

Dowry and Female Education: A Theoretical Evaluation

SUSHOBHAN MAHATA, ROHAN KANTI KHAN, and SOUMYAJIT MANDAL

Using a dynamic framework based on intertemporal optimisation, this paper explores the complexity of the intertwined relationship between dowry and female education. The incidence of dowry in a gendered society is not at all a mechanically biological entity but fundamentally socially nurtured. The effect of social heterogeneity, economic status of the bride and groom family, unemployment, and female-specific education subsidy has been analysed to explain the incidence of dowry. We find that specifically targeted subsidised education for the girl child and gender empowerment may aggravate the incidence of dowry. Interestingly, we found that even if dowry is negatively correlated with bride education initially, a rise in the groom's relative status can result in higher dowry and higher bride education in the final equilibrium. The results of this study show that the equilibrium level of dowry and female education exhibits a non-monotonous relationship which hinges on the nature of the underlying socio-economic characteristic. However, overhauling the existing social system is not an easy exercise given the stigma associated with dowry exchange, and thus dowry may persist.

JEL Classification: D11, D14, I20, J12

Keywords: Dowry, Female Education, Gender Wage Disparity, Unemployment, Education Subsidy

1. INTRODUCTION

The practice of dowry as a part of the marriage and family system has evolved as a historical and socio-cultural phenomenon. This has become a standard social norm in most societies, especially in South-Asian countries. As a general convention, the groom's and bride's parents exchange hand-in-hand the dowry payment (in cash or in kind or both) at the time of marriage. This type of payment can be classified into two broad groups. When a payment is made to the groom's family from the bride's family, it is known as the "dowry". On the other hand, when payment is made to the bride's family from the groom's family, it is known as the "bride price". Becker's (1991) price model of dowry suggests that those with a high marginal gain from marriage pay the price as the groom or bride price. In his analysis, the dowry or groom price is derived as the equilibrating price of the joint value of marriage. The custom of dowry dates back to at least 200-800 BCE in the ancient Greek cities-states and Rome, while in the

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contemporary period, its widespread prevalence could be found in India, Bangladesh, Pakistan, Afghanistan, Nepal, and Sri Lanka.¹

Scholarship in the field of gender studies in general and dowry, in particular, has studied the phenomenon and factors affecting dowry for different cultures and countries. Their results have been broadly mixed and contradictory in a few particular aspects. Botticini and Siow (2003) modelled dowry as an attempt by altruistic parents to mitigate the free-riding problems of family wealth between siblings (daughter and son) when the daughter leaves their parent's home after marriage. Alternatively, dowry is also interpreted as a means to strengthen the bargaining power of the bride in the connubial household (Zhang & Chan, 1999; Brown, 2009, etc.). The existence of the dowry system has also been attributed to antecedents such as tradition, modernisation, self-interest, social status, caste structure of the families, daughters' security, happiness, and timely marriage and marriage squeeze (Anderson, 2007a; Rao, 1993; Dalmia & Lawrence, 2005; Srinivasan & Lee, 2004 & Anderson, 2007b).

Several scholarly attempts have investigated the interrelationship between the practice of dowry and the education of marital partners. Dalmia & Lawrence (2005) found a non-decreasing relationship between the bride's education and the amount of dowry in India. Sharma & Frijters (2009), using an OLS and 2SLS model, obtained a positive association between female education and dowry for middle-class families in the Indian city of Patna. On the other hand, Dasgupta & Mukherjee (2003) and Lahiri & Self (2007) obtained that dowry hinders female skill acquisition. According to Roy (2015), dowry payments can be substituted for higher education in marriage markets if dowry is regarded as a price that clears marriage markets. Education increases the bride's value, therefore, lower dowries are needed to secure the groom of their choice. Krishnaswamy (1995), Makino (2021), and Anukiti, et al. (2018) found that higher female education improves a bride's earning potential in the labour market and leads to a lower amount of dowry exchange at the time of marriage. It has also been obtained that the higher the quality of the groom, the higher the dowry the bride's parent is willing to pay, as it is a claim to take a position on the higher social ladder. It is argued that as parents spend more on their son's education (to make him capable to look after a family), dowry is taken as the reimbursement of the son's education investment (Gierbo & Imam, 2006; Dalmia & Lawrence, 2005). Empirically a significant and positive relationship was obtained between dowry and the education of Indian grooms (Dalmia & Lawrence, 2005; Deolalikar & Rao, 1998). In the Indian context, it was observed that a good appearance is an essential quality for brides, while for grooms, it is the education level (Anderson, 2007a). Using the Indian Human Development Survey-II, Goel and Barua (2021) found that though dowry increases with the groom's education, the rate of increase decreases with the bride's education.

