\boldsymbol{\beta}_4 = \lim_{T\uparrow A^*} E[Price_{i,t}|T_{i,t} = Amendment] - \lim_{T\downarrow A^*} E[Price_{i,t}|T_{i,t} = Amendment]$. In addition, considering that the term of bride's income used in calculating the dowry-to-bride income ratios is the current income, I further include the control variable of the bride's age at which she got married. Table 4 presents the estimation results:

[Insert Table 4 here]

The first four columns test the effect on the bride price and dowry, where both the actual currency values $(1-2)$ and values after IHS conversion $(3-4)$ are presented. The last column presents the dowry-to-income ratio results. The estimation shows that the increase of dowries and the dowry-to-income ratio at the timing cutoff is consistently significant at the 10-percent level or higher. The increase of the exact bride price and dowry values amount to $2,243$ and $1,214$ *yuan*, respectively. The average bride price and dowry before the law amendment were $9,300$ and $12,483$ *yuan*, respectively; thus, this amendment amounts to 26.26% and 9.93% increases for the two prices. The average dowry-to-income ratio prior to the amendment was 1.04; thus, the amendment helped to raise the ratio considerably to 1.68.

4.3.2. Robustness Tests on the Impacts of the Marriage Law Amendment

Manipulation of the Wedding Years around the Year of Implementation: This part examines the general concern of testing the implementaion of any policies that a manipulation may occur around the year when a policy is introduced. The concern regarding this specific amendment is refelcted in two parts both before and after the year of implementation. Since the hearing of the amendment was held one year ahead of the implementaion in October 2000 and the release of the information could even be earlier, some people would have expection for the implementaion. Thus, for them, if they chose to get married one or two years ahead of the amendment, they may choose to set the prices according the new information. On the other hand, for those who are less sensitive to political news, it might take sometime for them to apprehend the new law. Thus they may still set the prices according to the old law. In addition to the the marriage price part, another aspect with regard to the manipulation is the decision of timing of getting married. Because this amendment is more pro-woman, the couple, especially the bride's side, would want to wait to see how the policy would be implemented if they were initially planning to register around those years. Though we cannot directly test the first case, it is possible to conduct a McCrary density test to examine whether there was an abnormality around the year of implementation. Following Cattaneo et al. (2020, 2021), I conduct a hypothesis test about whether the density near the cutoff to is discontinuous. Table 5 below presents the result:

[Insert Table 5 here]

The test clearly indicates there is a manipulation around the year of the implementation of the amendment. It indicates some couples adopted a "wait to see" strategy. Thus, in order to avoid the interference of the lag and lead effects, I employ the donut RDD method. Table 6 below shows the results with one and two years excluded on each side.

[Insert Table 6 here]

We can notice that the magnitudes of all five indicators of both new samples are larger than the original test. In addition, higher sigifcant levels can also be observed in the new estimation. The differnce is especially noticable in the sample with two years on each side excluded where the discontinuity of the bride price is almost doubled and the dowry estimation sees a nearly 50% increase. The donut RDD regression results further strengthen our findings respecting the impacts of external shocks on the marriage payments.

5. Conclusions

I have constructed a simple model of the marriage market to explore the bargaining process of the families on two sides regarding a bidirectional marriage payment tradition in Chinese society: bride price and dowry. I also investigate the consequential impacts of the marriage payments on spouses' intrahousehold bargaining power by adopting a collective model. By taking advantage of a pro-women marriage law amendment, I examine how the amendment increases both families' willingness to transfer more wealth. The result leads to a Pareto improvement for all sides in a society with high gender inequality. My research helps to understand the importance of gender roles in a traditionally conservative society with reference to one of the most important events in people's life: marriage.

In the discussion of the bargaining process regarding marriage payments, I complement the existing literature by allowing bidirectional and non-zero-sum wealth transfer between the families on the two sides. The take-it-or-leave-it bride price offer and the subsequent dowry are based on a maximization problem of the bride's family, where the parents' utility comprises both their own and their daughter's consumption as well as the utility loss from the daughter's marriage due to the patrilocal tradition. To examine the role of dowries and intrahousehold inequality, I build a collective model that involves intrahousehold bargaining between spouses. I introduce the heterogeneity into the Pareto weights of individuals by incorporating the dowry payment. By observing the allocation of resources and time in each family, I find dowries increase a wife's bargaining power even though her Pareto weight is relatively weaker (~ 0.2). Lastly, I discuss how a positive external shock that increases the value of dowries can lead to a Pareto improvement for all sides—by increasing both payments.

This article provides empirical evidence to test the predictions of the theoretical models with both structural model estimation and reduced-form methods. A unique dataset that includes marriage payment information and family characteristics is adopted. The RDD estimation regarding the impacts of the marriage law amendment indicates positive increments in both marriage payments. The marriage law amendment resulted in positive changes in both bride prices and dowries, where a 26.26% increase in the bride price and a 9.93% increase in the dowry or 61.5% increase in the dowry-to-income ratio can be observed.

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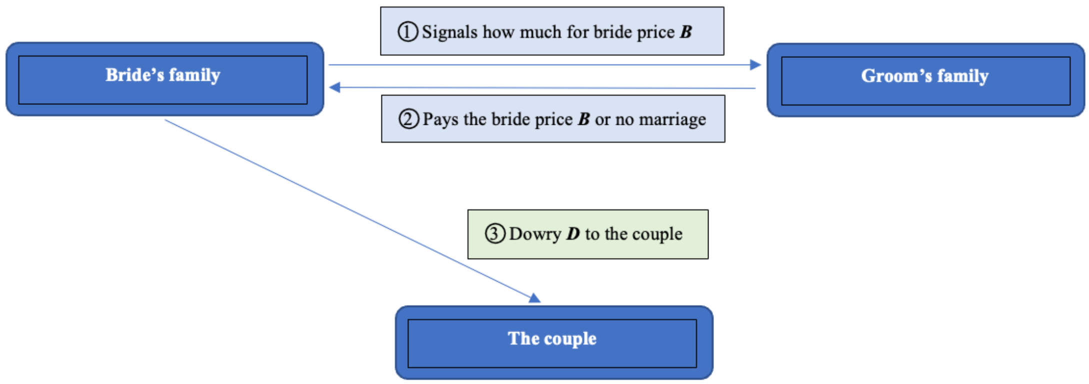
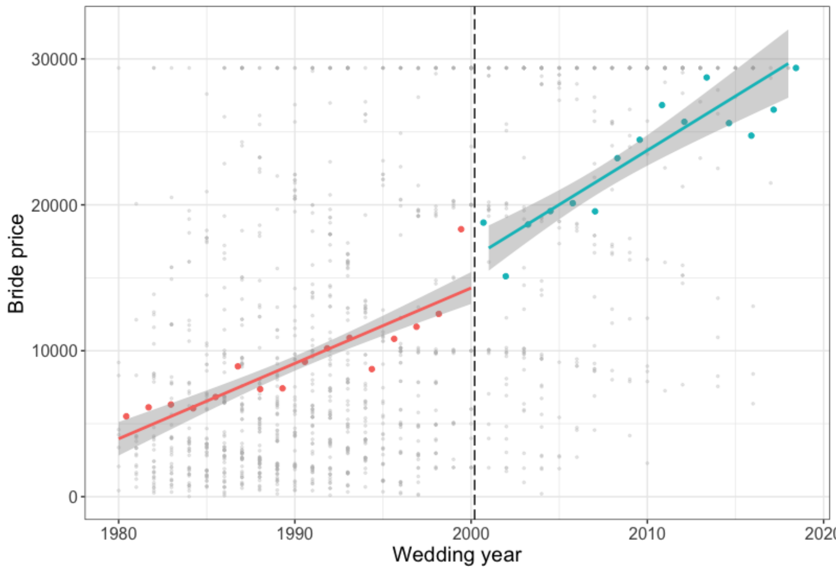
Figures

Figure 1: The Process of Payments in A Marriage



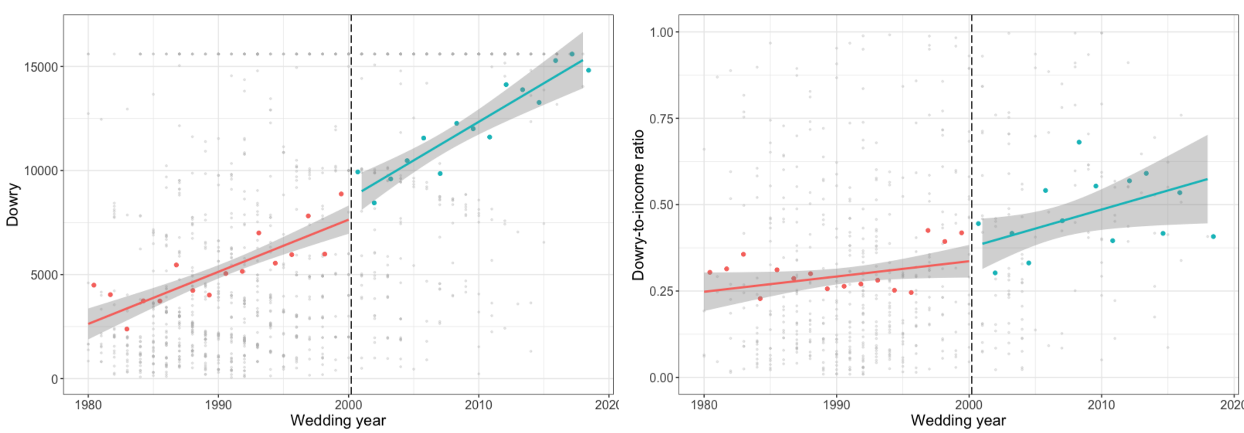
Note: This flowchart illustrates the process of the two payments: bride price and dowry. Bride prices are usually in the form of cash, and dowries are in the form of physical assets.

Figure 2: Relationship between wedding year and bride price



Note: This figure demonstrates the time trend of bride prices from 1980 to 2018. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS). The sample size is $1,461$. The vertical axis is the bride price (*yuan*). The horizontal axis stands for the years when the couples got married. The cutoff line is the year 2001. The data is winsorized at the 0.5% level at both the top and bottom.