In this paper, we attempt to offer a theoretical explanation focusing on the role of female education in determining the demand for and supply of dowry and the determination of the equilibrium dowry level. The effect of social heterogeneity, economic status of the bride and groom family, unemployment, and female-specific education subsidy has been analysed to explain the incidence of dowry. To illustrate

¹The detailed historical account about the evolution of dowry system could be found in Anderson (2007a), Botticini and Siow (2003) & Rao (1993).

social heterogeneity, we analyse the attitudes (stigma) associated with dowry exchange for both the bride and groom's families, as well as the preference of the groom's family towards the bride's participation in household chores. Economic status is measured in terms of the initial wealth of the bride's and groom's families, as well as the heterogeneity in earning potential between bride and groom. The paper also shows some counterintuitive results, such as an increase in dowry associated with an increase in female education (Munshi, 2012). We demonstrate this in terms of a special corner solution with high female education and high dowry. Our analysis reconciles the seemingly mixed results obtained in terms of the association between dowry and female education. For example, we show that even if initially dowry is negatively correlated with bride education, the ultimate equilibrium may result in high dowry and high bride education owing to the rise in the relative status of the groom's family.

The remainder of the paper is organised as follows. Section 2 elucidates the basic structure of the model. The equilibrium level of dowry and female education is determined in Section 3. The comparative statics exercise pertaining to our analysis is carried out in Section 4. Finally, Section 5 concludes the paper.

2. THE MODEL

We provide a theoretically tractable framework that demonstrates how parents' decision about the exchange of dowry hinges on the brides' level of education, which is an equilibrium outcome in the marriage market. In this stylised social framework, we consider two heterogeneous groups of families, the bride's and the groom's families, respectively. Each representative family belonging to either group stigmatised by social norms faces an intertemporal utility maximisation problem where the trade-off lies between female education (skill level) that determines her earning potential and dowry.

2.1. The Bride's Family

In this two-period ($i=1,2$) optimisation framework, the representative bride's family utility is assumed to be a positive function of their household consumption $\{Z_i\}_{i=1}^2$ which is discounted by the time impatience factor $\beta \in (0,1)$. Thus, the utility function of the representative bride's family is given by

$$U = \log Z_1 + \beta \log Z_2; Z_1, Z_2 > 1; \frac{\partial U}{\partial Z_i} \equiv U_i > 0 \forall i \quad \dots \quad \dots \quad \dots \quad (1)$$

This is a two-member household, one adult member (guardian) and one daughter, each endowed with one unit of total time. In period 1, the guardian decides on the time allocation of the daughter, a fraction of which is spent either at school acquiring skill (l_F^S) or participating in the unskilled female-specific labour market ($1 - l_F^S$).² The adult is

²The structure of the family could also be interpreted in the following fashion. Let the household has ' n ' adult members and ' m ' daughters. In that case, either the number of adult members (n) can be normalised to unity, or all adult members assume to have total one unit of time. Similarly, l_F^S can be thought as a fraction of ' m ' daughters in a family attending school and $l_F^U (= 1 - l_F^S)$ is the fraction of ' m ' daughters who are out of school. However, this will add no qualitative insight to the model except for the quantitative changes.

assumed to spend the entire endowment of time in wage-earning activities in period 1 and earns W_0 . The family receives a subsidy net of the cost of education for the education of the daughter ($s - b$), where ' s ' is the rate of education subsidy and ' b ' is the direct cost of schooling incurred by the family per unit time spent in skill acquisition. The opportunity cost of schooling of the girl child is $W_F(1 - l_F^S)$, where W_F is the unit monetary value of domestic household chores.³ Besides this, in period 1 the family saves an amount ' S_1 ' for the consumption of the guardian and payment of dowry in period 2.⁴ Thus, in period 1 the household is constrained by the following equation:

$$Z_1 + S_1 = W_0 + W_F - (W_F + b - s)l_F^S \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

In period 2, the guardian retires from the regular wage-earning activity and no longer earns any wage income, however, he survives out of his savings net of dowry payment. The daughter becomes an adult (potential bride) in this period and her skill endowment is equivalent to her time spent in schooling in period 1. Hence, her earning potential is $W_F^S l_F^S$ where W_F^S is the female skilled wage rate. The daughter gets married in this period and leaves her parent's home. Any earning by the potential bride in this period is owed to the potential groom's family. The guardian offers ' δ ' fraction of the savings as dowry, where δ is conditional on the ratio of potential groom's income to the potential bride's income, defined as $\delta = k \left(\frac{W_M^S}{W_F^S l_F^S} \right), k > 0$.⁵ An increase in this ratio implies a

higher fraction out of savings is to be paid as dowry.⁶ This ratio also represents the relative gender-based income disparity.⁷ This implies that an increase in gender-based income disparity deteriorates the relative status of the bride's family that impinge on the amount of dowry offered. The following equation gives the consumption of the parents in period 2:

$$Z_2 = (1 - \delta) S_1 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

³Webbink, et al. (2012) analysed the time-distribution of girl and boy child in household chores for 16 African and Asian countries. They found that girls are more involved in household work than boys. According to Allais (2009), twice as many girls as boys do household chores for more than 28 hours a week. Similar findings were reported Bonke (2010) and Evans & Skovdal (2015). This is because in many cultures girls' work in household chores is considered as good preparation for their marriage (Huisman & Smits, 2009). Kinship is identified as the other reason behind large participation of girls in household chores (Bass, 2004; Kambhampati & Rajan, 2008).

⁴Here we assume that saving earns no interest and serves in period 2 to allow for consumption and other expenses. The assumption simplifies algebra; however, incorporation of interest income from savings in the presence of perfect credit market will have only quantitative implication and no qualitative variation. There exist another interesting possibility of credit market imperfection and borrowing constraint which has substantial implication for those families who borrow from moneylender to pay for dowry and daughter's education. However, this is beyond the scope of the objective of this paper and is left for future research.

⁵The parameter ' k ' is the social stigma in the form of social norms associated with dowry payment by the bride's family under the cover of socio-cultural justification.

⁶' δ ' can also be interpreted as willingness to offer dowry by the bride's family.

⁷Alternatively, it can be explained as compensation from the bride's family that will ensure social parity (matching) between the groom and the bride, whenever, $\left(\frac{W_M^S}{W_F^S l_F^S} \right) > 1$.

Thus, the amount of dowry offered by the bride's family is:

$$D_s = \delta S_1 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

The family chooses the optimal level of saving that solves the following problem

$$\begin{aligned} \text{Max, } U &= \log Z_1 + \beta \log Z_2 \\ \{Z_1, Z_2, S_1\} \end{aligned}$$

subject to, $Z_1 + S_1 = W_0 + W_F - (W_F + b - s)l_F^S$

$$Z_2 = (1 - \delta)S_1$$

$$l_F^U + l_F^S = 1$$

Optimisation yields the following savings function⁸

$$S_1^* = \frac{\beta}{1 + \beta} \{W_0 + (s - b - W_F)l_F^S + W_F\} \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

Lemma 1: $S_1^* \geq 0$ in $l_F^{S*} \in (0, 1]$ provided $W_0 \geq b - s > 0$.

Thus, substituting Equation (5) in (4) we obtain the dowry supply function that is given by

$$D_s = k \frac{W_M^S}{W_F^S l_F^S} \left(\frac{\beta}{1 + \beta} \right) \{W_0 + (s - b - W_F)l_F^S + W_F\} \quad \dots \quad \dots \quad \dots \quad (6)$$

The dowry supply function has the following properties,

- (i) $\frac{\partial D_s}{\partial l_F^S} = - \frac{k \beta W_M^S (W_0 + W_F)}{(1 + \beta) W_F^S (l_F^S)^2} < 0$
- (ii) $\frac{\partial D_s}{\partial W_F^S} = - \frac{k \beta W_M^S \{W_0 + W_F + (s - b - W_F)l_F^S\}}{(1 + \beta) (W_F^S l_F^S)^2} < 0$
- (iii) $\frac{\partial D_s}{\partial W_0} = \frac{k \beta W_M^S}{(1 + \beta) W_F^S} > 0$
- (iv) $\frac{\partial D_s}{\partial k} = \frac{\beta W_M^S \{W_0 + W_F + (s - b - W_F)l_F^S\}}{(1 + \beta) W_F^S l_F^S} > 0$
- (v) $\frac{\partial D_s}{\partial W_M^S} = \frac{k \beta \{W_0 + W_F + (s - b - W_F)l_F^S\}}{(1 + \beta) W_F^S (l_F^S)^2} > 0$