Figure 3: Relationship between wedding year and the ratio of dowry to bride's income



Note: This figure demonstrates the time trend of dowries and dowry-to-income ratios from 1980 to 2018. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS). The sample sizes are $1,207$ and 804, respectively. The vertical axes are the dowry(*yuan*, left) and the dowry-to-income ratio. The horizontal axes stand for the years when the couples got married. The cutoff line is the year 2001. The data of dowries is winsorized at the 0.5% level at both the top and bottom.

Tables

Table 1: Summary Statistics

Panel A: Individual Data		
	Bride	Groom
Age (years)	46.16	47.77
Urban *Hukou* Percentage	16.70%	17.50%
High School Education Percentage	22.00%	30.60%
Income (*yuan*)	1,9445	3,4416
Labor Force Participation Rate	82.14%	96.46%
Average Working Hours (weekly)	18.08	32.01
Chore Participation Rate	97.80%	68.00%
Average Hours on Chores (weekly)	15.10	4.14
Father Urban *Hukou* Percentage	13.80%	17.00%
At Least One Parent High School Education	12.19%	11.60%
Panel B: Household Data		
	Household	
Bride Price	9,867	
Dowry	5,234	
Dowry-to-bride price Ratio	80%	
Total Consumption (annually)	26,635	
Food Consumption (annually)	6,728	
Number of Observations	1,196	

Notes: The results use the sample from the 2018 China Labor force Dynamics Surveys (CLDS). All prices are in 2000 value in each province (or equivalents).

Table 2: Reduced-form Evidence: Relatiobship between Dowry and Chore Participation

	Dependent variable:								
	Wife's time on chores			Time on chores / Time on work (Wife)			Husband's - Wife's time on chores		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dowry	-0.115***	-0.091***	-0.086***	-0.100***	-0.082***	-0.046*	0.121***	0.089***	0.080**
	(0.017)	(0.018)	(0.020)	(0.021)	(0.024)	(0.028)	(0.029)	(0.032)	(0.035)
Dependent Variable Mean	3.698	3.537	3.650	1.405	1.283	0.927	-2.327	-2.127	-1.853
Spouses' *Hukou* Statuses		X	X		X	X		X	X
Spouses' Eduaction		X	X		X	X		X	X
Province Fixed Effects			X			X			X
Observations	1,190	1,183	1,183	729	725	725	1,185	1,179	1,179
R^2	0.038	0.055	0.087	0.029	0.036	0.087	0.015	0.024	0.085

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variable of time on chores and the explanatory variable of the dowry amount are all transformed with the Inverse Hyperbolic Sine (IHS) function. Both spouses' education and *hukou* variables are dummy variables. For education, the variable is 1 if the individual has finished high school and 0 if they never have. For *hukou*, the variable is 1 if they hold an urban *hukou* and 0 if they do not.

Table 3: Structural estimation: Dowry, Preferences and Bargaining Power

	(1)		(2)	
Pareto Weight Parameters				
σ_3 (sample average)	0.764***		0.820**	
	(0.269)		(0.405)	
Dowry	-1.249***			
	(0.320)			
Dowry Ratio			-1.151**	
			(0.484)	
Individual Preference Parameters				
	Groom	Bride	Groom	Bride
Final Goods	0.254***	0.301***	0.296***	0.338***
	(0.061)	(0.052)	(0.051)	(0.045)
Home Production	0.397***	0.417***	0.452***	0.443***
	(0.085)	(0.065)	(0.050)	(0.043)
Home Production Parameters				
ρ_1	0.164***		0.174***	
	(0.002)		(0.002)	
ρ_2	0.204***		0.204***	
	(0.002)		(0.002)	
Observations	471		471	

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. Both final and intermediate goods values are transformed with the Inverse Hyperbolic Sine (IHS) function. The Pareto weight parameter estimation is based on the sample average values of the dowry amount and the dowry-to-bride price ratio.

Table 4: Reduced-form Evidence: Effect of The Marriage Law Amendment on Marriage Payments

	Dependent variable:				
	Bride price (log)	Bride price	Dowry (log)	Dowry	Dowry-to-income ratio
	(1)	(2)	(3)	(4)	(5)
RDD estimand	0.203*	2,242.983**	0.232*	1,213.899**	1.074***
	(0.122)	(971.448)	(0.138)	(583.456)	(0.393)
Observations	1,461	1,461	1,207	1,207	804
R^2	0.335	0.343	0.292	0.299	0.031

Note: Standard errors in brackets. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variables in columns 1 and 3 are the bride price and dowry transformed with the Inverse Hyperbolic Sine (IHS) function. The dependent variables in columns 2 and 4 are the actual amounts of the bride price and dowry. The dependent variable in column 5 is the ratio of dowry to the income of the bride (CPI adjusted). All five columns utilize local linear regression and triangular kernel. The Bandwidth type is chosen based on the method proposed by Imbens & Kalyanaraman (2012).

Table 5: Policy Manipulation Test

***Variables*:**		
Number of observations	1,461	
Cutoff = 0	Left of Cutoff	Right of Cutoff
Number of observations	1,076	385
Order est. (p)	2	2
Order bias (q)	3	3
Method	T	$P > \|T\|$
Robust	3.8378	1e-04

Note: The test is based on the local polynomial density estimator proposed in Cattaneo et al. (2020, 2021). The kernel used in the test is triangular. The VCE method is jackknife.

Table 6: Robustness Test on the Effect of The agent Marriage Law Amendment on Marriage Payments: Donut RDD

	Dependent variable:				
	Bride price (log)	Bride price	Dowry (log)	Dowry	Dowry-to-income ratio
	(1)	(2)	(3)	(4)	(5)
	Sample: One year on each side excludeded				
RDD estimand	0.251*	3,048.888***	0.273*	1,291.790**	1.153***
	(0.137)	(1,070.960)	(0.156)	(653.684)	(0.447)
Observations	1,395	1,395	1,148	1,148	759
R^2	0.339	0.353	0.296	0.305	0.033
	Sample: Two years on each side excludeded				
RDD estimand	0.365**	4,237.120***	0.323*	1,760.606**	1.226**
	(0.153)	(1,182.938)	(0.175)	(728.923)	(0.512)
Observations	1,339	1,339	1,097	1,097	722
R^2	0.346	0.367	0.302	0.315	0.033

Note: Standard errors in brackets. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variables in columns 1 and 3 are the bride price and dowry transformed with the Inverse Hyperbolic Sine (IHS) function. The dependent variables in columns 2 and 4 are the actual amounts of the bride price and dowry. The dependent variable in column 5 is the ratio of dowry to the income of the bride (CPI adjusted). All five columns utilize local linear regression and triangular kernel. The Bandwidth type is chosen based on the method proposed by Imbens & Kalyanaraman (2012).

Appendix

Appendix A: Theoretical Appendix

A.1. The Relationship between Bride Price and Bride's Family's Utility

$$\frac{\partial log(U_m^F)}{\partial B} = \gamma\Big\{\delta_1 \frac{1}{W^F + B - D}\big(1 - \frac{\partial D}{\partial B}\big) + (1-\delta_1)\frac{1}{c_m^F}\big[-\delta_3' \frac{\partial D}{\partial B}(w^M + w^F + D) + (1-\delta_3)\frac{\partial D}{\partial B}\big]\Big\} \tag{A1}$$

Since $-\delta_1 \frac{1}{W^F+B-D} + (1-\delta_1)\frac{1}{c_m^F}\big[-\delta_3'(w^M + w^F + D) + (1-\delta_3)\big] = 0$
and $\frac{\partial log(U_m^F)}{\partial B} = \gamma\delta_1 \frac{1}{W^F+B-D} > 0$,
$\frac{\partial log(U_m^F)}{\partial B} > 0$

A.2. Implication of the Three-agent Model under Equilibirum

This part provides detailed solutions to the discussions of the implications of the equilibrium of the three-agent models.

The rule deciding the dowry amount given any bride price can also be written as:

$$-\frac{\delta_1}{W^F + B - D} - \frac{(1-\delta_1)\delta_3'}{1-\delta_3} + \frac{1-\delta_1}{w^M + w^F + D} = 0 \tag{A2}$$

Take partial differential with respect to the bride price (D is a function of B):

$$\frac{\delta_1}{(W^F + B - D)^2} = \Big\{\frac{\delta_1}{(W^F + B - D)^2} + (1-\delta_1)\big[\frac{\delta_3''(1-\delta_3) + (\delta_3')^2}{(1-\delta_3)^2}\big] + \frac{1-\delta_1}{(w^M + w^F + D)^2}\Big\}\frac{\partial D}{\partial B} \tag{A3}$$

$\frac{\partial D}{\partial B} > 0$. This indicates that given the exogenous variables set, a higher bride price also means a high dowry payment.

I assign a detailed function form to the bargaining weight δ_3. Notice that the specification does not deliver an explicit function form of dowry but helps to simplify the analysis. The function form also meets the first and second-order:

$$\delta_3 = \frac{1}{1 + \alpha_0 + \alpha_1 D} \qquad \alpha_0, \alpha_1 > 0 \tag{A4}$$

$$\delta_3' = -\frac{\alpha_1}{(1+\alpha_0+\alpha_1 D)^2} < 0 \tag{A5}$$

$$\delta_3'' = \frac{2\alpha_1^2}{(1+\alpha_0+\alpha_1 D)^3} > 0 \tag{A6}$$

This results in a detailed dowry rule as below.

$$-\frac{\delta_1}{W^F+B-D} + \frac{(1-\delta_1)\alpha_1}{(\alpha_0+\alpha_1 D)(1+\alpha_0+\alpha_1 D)} + \frac{1-\delta_1}{w^M+w^F+D} = 0 \tag{A7}$$

We can notice the LHS's value is monotonically increasing with the increase of B. This indicates that given the exogenous variables W^F, w^M, and w^M, a D corresponds to a single B value.

The following subsections correspond to the proofs of the four propositions, where I list the opposite situations and prove that they only occur under rare conditions.