⁸The second-order sufficient condition is guaranteed by the following

$$\frac{\partial^2 U}{\partial S_1^2} = - \left[\frac{1}{\{W_0 + W_F - (W_F + b - s)l_F^S - S_1\}^2} + \frac{\beta}{S_1^2} \right] < 0$$

$$\begin{aligned}
\text{(vi)} \quad & \frac{\partial D_s}{\partial W_F} = \frac{k\beta W_M^S (1-l_F^S)}{(1+\beta)W_F^S l_F^S} > 0 \\
\text{(vii)} \quad & \frac{\partial D_s}{\partial s} = \frac{k\beta W_M^S}{(1+\beta)W_F^S} > 0
\end{aligned}$$

The intuition behind the properties (i)–(vi) are elucidated as follows. An increase in the potential bride’s skill (education) level or a hike in the female skilled wage rate improves the social status of her family relative to the potential groom’s family, thus, they are less willing to offer dowry as compensation towards achieving social parity. A higher level of the bride’s guardian (parent) income (W_0) improves the family’s economic status. Thus, they could afford to offer a higher amount of dowry, *ceteris paribus*. On the other hand, more stringent social norms associated with dowry payment compel the bride’s family to offer more dowry.⁹ A higher level of the groom’s wage rate (W_M^S) lowers the relative social status of the potential bride’s family and leads to a higher amount of dowry offer that could compensate for the loss in the social status of the bride’s family relative to the groom’s family. Finally, families could accumulate more savings in period 1 if unskilled female child wage (W_F) is high which could be used to finance a higher amount of dowry while she gets married in period 2.

2.2. The Groom’s Family

The representative groom’s family maximises the intertemporal utility which is a positive function of consumption $\{\tilde{Z}_i\}_{i=1}^2$ discounted by the time impatience factor $\tilde{\beta} \in (0,1)$ and social discount factor $(1-\lambda l_F^S)$, where $\lambda \in [0,1)$ is the groom family’s degree of aversion towards the bride’s labour market participation.¹⁰ This is represented by the following utility function:

$$V = \log \tilde{Z}_1 + \tilde{\beta}(1-\lambda l_F^S) \log \tilde{Z}_2 \quad ; \quad \tilde{Z}_1, \tilde{Z}_2 > 1 \quad ; \quad \frac{\partial V}{\partial \tilde{Z}_i} \equiv V_i > 0 \quad \forall i \quad \dots \quad \dots \quad (7)$$

In period 1, the guardian spends his entire time (1 unit of time) in wage-earning activities, while the male child is entirely engaged in acquiring skills (education).¹¹ There is no

⁹It follows from property (iii) and (iv) that economic and social heterogeneity coexist across the bride families, respectively. Families with a higher W_0 has a high economic status relative to those families with a lower W_0 . In the similar fashion, a higher value of k implies “bigoted” families compared to “liberal” families with lower value of k .

¹⁰In the Time Use Survey (TUS), 2019, conducted by the NSSO (MOSPI, Govt. of India) it was found that women spend 300 more minutes on unpaid household chores than men and 480 minutes of women work relative to men are not counted as work and thus remain unpaid (Mitra & Sinha, 2021; Mahata, et al. 2022). This reveals that in such gendered society, females are usually burdened with household tasks unlike their male counterpart. Many cultures do not encourage girls to pursue education because they are expected to grow up to be housewives, which the groom’s family values (Huisman & Smits, 2009).

¹¹In reference to evidences cited in footnote 11, we simplify the groom’s family utility by assuming away the possibility of male child labour.

male-specific education subsidy, however, a cost of education ($Q > 0$) is incurred by the household.¹² Thus, period 1 consumption is determined by the following equation:

$$\tilde{Z}_1 = \tilde{W}_0 - Q \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (8)$$

where, \tilde{W}_0 is the income earned by the guardian in period 1. Unlike the bride's family, the groom's family do not save due to the presence of three primary income sources in period 2, i.e., income from a skilled adult male, the bride's income from skilled jobs, and the dowry transfer from the bride's family to the groom's family.¹³ In period 2, the guardian retires and earns nothing, while the male child grows up to be an adult member (potential groom) and participates in a skilled wage-earning activity, earning W_M^S . In this period, the potential groom gets married, and the skilled income of the bride ($W_F^S l_F^S$) entirely becomes a part of the groom's family income.¹⁴ The other additional source of income is from the dowry transferred by the bride's family to the groom's family. Thus, this period's consumption is constrained by the following equation

$$\tilde{Z}_2 = QW_M^S + W_F^S l_F^S + D_d \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (9)$$

The household's demand for dowry is directly proportional to the cost incurred on the potential groom in period 1 which is given by

$$D_d = \vartheta Q ; \quad \vartheta = \gamma \frac{W_M^S}{W_F^S l_F^S} ; \quad \gamma > 0 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (10)$$

where, γ is the social stigma in the form of social norms associated with the demand for dowry by the groom's family. The household faces a trade-off in terms of the cost component Q . An increase in C would increase the household's present expenditure, thus, lowering consumption in period 1, however, the proportion of C can be recovered in the form of dowry in period 2. Thus, the groom's household's optimisation problem is stated as

$$\begin{aligned} \text{Max,} \quad V &= \log \tilde{Z}_1 + \tilde{\beta}(1 - \lambda l_F^S) \log \tilde{Z}_2 \\ &\{\tilde{Z}_1, \tilde{Z}_2, Q\} \end{aligned}$$

subject to, $\tilde{Z}_1 = \tilde{W}_0 - Q$

¹²The variable Q can be thought as not only representing cost of education, but aggregate of all other cost incurred on the male child such that he can participate in economic activity and possess all other characteristics to get married. Basically, Q represents investment in male child to get him a perfect match, otherwise, no girl would like to marry a below average skilled male without desired social characteristics.

¹³In this framework in absence of future uncertainty or interest income, savings is assumed to be necessary rather than precautionary or luxury. Given this assumption the bride's family saves in period 1 to consume in period 2 in absence of any income. On the other hand, the groom's family has multiple sources of income in period 2 to afford consumption, thus savings is not a necessary.

¹⁴Educated brides are valued more due to her income earning potential besides the advantage of home schooling by mothers as an input in the production of child education as argued by Behrman, et al. (1999). However, in our paper we focus only on the income earning aspect of married female.

$$\tilde{Z}_2 = QW_M^S + W_F^S l_F^S + D_d$$

The solution to the optimisation yields the following dowry demand function¹⁵

$$D_d = \left(\gamma \frac{W_M^S}{W_F^S l_F^S} \right) \left\{ \frac{\tilde{\beta} W_M^S \tilde{W}_0 (\gamma + W_F^S l_F^S) (1 - \lambda l_F^S) - (W_F^S l_F^S)^2}{W_M^S (1 + \tilde{\beta} (1 - \lambda l_F^S)) (\gamma + W_F^S l_F^S)} \right\} \dots \dots \dots (11)$$

The following are the properties of the demand function for dowry.