A.2.1.1. A negative bride price $\mathrm{B} < 0$

Intuitively, patrilocality means the groom's family gains from getting a daughter-in-law. Thus, a negative value of "bride price" could further make the marriage more attractive to them. However, for the bride's family, a negative value of "bride price" means they will further lose wealth after the leave of their daughter. This will make the condition difficult to hold.

From the view of the bride's family's utility, transferring wealth (negative "bride price") does not benefit either their own or their daughter's consumption. The spouses' consumption is not influenced by the bride price but only the dowry. Thus we have no change in the bride's consumption regardless of the bride price amount. The inequation below holds when the "bride price" is negative:

$$log(\xi^F) + \gamma[\delta_1 log(W^F - D) + (1-\delta_1)log(c_m^F)] \geq log(\xi^F) + \gamma[\delta_1 log(W^F + B - D) + (1-\delta_1)log(c_m^F)] \quad \text{when } B < 0 \tag{A8}$$

Hence, the only reason why the bride's family could possibly pay the groom's family is that the outside option for the groom's family is larger than getting their son married.

$$log(\xi^M)+\gamma\{\delta_2 log(W^M-B)+(1-\delta_2)log[\delta_3(w^M+w^F+D)]\}<\gamma[\delta_2 log(W^M)+(1-\delta_2)log(w^M)] \tag{A9}$$

This can be rewritten as:

$$\gamma(1-\delta_2)log\left[\frac{w^M}{\delta_3(w^M+w^F+D)}\right]>\gamma\delta_2 log\left(\frac{W^M-B}{W^M}\right)+log(\xi^M) \tag{A10}$$

Since the RHS is positive, the inequation holds only if the groom's consumption is worse off due to the marriage. This already contradicts the presumption that the marriage benefits both spouses. Even if this happens, it means the groom's income is much higher than the bride's. The spouses also get only a small amount of dowry from the bride's family. This is only possible in an arranged marriage where the bride has low productivity. In the case of a negative "bride price", the reservation bride price needs to be larger than the outside option:

$$log(\xi^F)+\gamma[\delta_1 log(W^F+B-D)+(1-\delta_1)log(c_m^F)]\geq\gamma[\delta_1 log(W^F)+(1-\delta_1)log(w^F)] \tag{A11}$$

Suppose $B<0$, $D\geq 0$, and $W^F+B-D>0$. A negative bride price means that the gain for the bride has to justify both the loss of wealth and the leave of the daughter:

$$log(c_m^F)-log(w^F)\geq\frac{\delta_1}{1-\delta_1}[log(W^F)-log(W^F+B-D)]-\frac{1}{\gamma(1-\delta_1)}log(\xi^F) \tag{A12}$$

This can be rewritten as:

$$\frac{\frac{\alpha_0+\alpha_1 D}{1+\alpha_0+\alpha_1 D}\frac{w^M+w^F+D}{w^F}}{\left[\frac{1-\delta_1}{\delta_1}W^F\left(\frac{\alpha_1}{(\alpha_0+\alpha_1 D)(1+\alpha_0+\alpha_1 D)}+\frac{1}{w^M+w^F+D}\right)\right]^{\frac{\delta_1}{1-\delta_1}}}\geq exp\left[-\frac{1}{\gamma(1-\delta_1)}log(\xi^F)\right] \tag{A13}$$

This inequation condition is met when the spouses, especially the bride, have a high income and dowry payment. Considering that these two conditions contradict the conditions just raised, achieving the situation of a negative "bride price" is possible.

A.2.1.2. No transfers between the natal families $\mathrm{B}=0$ and $\mathrm{D}>0$

If $B=0$:

$$log(\xi^M) + \gamma(1-\delta_2)log(\frac{\delta_3(w^M + w^F + D)}{w^M}) = 0 \quad \text{(A14)}$$

Since $log(\xi^M) > 0$, if the equation holds, we at least need $\delta_3(w^M + w^F + D) < w^M$, which is the same situation facing us for a negative "bride price" where the consumption of the groom becomes lower after the marriage. Even if the inequation is feasible, this means the income of the groom is much higher than the bride, and the dowry amount cannot be too high.

Let $g(D) = -\frac{\delta_1}{W^F+B-D} + \frac{(1-\delta_1)\alpha_1}{(\alpha_0+\alpha_1 D)(1+\alpha_0+\alpha_1 D)} + \frac{1-\delta_1}{w^M+w^F+D}$. $g'(D) < 0$. Thus, when B is zero, there exists a positive value of dowry only if $-\frac{\delta_1}{W^F} + \frac{(1-\delta_1)\alpha_1}{\alpha_0(1+\alpha_0)} + \frac{1-\delta_1}{w^M+w^F} > 0$. In other words, we will see a positive value of dowry given a zero bride price only if the bride's family is relatively wealthy and both spouses have low incomes.

With the two conditions above, it is impossible to achieve both simultaneously.

A.2.1.3. A positive value of bride price but no dowry $\mathrm{D} = 0$ and $\mathrm{B} > 0$

If $D = 0$:

Similar to the analysis above, the function of D will satisfy:

$$-\frac{\delta_1}{W^F + B} + \frac{(1-\delta_1)\alpha_1}{\alpha_0(1+\alpha_0)} + \frac{1-\delta_1}{w^M + w^F} \leq 0 \quad \text{(A15)}$$

This means a relatively impecunious bride's family even after the reception of a bride price and high-income spouses. To ensure a positive bride price, the following condition has to be met:

$$log(\xi^M) + \gamma(1-\delta_2)log(\frac{\delta_3(w^M + w^F)}{w^M}) > 0 \quad \text{(A16)}$$

Since $log(\xi^M) > 0$, the condition is not impossible to achieve even if the bride's income is low.

A.2.1.4. A higher value of dowry than the bride price $\mathrm{D} > \mathrm{B}$

When $D > B$, we can easily get the inequation below from the rule of dowry decision:

$$\frac{(1-\delta_1)\alpha_1}{(\alpha_0 + \alpha_1 D)(1 + \alpha_0 + \alpha_1 D)} + \frac{1-\delta_1}{w^M + w^F + D} = \frac{\delta_1}{W^F + B - D} > \frac{\delta_1}{W^F} \quad \text{(A17)}$$

The inequation holds when the bride's family is wealthy and the couple's income is comparatively low. In addition, the groom's family's side derives the inequation as below:

$$log(\xi^M)+\gamma\{\delta_2 log(W^M-B)+(1-\delta_2)log[\delta_3(w^M+w^F+B)]\} < \gamma[\delta_2 log(W^M)+(1-\delta_2)log(w^M)] \quad \text{(A18)}$$

This can be rewritten as:

$$log(\xi^M) + \gamma\delta_2 log\left(1 - \frac{B}{W^M}\right) < \gamma(1-\delta_2)log\left[\frac{w^M}{\delta_3(w^M+w^F+B)}\right] \quad \text{(A19)}$$

Combined with the previous results, we know that $D > B$ also happens because of a less wealthy groom's family and a low bride price.

A.2.2. Patrilocality and bride price

The bride price rule with the explicit function form of the Pareto weights is written as:

$$log(\xi^M)+\gamma\{\delta_2 log(W^M-B)+(1-\delta_2)log[\delta_3(w^M+w^F+D)]\} = \gamma[\delta_2 log(W^M)+(1-\delta_2)log(w^M)] \quad \text{(A20)}$$

or:

$$log(\xi^M) + \gamma\delta_2 log\left(1 - \frac{B}{W^M}\right) = \gamma(1-\delta_2)log\left[\frac{w^M}{\delta_3[w^M+w^F+D(B)]}\right] \quad \text{(A21)}$$

The LHS is a function monotonically decreasing with the increase in bride price. Under the assumption, the RHS normally decreases with the amount of dowry. When either side is wealthy enough, the RHS starts to increase after reaching the turning point. However, regardless of the shape of the RHS, higher patrilocality (a larger value of the constant $log(\xi^M)$) would always result in a higher value of bride price.

A.2.3. Dowry and bargaining power

This part presents theoretical evidence of how the bride price and dowry change with an exogenous shock that brings extra value to the dowry. Considering the form of the Pareto weight, we can interpret the exogenous shock at a constant gain (higher α_0) or a higher marginal gain from the dowry (higher α_1). However, either of the changes would lead to the same result on the dowry rule: for a fixed amount of bride price, the dowry will decrease. This is because the bride's family only needs a smaller amount of wealth transfer to maintain the same level of bargaining power for their daughter.

Next, we can again look at the bride price rule under the updated dowry rule. For the groom's side, the final rule for the groom's family is that they always get the utility the same as the outside option ($\gamma[\delta_2 log(W^M) + (1-\delta_2)log(w^M)]$). However, we can not directly tell the changing direction of the bride price. Consider the bride price rule:

$$log(\xi^M) + \gamma\{\underbrace{\delta_2 log(W^M - B)}_{\text{Part A}} + \underbrace{(1-\delta_2)log[\delta_3(w^M + w^F + D)]}_{\text{Part B}}\} = \underbrace{\gamma[\delta_2 log(W^M) + (1-\delta_2)log(w^M)]}_{\text{Outside option (constant)}} \tag{A22}$$

When the bride price increases, Part A will decrease. However, the amount of dowry and the consequent bargaining power is uncertain, depending on the parameters' values. Hence, Part B may increase. In other words, the consumption of the groom: $[\delta_3(w^M + w^F + D) = \frac{w^M+w^F+D}{1+\alpha_0+\alpha_1 D}$ should increase. In this case, the only outcome would be dowry also increase. If D instead decreases, $1+\alpha_0+\alpha_1 D$ should also decrease. However, this would contradict the dowry rule. Thus, the only possible case is that the dowry amount also increases.