$$\begin{aligned} \text{(viii)} \quad \frac{\partial D_d}{\partial l_F^S} &= \frac{-\gamma \left[\tilde{\beta}^2 W_M^S \tilde{W}_0 (\gamma + W_F^S l_F^S)^2 (1 - \lambda l_F^S)^2 + \tilde{\beta} \left\{ \lambda (W_F^S)^3 (l_F^S)^4 + (W_F^S l_F^S)^2 (W_M^S \tilde{W}_0 + \gamma) (l_F^S)^2 + 2\gamma W_M^S \tilde{W}_0 W_F^S l_F^S + \gamma^2 W_M^S \tilde{W}_0 \right\} + \gamma (W_F^S l_F^S)^2 \right]}{W_F^S (l_F^S)^2 (\gamma + W_F^S l_F^S)^2 \{1 + \tilde{\beta} (1 - \lambda l_F^S)\}^2} < 0 \\ \text{(ix)} \quad \frac{\partial D_d}{\partial W_F^S} &= - \left[\frac{\mathcal{G} W_F^S (l_F^S)^2 (2\gamma + W_F^S l_F^S)}{W_M^S (1 + \tilde{\beta} (1 - \lambda l_F^S)) (\gamma + W_F^S l_F^S)^2} + \frac{\gamma W_M^S}{(W_F^S)^2 l_F^S} \right] < 0 \\ \text{(x)} \quad \frac{\partial D_d}{\partial W_M^S} &= \frac{\tilde{\beta} \tilde{W}_0 \gamma (1 - \lambda l_F^S)}{W_F^S l_F^S \{1 + \tilde{\beta} (1 - \lambda l_F^S)\}} > 0 \\ \text{(xi)} \quad \frac{\partial D_d}{\partial \tilde{W}_0} &= \frac{\gamma W_M^S \tilde{\beta} (1 - \lambda l_F^S)}{W_F^S l_F^S (1 + \tilde{\beta} (1 - \lambda l_F^S))} > 0 \\ \text{(xii)} \quad \frac{\partial D_d}{\partial \lambda} &= - \frac{\gamma \tilde{\beta} \left\{ W_M^S \tilde{W}_0 (W_F^S l_F^S + \gamma) + (W_F^S l_F^S)^2 \right\}}{W_F^S (\gamma + W_F^S l_F^S) (1 + \tilde{\beta} (1 - \lambda l_F^S))^2} < 0 \\ \text{(xiii)} \quad \frac{\partial D_d}{\partial \gamma} &= \left[\frac{W_M^S}{W_F^S l_F^S} + \frac{\mathcal{G} (W_F^S l_F^S)^2}{W_M^S \{1 + \tilde{\beta} (1 - \lambda l_F^S)\} (W_F^S l_F^S + \gamma)^2} \right] > 0 \end{aligned}$$

An increase in the bride's level of education (skill) or a higher W_F^S improves the earning potential of the bride, thus consumption in period 2 can be more easily sustained by this increment in the bride's income and the need for dowry to cover the cost now becomes less. On the other hand, a higher level of W_M^S or \tilde{W}_0 escalates the demand for dowry owing to an increase in relative status (9) and a rise in investment in the groom (Q) in period 1, respectively. Finally, a higher degree of aversion towards the bride's labour market participation accentuates the social discount factor that shifts the consumption in favour of period 1. Thus, to increase consumption in period 1 the household lowers the expenditure on the groom that lead to a fall in the demand for dowry.¹⁶

¹⁵The second-order sufficient condition is guaranteed by the following

$$\frac{\partial^2 V}{\partial Q^2} = - \left\{ \frac{1}{(\tilde{W}_0 - Q)^2} + \frac{\tilde{\beta} (1 - \lambda l_F^S) \left(W_M^S + \frac{\gamma W_M^S}{W_F^S l_F^S} \right)^2}{\left(Q W_M^S + W_F^S l_F^S + \frac{\gamma W_M^S Q}{W_F^S l_F^S} \right)^2} \right\} < 0$$

¹⁶The economic and social heterogeneity for the groom's family follows from the properties (xi)-(xiii). The similar type of heterogeneity has been explained in details in footnote 6 in the context of bride's family.

3. EQUILIBRIUM DOWRY AND BRIDE'S EDUCATION

Let U' and V' represent the utility of the bride's and groom's families if they remain unmarried, respectively. In this case, the bride's family saves the cost of dowry payment and retains the unmarried girl's income in period 2. On the other hand, this imposes a social humiliation cost (denoted by \bar{R}) on the bride's family.¹⁷ In this case, the bride's family will gain a positive pay-off from the marriage of the girl, if U is greater than U' for a sufficiently higher value of \bar{R} . Similarly, $V > V'$ implies a positive pay-off from marriage for the groom's family.

Definition 1: Matching between bride and groom is feasible in period 2, if and only if,

$$D_S = D_D = D^* \text{ such that } D^* \in (0, \infty) \text{ and } \bar{R} > (U' - U)$$

The equilibrium level of dowry (D^*) and bride's education (l_F^{S*}) are obtained by solving Equations (6) and (11) simultaneously. It follows from Equations (6) and (11) that $\lim(D_S) \rightarrow \infty$ as $l_F^S \rightarrow 0$ and $\lim(D_D) \rightarrow \infty$ as $l_F^S \rightarrow 0$, thus, $l_F^{S*} = 0$ cannot be a plausible solution. However, for a sufficiently small value of l_F^S there exist a positive finite equilibrium amount of dowry which is sufficiently large. Thus, the following lemmas are immediate.