If the bride price goes down, Part A will increase. Depending on the effect of the amendment, dowries could change in different directions. When the effect is reflected as a constant gain (an increase in α_0), the only possible direction is a decrease in dowries. However, if the effect increases the marginal value of dowries (higher α_1), there can be two directions. Generally, this would result in a decrease in dowries as well. An increase in dowries can be seen if the original dowry value is very low and the effect on the marginal value of dowries is large. In the actual situation, this can only mean a zero payment of dowry before the amendment and an incentive for the bride's family to transfer a small amount of dowry. Thus, this aligns with the previous discussion about the zero payment of dowry and is not a typical case. Under these two conditions, the bargaining power will also decrease, and Part B will drop. To conclude, only two main conditions can make the equation above hold that the two prices must change in the same direction.

Even theoretically, the two price rules hold in both cases; the parameters decide which direction is more likely to occur in what circumstance. The dowry rule decides that a groom with lower bargaining power (compared with other grooms with higher bargaining power) in a less unequal family tends to see dowry changes negatively and vice versa.

A.3. Comparative Statics of the Marriage Payments

The framework of the marriage payment model allows us to conduct a comparative static analysis of how exogenous variables impact the amounts of marriage payments. Four exogenous variables mainly interest us:

the wealth of the two families and the spouses' income. This section delves into how the equilibrium of the two prices changes with the change of the four variables.

The equilibrium involves four exogenous variables: w^M, w^F, W^M, and W^F and four endogenous variables: c_m^M, c_m^F, B, and D. The intrahousehold allocation rules present two equations regarding the consumption of the spouses. In addition, the utility maximization problem of the bride's family and the indifference condition of the groom's family provides another two equations.

$$\begin{cases} c_m^M - \delta_3(w^M + w^F + D) & = 0 \\ c_m^F - (1-\delta_3)(w^M + w^F + D) & = 0 \\ \gamma\Big\{ - \delta_1 \dfrac{1}{W^F + B - D} + (1-\delta_1)\dfrac{1}{c_m^F}[-\delta_3'(w^M + w^F + D) + (1-\delta_3)]\Big\} & = 0 \\ log(\xi^M) + \gamma[\delta_2 log(W^M - B) + (1-\delta_2)log(c_m^M)] - \gamma[\delta_2 log(W^M) + (1-\delta_2)log(w^M)] & = 0 \end{cases} \tag{A23}$$

In order to conduct a comparative static analysis, we need to take derivatives regarding all endogenous and exogenous variables.

$$\begin{cases} dc_m^M - [\delta_3'(w^M + w^F + D) + \delta_3]dD - \delta_3 dw^M - \delta_3 dw^F & = 0 \\ dc_m^F - [-\delta_3'(w^M + w^F + D) + (1-\delta_3)]dD - (1-\delta_3)dw^M - (1-\delta_3)dw^F & = 0 \\ -\dfrac{(1-\delta_1)[-\delta_3'(w^M + w^F + D) + (1-\delta_3)]}{(c_m^F)^2}dc_m^F + \dfrac{\delta_1}{(W^F + B - D)^2}dB & \\ +\Big\{ -\dfrac{\delta_1}{(W^F + B - D)^2} + \dfrac{1-\delta_1}{c_m^F}[-\delta_3''(w^M + w^F + D) - 2\delta_3']\Big\}dD & \\ -\dfrac{1-\delta_1}{c_m^F}\delta_3' dw^M - \dfrac{1-\delta_1}{c_m^F}\delta_3' dw^F + \dfrac{\delta_1}{(W^F + B - D)^2}dW^F & = 0 \\ \dfrac{1-\delta_2}{c_m^M}dc_m^M - \dfrac{\delta_2}{W^M - B}dB - \dfrac{1-\delta_2}{w^M}dw^M + \delta_2\big(\dfrac{1}{W^M - B} - \dfrac{1}{W^M}\big)dW^M & = 0 \end{cases} \tag{A24}$$

The four differential equations can be written as a matrix form

$$\begin{bmatrix} 1 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ 0 & K_2 & K_3 & K_4 \\ K_5 & 0 & K_6 & 0 \end{bmatrix} \begin{bmatrix} dc_m^M \\ dc_m^F \\ dB \\ dD \end{bmatrix} = \begin{bmatrix} \delta_3 & \delta_3 & 0 & 0 \\ (1-\delta_3) & (1-\delta_3) & 0 & 0 \\ K_7 & K_7 & 0 & -K_3 \\ K_8 & 0 & K_9 & 0 \end{bmatrix} \begin{bmatrix} dw^M \\ dw^F \\ dW^M \\ dW^F \end{bmatrix} \tag{A25}$$

where

$$\begin{cases} K_1 = -[\delta_3'(w^M + w^F + D) + \delta_3] \\ K_2 = -\dfrac{(1-\delta_1)[-\delta_3'(w^M + w^F + D) + (1-\delta_3)]}{(c_m^F)^2} \\ K_3 = \dfrac{\delta_1}{(W^F + B - D)^2} \\ K_4 = -\dfrac{\delta_1}{(W^F + B - D)^2} + \dfrac{1-\delta_1}{c_m^F}[-\delta_3''(w^M + w^F + D) - 2\delta_3'] \\ K_5 = \dfrac{1-\delta_2}{c_m^M} \\ K_6 = -\dfrac{\delta_2}{W^M - B} \\ K_7 = \dfrac{1-\delta_1}{c_m^F}\delta_3' \\ K_8 = \dfrac{1-\delta_2}{w^M} \\ K_9 = -\delta_2\left(\dfrac{1}{W^M - B} - \dfrac{1}{W^M}\right) \end{cases} \tag{A26}$$

Three assumptions:

Assumption 1: Generally, $\partial c_m^M / \partial D > 0$. However, when w^M or w^F is large, $\partial c_m^M / \partial D < 0$

$$\begin{cases} \delta_3'(w^M + w^F + D) + \delta_3 > 0, & \text{when } w^M \text{ and } w^F \text{ are not too large} \\ \delta_3'(w^M + w^F + D) + \delta_3 < 0, & \text{when } w^M \text{ or } w^F \text{ is very large} \end{cases} \tag{A27}$$

This also indicates that δ_3' is comparatively small: $|\delta_3'| << \delta_3$. The discussion of the sign of $\delta_3'(w^M + w^F + D) + \delta_3$ is only limited to the comparative statics of w^M and w^F. In the general cases where both w^M and w^F are not too large, we always have $\delta_3'(w^M + w^F + D) + \delta_3$ as positive because dowry benefits both spouses.

Assumption 2: $\partial^2 U_m^F / \partial D^2 < 0$

$$-\frac{\delta_1}{(W^F + B - D)^2} + \frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M + w^F + D) - 2\delta_3'] < 0 \tag{A28}$$

Assumption 3: $\frac{\partial c_m^M}{\partial W^M} > 0$, $\frac{\partial c_m^M}{\partial W^F} > 0$, $\frac{\partial c_m^F}{\partial W^M} > 0$, and $\frac{\partial c_m^F}{\partial W^F} > 0$.

$$\begin{aligned}
&\begin{vmatrix} 1 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ 0 & K_2 & K_3 & K_4 \\ K_5 & 0 & K_6 & 0 \end{vmatrix} \\
&= -K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6 \\
&= \frac{\delta_1(1-\delta_2)[\delta_3'(w^M+w^F+D)+\delta_3]}{c_m^M(W^F+B-D)^2} - \frac{(1-\delta_1)\delta_2[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]^2}{(c_m^F)^2(W^M-B)} \\
&+ \frac{\delta_2}{W^M-B}\Bigg\{-\frac{\delta_1}{(W^F+B-D)^2} + \frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M+w^F+D)-2\delta_3']\Bigg\}
\end{aligned} \tag{A29}$$

The expression of $-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6$ indicates that under the situation of a large value of either w^M or w^F, $-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6$ is certainly negative. However, when both w^M and w^F are not too large, $-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6$ can be positive or negative.

Groom's consumption

$$\begin{aligned}
\frac{\partial c_m^M}{\partial W^M} &= \frac{\begin{vmatrix} 0 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ 0 & K_2 & K_3 & K_4 \\ K_9 & 0 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \\
&= \frac{-K_1K_3K_9}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}
\end{aligned} \tag{A30}$$

Since $-K_1K_3K_9 = -\frac{B\delta_1\delta_2[\delta_3'(w^M+w^F+D)+\delta_3]}{(W^F+B-D)^2(W^M-B)W^M} < 0$, we must have $-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6 < 0$

$$\frac{\partial c_m^M}{\partial W^F} = \frac{\begin{vmatrix} 0 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ -K_3 & K_2 & K_3 & K_4 \\ 0 & 0 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A31}$$

$$= \frac{-K_1K_3K_6}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}$$

$-K_1K_3K_6 = -\frac{\delta_1\delta_2[\delta_3'(w^M+w^F+D)+\delta_3]}{(W^F+B-D)^2(W^M-B)} < 0$

Bride's consumption

$$\frac{\partial c_m^F}{\partial W^M} = \frac{\begin{vmatrix} 1 & 0 & 0 & K_1 \\ 0 & 0 & 0 & -1-K_1 \\ 0 & 0 & K_3 & K_4 \\ K_5 & K_9 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A32}$$

$$= \frac{K_3K_9 + K_1K_3K_9}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}$$

$K_3K_9 + K_1K_3K_9 = -\frac{B\delta_1\delta_2[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]}{(W^F+B-D)^2(W^M-B)W^M} < 0$

$$\frac{\partial c_m^F}{\partial W^F} = \frac{\begin{vmatrix} 1 & 0 & 0 & K_1 \\ 0 & 0 & 0 & -1-K_1 \\ 0 & -K_3 & K_3 & K_4 \\ K_5 & 0 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A33}$$

$$= \frac{K_3K_6 + K_1K_3K_6}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}$$

$K_3K_6 + K_1K_3K_6 = -\frac{\delta_1\delta_2[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]}{(W^F+B-D)^2(W^M-B)} < 0$

Bride price

$$\frac{\partial B}{\partial w^M}=\frac{\begin{vmatrix}1 & 0 & \delta_3 & K_1\\ 0 & 1 & 1-\delta_3 & -1-K_1\\ 0 & K_2 & K_7 & K_4\\ K_5 & 0 & K_8 & 0\end{vmatrix}}{-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6} \tag{A34}$$

$$=\frac{\delta_3K_2K_5+K_1K_2K_5+\delta_3K_4K_5-K_1K_5K_7-K_2K_8-K_1K_2K_8-K_4K_8}{-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6}$$

$\delta_3K_2K_5+K_1K_2K_5+\delta_3K_4K_5-K_1K_5K_7-K_2K_8-K_1K_2K_8-K_4K_8$
$=-\frac{1}{c_m^M w^M}(1-\delta_2)\Big\{(c_m^M-\delta_3 w^M)\{\frac{\delta_1}{(W^F+B-D)^2}-\frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M+w^F+D)-2\delta_3']\}+\frac{1-\delta_1}{c_m^F}(\delta_3')^2w^M(w^M+w^F+D)-\frac{(1-\delta_1)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]\delta_3'w^M(w^M+w^F+D)}{(c_m^F)^2}-\frac{(1-\delta_1)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]^2c_m^M}{(c_m^F)^2}+\frac{(1-\delta_1)\delta_3\delta_3'w^M}{c_m^F}\Big\}$.

The first part $(c_m^M-\delta_3 w^M)\{\frac{\delta_1}{(W^F+B-D)^2}-\frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M+w^F+D)-2\delta_3']\}+\frac{1-\delta_1}{c_m^F}(\delta_3')^2w^M(w^M+w^F+D)-\frac{(1-\delta_1)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]\delta_3'w^M(w^M+w^F+D)}{(c_m^F)^2}>0$.

and the second part $-\frac{(1-\delta_1)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]^2c_m^M}{(c_m^F)^2}+\frac{(1-\delta_1)\delta_3\delta_3'w^M}{c_m^F}<0$.

When w^M is comparatively large, in discussing the sign of $-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6$, we can ignore other factors but focus on the coefficient of w^M. The coefficient of w^M in the first part is $\frac{(1-\delta_1)(\delta_3')^2}{1-\delta_3}+\frac{(1-\delta_1)(\delta_3')^2}{(1-\delta_3)^2}$ and the coefficient of the second part is: $-\frac{(1-\delta_1)\delta_3'\delta_3}{(1-\delta_3)^2}+\frac{(1-\delta_1)\delta_3\delta_3'}{1-\delta_3}$. Thus the absolute value of the coefficient in the second part is larger. Hence, $-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6<0$. When w^M is small or not too large, $-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6>0$.

$$\frac{\partial B}{\partial w^F}=\frac{\begin{vmatrix}1 & 0 & \delta_3 & K_1\\ 0 & 1 & 1-\delta_3 & -1-K_1\\ 0 & K_2 & K_7 & K_4\\ K_5 & 0 & 0 & 0\end{vmatrix}}{-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6} \tag{A35}$$

$$=\frac{\delta_3K_2K_5+K_1K_2K_5+\delta_3K_4K_5-K_1K_5K_7}{-K_1K_3K_5-K_2K_6-K_1K_2K_6-K_4K_6}$$

$\delta_3K_2K_5+K_1K_2K_5+\delta_3K_4K_5-K_1K_5K_7=\frac{1-\delta_2}{c_m^M}\Big\{\delta_3\{-\frac{\delta_1}{(W^F+B-D)^2}+\frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M+w^F+D)-2\delta_3']\}+\frac{(1-\delta_1)\delta_3'[\delta_3'(w^M+w^F+D)+\delta_3]}{c_m^F}+\frac{(1-\delta_1)\delta_3'(w^M+w^F+D)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]}{(c_m^F)^2}\Big\}<0$.

$$
\frac{\partial B}{\partial W^M} = \frac{\begin{vmatrix} 1 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ 0 & K_2 & 0 & K_4 \\ K_5 & 0 & K_9 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A36}
$$

$$
= \frac{-K_2K_9 - K_1K_2K_9 - K_4K_9}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}
$$

Since $-K_2K_9 - K_1K_2K_9 - K_4K_9 = \frac{B\delta_2}{W^M(W^M-B)}\{-\frac{\delta_1}{(W^F+B-D)^2} + \frac{1-\delta_1}{c_m^F}[-\delta_3''(w^M+w^F+D) - 2\delta_3'] - \frac{(1-\delta_1)[-\delta_3'(w^M+w^F+D)+(1-\delta_3)]^2}{(c_m^F)^2}\} < 0$, $\frac{\partial B}{\partial W^M} > 0$.

$$
\frac{\partial B}{\partial W^F} = \frac{\begin{vmatrix} 1 & 0 & 0 & K_1 \\ 0 & 1 & 0 & -1-K_1 \\ 0 & K_2 & -K_3 & K_4 \\ K_5 & 0 & 0 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A37}
$$

$$
= \frac{K_1K_3K_5}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}
$$

Since $K_1K_3K_5 = -\frac{\delta_1(1-\delta_2)[\delta_3'(w^M+w^F+D)+\delta_3]}{c_m^M(W^F+B-D)^2} < 0$, $\frac{\partial B}{\partial W^F} > 0$.

Dowry

$$
\frac{\partial D}{\partial w^M} = \frac{\begin{vmatrix} 1 & 0 & 0 & \delta_3 \\ 0 & 1 & 0 & 1-\delta_3 \\ 0 & K_2 & K_3 & K_7 \\ K_5 & 0 & K_6 & K_8 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A38}
$$

$$
= \frac{-\delta_3K_3K_5 + K_2K_6 - \delta_3K_2K_6 - K_6K_7 + K_3K_8}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}
$$

$$- \delta_3 K_3 K_5 + K_2 K_6 - \delta_3 K_2 K_6 - K_6 K_7 + K_3 K_8$$

$$= \frac{\delta_1(1-\delta_2)(c_m^M - \delta_3 w^M)}{c_m^M w^M (W^F + B - D)^2} + \frac{(1-\delta_1)\delta_2[1 + \delta_3^2 - 2\delta_3 + c_m^F \delta_3' - \delta_3'(w^M + w^F + D) + \delta_3'\delta_3(w^M + w^F + D)]}{(c_m^F)^2 (W^M - B)}$$

$$= \frac{\delta_1(1-\delta_2)(c_m^M - \delta_3 w^M)}{c_m^M w^M (W^F + B - D)^2} + \frac{(1-\delta_1)\delta_2(1-\delta_3)^2}{(c_m^F)^2 (W^M - B)} \tag{A39}$$

We can notice the sign of the expression should be positive. However, in terms of discussing w^M, the expression shows w^M is in the power of -2. However, the denominator $-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6$ has the maximum power of w^M being -1. This indicates that the value of the derivative should be small and insignificant.

$$\frac{\partial D}{\partial w^F} = \frac{\begin{vmatrix} 1 & 0 & 0 & \delta_3 \\ 0 & 1 & 0 & 1-\delta_3 \\ 0 & K_2 & K_3 & K_7 \\ K_5 & 0 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A40}$$

$$= \frac{-\delta_3 K_3 K_5 + K_2 K_6 - \delta_3 K_2 K_6 - K_6 K_7}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6}$$

Since

$$- \delta_3 K_3 K_5 + K_2 K_6 - \delta_3 K_2 K_6 - K_6 K_7$$

$$= -\frac{\delta_1\delta_3(1-\delta_2)}{c_m^M (W^F + B - D)^2} + \frac{(1-\delta_1)[1 + \delta_3^2\delta_3 + c_m^F \delta_3' - \delta_3'(w^M + w^F + D) + \delta_3(-2 + \delta_3'(w^M + w^F + D))]}{(c_m^F)^2 (W^M - B)}$$

$$= -\frac{\delta_1\delta_3(1-\delta_2)}{c_m^M (W^F + B - D)^2} + \frac{(1-\delta_1)\delta_2(1-\delta_3)^2}{(c_m^F)^2 (W^M - B)}$$

$$= -\frac{\delta_1(1-\delta_2)}{(w^M + w^F + D)(W^F + B - D)^2} + \frac{(1-\delta_1)\delta_2}{(w^M + w^F + D)^2 (W^M - B)} \tag{A41}$$

$-\frac{\delta_1(1-\delta_2)}{(w^M+w^F+D)(W^F+B-D)^2} < 0$ and $\frac{(1-\delta_1)\delta_2}{(w^M+w^F+D)^2(W^M-B)} > 0$. When w^F is small $-\delta_3 K_3 K_5 + K_2 K_6 - \delta_3 K_2 K_6 - K_6 K_7 > 0$ and when w^F is large $-\delta_3 K_3 K_5 + K_2 K_6 - \delta_3 K_2 K_6 - K_6 K_7 < 0$.

$$\frac{\partial D}{\partial W^M} = \frac{\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & K_2 & K_3 & 0 \\ K_5 & 0 & K_6 & K_9 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} = \frac{K_3K_9}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A42}$$

Since $K_3K_9 = -\frac{\delta_1\delta_2 B}{(w^M+w^F+D)^2(W^M-B)W^M} < 0$, $\frac{\partial D}{\partial W^M} > 0$.

$$\frac{\partial D}{\partial W^F} = \frac{\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & K_2 & K_3 & -K_3 \\ K_5 & 0 & K_6 & 0 \end{vmatrix}}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} = \frac{K_3K_6}{-K_1K_3K_5 - K_2K_6 - K_1K_2K_6 - K_4K_6} \tag{A43}$$

Since $K_3K_6 = -\frac{\delta_1\delta_2}{(w^M+w^F+D)^2(W^M-B)} < 0$, $\frac{\partial D}{\partial W^F} > 0$.

A.3.1. Bride Price and Spouses' Income

The results from the theoretical model indicate that the impacts of the groom's income on the bride price are in a quadratic form. When a groom's income is low, with the increase in his income, the bride price will decline initially until reaching a turning point. After the lowest point, the bride price keeps rising with the further growth of the groom's income. From the theory perspective, the initial downturn is due to the comparatively large absolute value of the second-order derivative of the bride's family utility with respect to the dowry amount and the altruistic utility function form. This reflects that when the groom's income is low, the bride's family will choose to retain a large portion of the bride price. Because one role of dowry is the bride's family's willingness for higher bargaining power for their daughter, the bride's family does not need a large dowry to ensure favored bargaining power for the bride when the groom's income is not high. In other words, the marginal utility of retaining bride price is high for the bride's family. This consequently leads to less dowry transferred to the couple as well as less consumption for the groom. This also leads to a lower incentive for the groom's family to pay a high bride price. However, with the further increase in the groom's income level, the bride's family needs to pay a higher dowry to improve their daughter's bargaining power. The decreasing marginal utility of the bride's family hampers them from retaining bride price and leads to a higher dowry transfer. In this case, the groom's family will have a higher incentive to transfer wealth to their son through bride price.

The theoretical model suggests that the bride price is always positively correlated with the bride's income. The explanation from the perspective of the marriage market model is because of the diminishing marginal utility of the bride's family with respect to dowry and the positive impacts of dowry on both bride's and groom's consumption. Unlike the case in which the groom's income is low, even when the bride's income is not high, the bride's family still has incentives to transfer wealth to their daughter through dowry. Because dowry is a shared resource, the groom's family also has incentives to transfer wealth through the bride price.

A.3.2. Dowry and Spouses' Income

The theoretical model indicates that a groom's income level has a very limited impact on the dowry amount (when the bride's income is not too low). The derivative of dowry with respect to the groom's income sees the effect of the bride's consumption being canceled out. This results in the groom's income entering into the derivative in the form of a reciprocal. Because the decision-making of the dowry amount is on the bride's family's side and they only consider their daughter's utility, unless both spouses have very low income, the groom's income is not a major factor for the bride's family.

On the other hand, the impacts of the bride's income on dowry are also in a quadratic form from the theoretical model's derivative results. With an initial downturn, the dowry amount increases with the growth of a bride's income. In the model, the derivative implies that both groom's and bride's consumption enter into the decision-making of the dowry amount. This is because dowry is from the bride price and the decision-making of bride price involves the consumption of the groom. The analysis of a low bride's income to the groom's family is similar to the scenario where the groom's income is low. When the bride's income is low, the marginal utility from the effect of improving the bargaining power of the bride through dowry payment is low. In this situation, the bride's family chooses to retain a large portion of the bride price, and the groom's family will pay a low price. After the turning point, the groom's consumption plays a more prominent role, and the groom's family has higher incentives to pay for more bride price, which leads to higher payment of dowry as well.

A.3.3. Marriage Payments and Natal Families' Wealth

The theoretical model presents relatively simple derivatives between marriage payments and the natal families' wealth. Both bride price and dowry positively correlate with either side of the family. Firstly, the derivative of dowry with respect to the wealth of the bride's family in the theoretical model indicates a negative relationship. The interpretation of the theoretical result is straightforward: when the bride's family is wealthy, they are willing to transfer more to the couple, increasing their daughter's consumption. Similar to the bride's family's wealth, a wealthier groom's family is also associated with a higher dowry payment. The derivative of dowry with respect to the groom's family's wealth is positive and positively correlated with the bride price.

The derivative of bride price with respect to the wealth of the bride's family is positive regardless of the income levels of the couple. The explanation is straightforward, considering that a wealthier bride's family has a higher potential to transfer greater dowry to the couple. The positive relationship between bride price and the groom's family's wealth is due to a negative second-order derivative of the bride's family's utility with respect to dowry, and that dowry always brings positive utility to a wife. As explained from the economic intuition, the wealthier a groom's family is, the higher the upper limit for the bride price. Considering the bride's family seeks the bride price as high as possible, the bride price in equilibrium should be positively correlated with the groom's family's wealth.

Appendix B: Empirical Appendix

I test the relationships between marriage payments and family characteristics of both spouses and their parents. Even though causality is not the main goal of the analysis, it is equally important to test whether the patterns are consistent with what we can claim theoretically. Due to the limitation of data on the parents' wealth on both sides, I adopt two proxies for the two variables: the *hukou* statuses and education levels. An urban *hukou* and higher education levels are typically associated with higher wealth. A person's father's *hukou* status is chosen as the measurement considering that 98% of the parents have the same types of *hukou*. For the bride's side, 13.80% of their parents hold urban *hukou*.

B.1. Bride Price

As suggested in the model, the bride price under equilibrium B is correlated with all four factors: the couple's incomes and their parents' wealth. Specifically, the bride price value is correlated with the groom's income in a quadratic form and has a positive linear relationship with the bride's income. Figure B1 shows that the trends from the data are consistent with the model prediction. We can notice that the higher percentage of women out of the labor force dwindles the scale of the relationship. This is because in deciding to set the bride price and dowry, the parents consider the children's potential incomes. However, those potential high-income earners may choose not to work. I will further inspect this issue in the following analysis.

[Insert Figure B1 here]

The reduced-form specification for the relationship is below:

$$Bride\ Price_{i,k,t} = \boldsymbol{X}_{i,k,t_{2018}}\boldsymbol{\beta}_{B1} + \boldsymbol{Y}_{i,k,t_{2018}}\boldsymbol{\beta}_{B2} + \kappa_k + \tau_t + \varepsilon_{i,k,t} \tag{B1}$$

where $Bride\ Price_{i,t,k}$ stands for the bride price for the couple in household i in province k and getting married in time range t. $\boldsymbol{X}$ is the vector that includes the quadratic form of the groom's income and the linear form of the bride's income. Considering that it is implausible to survey the income in the wedding years, I use the incomes in the 2018 surveys (i.e., the annual incomes in 2017), which should be reasonable proxies for the expected incomes at that time. $\boldsymbol{Y}$ is the vector that reflects the groom's and bride's parents' characteristics. I adopt the *hukou* statuses and education levels of the parents on both sides as proxies for their wealth. This includes whether at least one of the parents finished high school and their fathers' *hukou* types. Table B1 presents the estimation results:

[Insert Table B1 here]

In Columns (1)-(4), I use the actual incomes of brides, and the brides' education levels are adopted as the proxy for their potential incomes in Columns (5)-(8). We can notice that the quadratic form of grooms' incomes always holds across the columns. In addition, the coefficients of the linear term are negative for the quadrative term. The signs of the groom's income coefficients indicate that with the increase of a groom's income, the bride price declines initially, then gradually starts to rise. The coefficient for brides' actual incomes shows a positive sign but is less significant in Columns (1)-(4). This could be due to two facts: a bride's and groom's incomes can be positively correlated, and a larger percentage of women do not work even though their potential income is high. To tackle these issues, I replace the actual income of the brides with their education levels (whether they finished high school)—the replacement results in positive and significant estimation.

In analyzing the dynamics of the bride price, we know the turning point for the groom's income is $\overline{w}$. The empirical evidence shows that the turning point is as low as 100 *yuan*. This can be interpreted as: generally, the bride price is positively correlated with the groom's income except for the situation where the groom does not work or earns minimal income. On average, for a groom who earns a mean income ($34,000$ *yuan* as in Table 1), a 1% increase in his income is associated with a 16.2% raise in the bride price. Even though the magnitude of the bride's actual income coefficient is lower, the adoption of education levels as the measurement sees significantly larger impacts. A bride who finished high school education could expect a $40 - 60\%$ increment in the bride price.

B.2. Dowry

To test the empirical evidence on the dynamics of the amount of dowry, I inspect two parts: the relationship between the values of bride price and dowry and the relationship between all family characteristics and dowry. Figure B2 shows the distribution of the bride prices and dowries in each family. It is noticeable that the majority of the sample falls below the line with a slope of one. The lower end tail shows the ratio of dowry to bride price is larger than one. However, the number of observations is low.

[Insert Figure B2 here]

To test the relationship between the two prices, I simply include the explanatory variable and other fixed effects as specified below:

$$Dowry_{i,k,t} = Bride\ Price_{i,k,t}\beta_{B3} + \kappa_k + \tau_t + \varepsilon_{i,k,t} \tag{B2}$$

For other fixed effects, I adopt either the provincial or city level. Considering the surveys select only a very limited number of cities in each province, we would not expect a substantial difference between the outcomes.

Table B2 below presents the estimation results:

[Insert Table B2 here]

The coefficient estimation without any fixed effects controlled is 0.91. However, with the province or city and wedding year fixed effects controlled, the coefficients are reduced to close to the average of the dowry-to-bride price ratio of 80% (A logarithmic form is adopted in the estimation so that they are not equivalent), and the scale of the constant term falls. This alludes to the role of regional cultural differences. I will further test this in the next part.

Different from the specification of the bride price regressions, the discussion of dowry involves two parts: testing the significance of the groom's income and the direction of the impacts of the bride's income. Figure B3 below experiments curve fitting with the specified forms of the spouses' incomes:

[Insert Figure B3 here]

We have learned that bride price is a function of all four family characteristics and tested the relationships graphically above. Following the last step, I inspect the relationships between dowry and all family characteristics. The dowry regression specification consists of a linear groom's income and a quadratic form of the bride's income. The specification is below:

$$Dowry_{i,k,t} = \boldsymbol{X}_{i,k,t_{2018}}\boldsymbol{\beta}_{B4} + \boldsymbol{Y}_{i,k,t_{2018}}\boldsymbol{\beta}_{B5} + \kappa_k + \tau_t + \varepsilon_{i,k,t} \tag{B3}$$

Table B3 below presents the results

[Insert Table B3 here]

Columns (1)-(4) show the results where I directly use the brides' actual income, and I replace the brides' income with their education levels in Columns (5)-(8). All the columns show no significance of the impacts of the groom's income on the dowry amount. In addition, we can notice negative and positive signs in the coefficients. When the quadratic forms of the bride's income are adopted, significant results consistent with the graphic evidence can be observed. Different from the groom's income in the discussion of the bride price, the turning point for the bride's income is smaller. The turning point for the bride's income is around 50 *yuan*, which is half the amount of the groom's turning point. In light of the cause for the turning point of the bride's income is the same as the groom's income and dowry is from the bride price,

As for the parents' sides, similar conclusions can be drawn, as in the bride price analysis part. Proxied by fathers' *hukou* types and parents' education levels, the estimation results indicate that dowry is positively associated with the wealth of both sides. Whether measured with *hukou* or education levels, the coefficients exhibit highly significant levels in dowry regressions. Nevertheless, the correlation between *hukou* and education also boosts standard errors when both indicators are regressed together.

B.3. Patrilocality and Bride Price

This part examines the relationship between the levels of patrilocality and the bride price. Since patrilocality is a major factor resulting in the payment of the bride price and a higher degree of patrilocality (in terms of the gain of utility for the groom's family) is positively correlated with the bride price asked by the bride's family, the critical part of the discussion is the find proxies for the levels of patrilocality.

To proxy the levels of patrilocality, I use the distance between the wife's original and current places and the frequency of the wife's visits to her maiden family each year. A longer physical distance between the wife's natal and current families reflects the patrilocality on both families' sides. If a wife lives far from her natal family, her family will experience a larger loss as it is hard for her to contribute to the production. Meanwhile, this forces her to integrate into her husband's family and the local society, which results in a higher chance that she could contribute more to the production. Similar to the distance but more straightforward, the frequency of visiting her natal family indicates whether she contributes more to her natal or her husband's family.

For the distance measurement, I adopt the direct geographic distance between the city the wife currently lives in and the city where she was born or the city where she was fourteen years old. The survey also selected a portion of the sample for an extended version that asked about their routines. These included the frequency of visiting their parents if the individual lives in a different location than their parents. In the following regressions, I use the number of days the wife usually visits in a year and the times she visited last year. The basic specification is below:

$$Bride\ Price_{i,t} = \boldsymbol{\beta}_{B6} + \boldsymbol{\beta}_{B7} Patri_{i,t} + \boldsymbol{\beta}_{B8} X_{i,t} + \varepsilon_{i,t} \tag{B4}$$

$Patri_{i,t}$ is one of the four proxies for the levels of patrilocality, and $X_{i,t}$ is the control variable that varies for the two proxies where I either control the income levels or the provincial and wedding year fixed effects. Table B4 below presents the results.

[Insert Table B4 here]

The first four columns present the regression results proxied with the geographic distances. The second and fourth columns further control the income of the two spouses. The last two columns show the results where the visiting frequencies are the indicator for patrilocality. The results estimated with the distance proxy at different ages do not display a large difference. Considering the low mobility in the society, especially due to the *hukou* policy, a minor difference is expected. A 10% increase in the physical distance is associated with one percent higher bride price. Additionally, it is more common to have a marriage between two people from the same location (a zero physical distance under the specification). A groom marrying a bride from another town sees 1.5 times higher bride price on average. Consistent conclusions can be found when patrilocality is proxied by the frequency of the wife visiting her natal family. The more she visits her parents, the stronger connection she maintains with her maiden family, and less contribution to her spouse's. A 10% increase in her frequency of visiting her maiden family is reflected in a 4% less bride price.

B.4. Structural Estimation on Bargaining power

$$\begin{aligned}\mathcal{L} = \gamma\Big\{&\sigma_3\{\tau_1^M log(c_m^M) + \tau_2^M[\rho_1 log(h^M) + \rho_2 log(h^F) + (1-\rho_1-\rho_2)log(g)] + \tau_3^M log(\ell^M)\}\\ &+ (1-\sigma_3)\{\tau_1^F log(c_m^F) + \tau_2^F[\rho_1 log(h^M) + \rho_2 log(h^F) + (1-\rho_1-\rho_2)log(g)] + \tau_3^F log(\ell^F)\}\Big\}\\ &+ \lambda[c_m^H + g - \omega^M(1-h^M-\ell^M) - \omega^F(1-h^F-\ell^F) - D]\end{aligned} \tag{B5}$$

First-order conditions:

c_m^H:

$$\gamma\{\sigma_3\tau_1^M\frac{1}{c_m^H} + (1-\sigma_3)\tau_1^F\frac{1}{c_m^H}\} + \lambda = 0 \tag{B6}$$

g:

$$\gamma\{\sigma_3\tau_2^M(1-\rho_1-\rho_2)\frac{1}{g} + (1-\sigma_3)\tau_2^F(1-\rho_1-\rho_2)\frac{1}{g}\} + \lambda = 0 \tag{B7}$$

h^M:

$$\gamma\{\sigma_3\tau_2^M\rho_1\frac{1}{h^M} + (1-\sigma_3)\tau_2^F\rho_1\frac{1}{h^M}\} + \lambda\omega^M = 0 \tag{B8}$$

h^F:

$$\gamma\{\sigma_3\tau_2^M\rho_2\frac{1}{h^F} + (1-\sigma_3)\tau_2^F\rho_2\frac{1}{h^F}\} + \lambda\omega^F = 0 \tag{B9}$$

ℓ^M:

$$\gamma\sigma_3\tau_3^M\frac{1}{\ell^M} + \lambda\omega^M = 0 \tag{B10}$$

ℓ^F:

$$\gamma\sigma_3\tau_3^F \frac{1}{\ell^F} + \lambda\omega^F = 0 \tag{B11}$$

B.5. The Direct Effect of the Marriage Law Amendment

The primary test indicates a result of increasing marriage payments. The first concern could come from the baseline assumption if there is an increased value of dowry. Since the value is not possible to measure directly, I adopt the house purchasing behavior of the couple as the proxy to reflect the direct effect of the amendment. Purchasing a house is an essential goal for Chinese people, and ownership of houses has led to many disputes in divorce cases. Thus, if the hypothesis is correct that the amendment helps to clarify the ownership of property, this will ease the concern of the couple in house purchasing. Thus, I look into the waiting time between wedding the house purchasing. With the clarification of the property ownership, we can expect the waiting time shortens after the amendment. Figure B4 below shows the trend of the waiting time between the year of purchasing houses and the wedding year.[21]

[Insert Figure B4 here]

The gradual relaxation of the housing market and the growth of wealth in society result in a downward trend of waiting time. However, Not only can we observe a discontinuity but also an accelerated downward trend. Table 6 below presents the RDD estimation results.

[Insert Table B5 here]

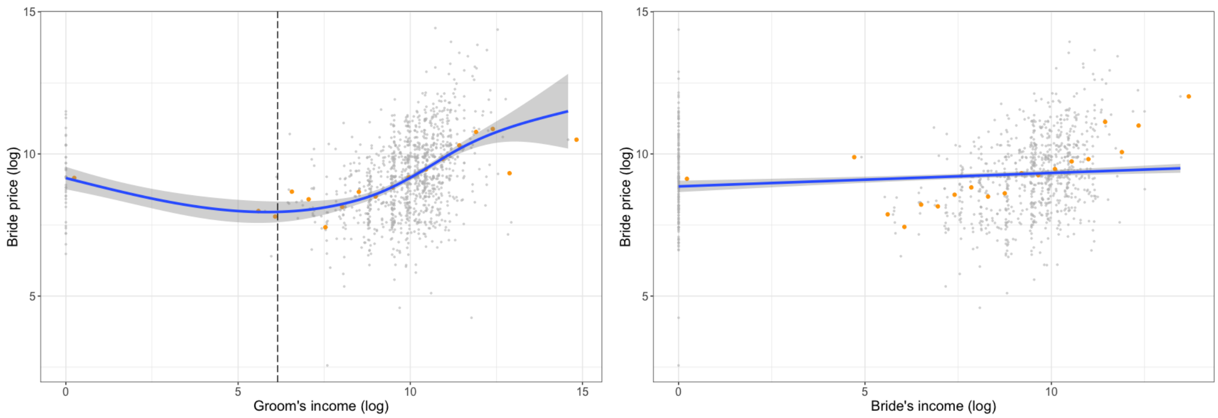
The RDD estimation indicates a significant negative discontinuity in 2001, led by the marriage law amendment. The average waiting time between purchasing a house and wedding was shortened by 3.7 years, which is a 25% reduction.[22] Even though the market has continuously seen the worsening housing affordability(C. Zhang et al., 2016), this reflects a relief of the concern regarding the ownership of houses for people. In comparison, prior to the amendment, couples may need more time to establish trust or find methods to solve disputes regarding ownership should divorces happen.

[21] I utilize the data since 1982. House ownership was a part of the planned economy before 1980. *Outline of the Report of the National Conference on Capital Construction* in 1980 proposed commercialization of the housing market. Between 1980 and 1982, commercialization was conducted in part of China. The experiment stopped in 1982, and the mortgage loan was formerly introduced in that year as well.

[22] Another around 6% households in the sample purchased their houses before the marriage and are not taken into account in the analysis.

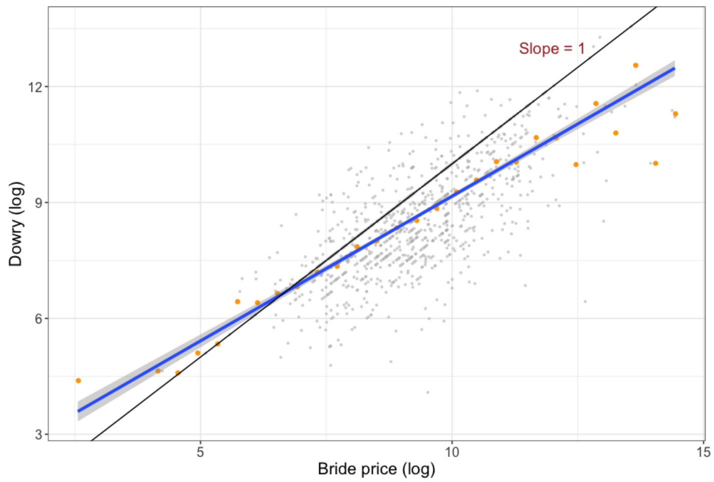
Appendix Figures

Figure B1: Relationships between bride price and groom's (left) and bride's (right) incomes



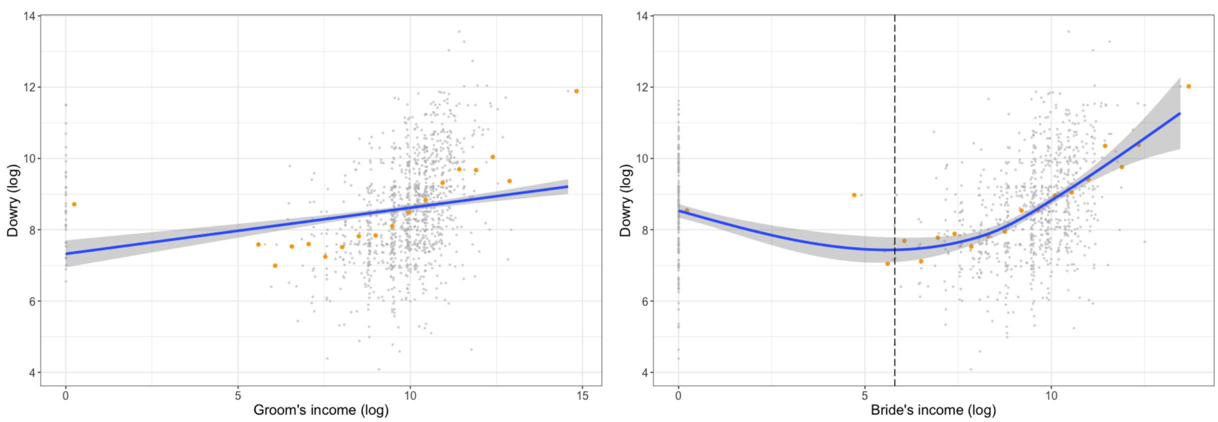
Note: This figure shows the relationship between the bride price and the spouses' income: the groom (left) and the bride (right). Bride prices, bride's and groom's income are all transformed with the Inverse Hyperbolic Sine (IHS) function. The dashed line on the left indicates the turning point. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS)

Figure B2: Relationships between dowry and bride price



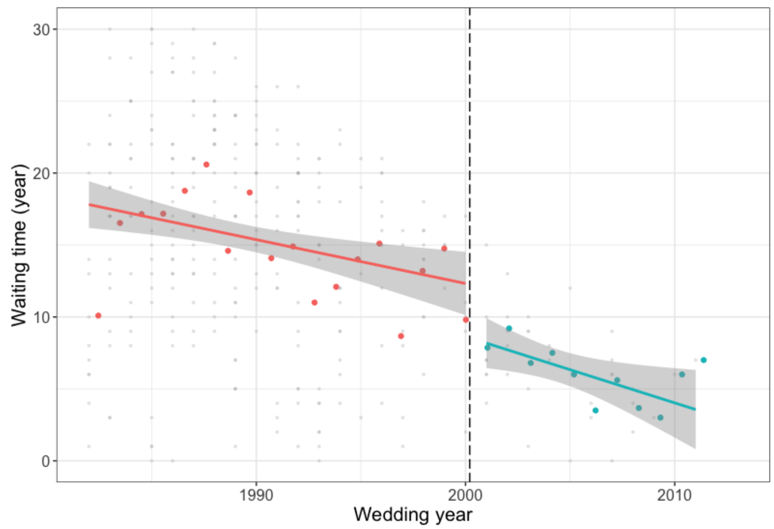
Note: This figure shows the relationship between dowries and bride prices. Both prices are all transformed with the Inverse Hyperbolic Sine (IHS) function. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS)

Figure B3: Relationships between dowry and groom's (left) and bride's (right) incomes



Note: This figure shows the relationship between the dowry and the spouses' income: the groom (left) and the bride (right). Dowries, bride's and groom's income are all transformed with the Inverse Hyperbolic Sine (IHS) function. The dashed line on the right indicates the turning point. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS).

Figure B4: Relationship between wedding year and the waiting time of purchaing houses



Note: This figure demonstrates the time trend of the waiting time between purchasing a house and the wedding from 1982 to 2018. The sample is from the 2018 China Labor force Dynamics Surveys (CLDS). The sample size is 301. The vertical axis is the waiting time between purchasing the house and the wedding year (year). The horizontal axis stands for the years when the couples got married. The cutoff line is the year 2001. The data is winsorized at the 0.5% level at both the top and bottom.

Appendix Tables

Table B1: Reduced-form Evidence I: Relatiobship between Bride Price and Family Characteristics

	Dependent variable: Bride price							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Groom's Income	-0.225***	-0.162**	-0.151***	-0.143**	-0.193***	-0.121**	-0.137***	-0.110*
	(0.051)	(0.065)	(0.056)	(0.066)	(0.047)	(0.060)	(0.050)	(0.060)
(Groom's Income)^2	0.022***	0.016***	0.015***	0.014***	0.019***	0.012***	0.013***	0.011**
	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)
Bride's Income	0.020**	0.014	0.017*	0.015				
	(0.008)	(0.012)	(0.009)	(0.012)				
Bride's High School					0.529***	0.424***	0.367***	0.348***
					(0.081)	(0.114)	(0.099)	(0.121)
Natal Families' Education		X		X		X		X
Natal Families' *Hukou*			X	X			X	X
Province Fixed Effects	X	X	X	X	X	X	X	X
Wedding Year Fixed Effects	X	X	X	X	X	X	X	X
Observations	1,128	667	907	666	1,380	811	1,119	809
R^2	0.418	0.410	0.415	0.413	0.427	0.415	0.414	0.418

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variable of the bride price and the explanatory variables of the bride's and groom's income are all transformed with the Inverse Hyperbolic Sine (IHS) function. The variable of a bride's education is a dummy variable which equals 1 if she has finished high school and 0 if she never has. Both parents' education and *hukou* variables are dummy variables. For education, the variable is 1 if at least one of the parents has finished high school and 0 if neither has. For *hukou*, the variable is 1 if their father holds an urban *hukou* and 0 if he does not. Wedding year fixed effects indicate the year ranges in which the couple got married. They are the 1970s, 1980s, 1990s, and 2000s.

Table B2: Reduced-form Evidence II: Relatiobship between Dowry and Bride Price

	Dependent variable: Dowry				
	(1)	(2)	(3)	(4)	(5)
Bride price	0.909***	0.939***	0.792***	0.790***	0.652***
	(0.065)	(0.069)	(0.081)	(0.082)	(0.094)
Province Fixed Effects		X	X		
City Fixed Effects				X	X
Wedding Year Fixed Effects			X		X
Observations	1,461	1,461	1,461	1,461	1,461
R^2	0.117	0.172	0.180	0.333	0.340

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variable of dowry and the explanatory variables of the bride price are both transformed with the Inverse Hyperbolic Sine (IHS) function. Wedding year fixed effects indicate the year ranges in which the couple got married. They are the 1970s, 1980s, 1990s, and 2000s.

Table B3: Reduced-form Evidence III: Relatiobship between Dowry and Family Characteristics

	Dependent variable: Dowry							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Groom's Income	-0.00003	0.037	-0.013	0.037	0.025	0.046	0.012	0.045
	(0.046)	(0.053)	(0.048)	(0.053)	(0.043)	(0.050)	(0.045)	(0.050)
Bride's Income	-0.403***	-0.514***	-0.397***	-0.469***				
	(0.136)	(0.178)	(0.153)	(0.178)				
(Bride's Income)^2	0.039***	0.049***	0.039***	0.045***				
	(0.012)	(0.016)	(0.014)	(0.016)				
Bride's High School					1.047***	1.506***	0.684**	1.257***
					(0.255)	(0.344)	(0.315)	(0.368)
Natal Families' Education		X		X		X		X
Natal Families' *Hukou*			X	X			X	X
Province Fixed Effects	X	X	X	X	X	X	X	X
Wedding Year Fixed Effects	X	X	X	X	X	X	X	X
Observations	1,128	667	907	666	1,380	811	1,119	809
R^2	0.152	0.185	0.180	0.198	0.151	0.188	0.172	0.192

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variable of dowry and the explanatory variables of the bride's and groom's income are all transformed with the Inverse Hyperbolic Sine (IHS) function. The variable of a bride's education is a dummy variable which equals 1 if she has finished high school and 0 if she never has. Both parents' education and *hukou* variables are dummy variables. For education, the variable is 1 if at least one of the parents has finished high school and 0 if neither has. For *hukou*, the variable is 1 if their father holds an urban *hukou* and 0 if he does not. Wedding year fixed effects indicate the year ranges in which the couple got married. They are the 1970s, 1980s, 1990s, and 2000s.

Table B4: Reduced-form Evidence I: Relatiobship between Bride Price and Patrilocality

	Dependent variable: Bride price					
	(1)	(2)	(3)	(4)	(5)	(6)
City distance	0.101***	0.078***				
	(0.022)	(0.024)				
City Distance at 14			0.112***	0.090***		
			(0.023)	(0.025)		
Times visit					-0.404**	
					(0.187)	
Times visited last year						-0.423**
						(0.173)
Groom's Income		X		X		
Bride's Income		X		X		
Province Fixed Effects					X	X
Wedding Year Fixed Effects					X	X
Observations	1,390	1,073	1,391	1,075	108	107
R^2	0.015	0.068	0.017	0.070	0.511	0.510

Note: Standard errors in brackets and errors are clustered at the household level. * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. The dependent variable bride prices are transformed with the Inverse Hyperbolic Sine (IHS) function. Explanatory variable CIty distance measures the distance between the wife's current home and her birthplace. Explanatory variable CIty distance at 14 measures the distance between the wife's living place at 14 years old and her birthplace. The explanatory variable Times visit is the average number of the wife visiting her marital family. Explanatory variable Times visit last year is the number that the wife visited her marital family last year. Wedding year fixed effects indicate the year ranges in which the couple got married. They are the 1970s, 1980s, 1990s, and 2000s.

Table B5: Robustness Test on the Efficiency of the Marriage Law Amendment

	Dependent variable: Waiting time (year)	
	(1)	(2)
RDD estimand	-3.842*	-3.734*
	(2.164)	(2.166)
Bride marriage age		X
Observations	301	301
R^2	0.175	0.178

Note: Standard errors in brackets. * significant at the 10% level. The dependent variable is the gap between the year of purchasing the house and the wedding year. Both columns utilize local linear regression and triangular kernel. The Bandwidth type is chosen based on the method proposed by Imbens & Kalyanaraman (2012).