Lemma 2: $l_F^{S*} \in (0, 1]$ and $D^* \geq 0$ provided the following sufficient condition

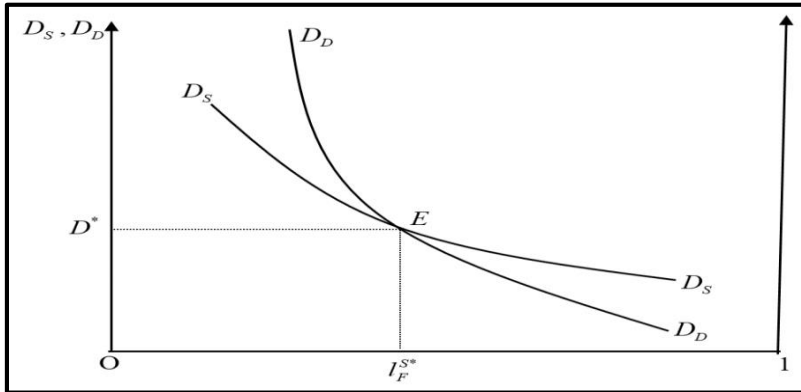
$$W_0 \geq b - s > 0$$

$$(W_F^S)^2 \geq \tilde{\beta}(1 - \lambda)W_M^S \tilde{W}_0(\gamma + W_F^S)$$

Lemma 3: $|l_F^{S*} - 0| < \varepsilon$ for some small $\varepsilon > 0$ ($\varepsilon \approx 0$), $D^* \gg 0$.

Given Lemma 2 and Lemma 3, we provide a diagrammatic representation of the bride's family's offer of dowry and the groom's family's demand for dowry.

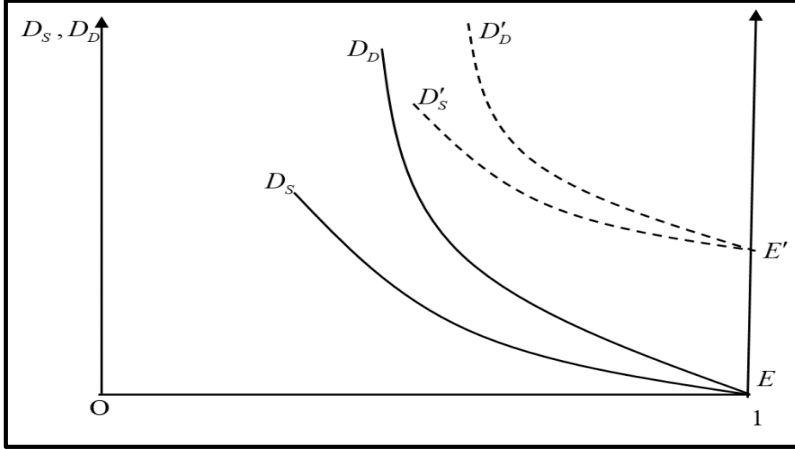
Fig. 1. Determination of Equilibrium Dowry and Bride's Education



¹⁷In countries like India, families having unmarried girl are stigmised by the society based on traditional social norms which leads to “family shaming”. This imposes a social humiliation cost on such families.

Figure (1) plots the relationship between the amount of dowry and the bride's education for the respective bride and groom family using Equations (6) and (11), respectively. Using properties (i) and (vii) we obtain a negatively sloped dowry offer curve ($D_S D_S$) and dowry demand curve ($D_D D_D$), respectively. The interior equilibrium is obtained at point E that corresponds to the level of (l_F^{S*}, D^*) .¹⁸

Fig. 2. Two Possible Equilibria



It follows from lemma 2 that there exist two possible extreme cases which are depicted in Figure (2). Equilibrium at point E is a *socially desirable equilibrium* at which the bride possesses the maximum level of education and dowry ceases to exist even though social norms persist. On the other hand, equilibrium at point E' is characterised by a higher level of dowry even if the bride possesses the maximum level of education.

4. COMPARATIVE STATICS

The incidence of dowry and female education can be attributed to socio-cultural factors, economic factors, religious factors, regional factors, and biological factors. This section deals specifically with the socio-cultural factors in terms of heterogeneity in social norms, economic factors in terms of class, gender-wage disparity, and unemployment.

4.1. Socio-cultural Factors

Society's perspective towards the ubiquitous practice of dowry custom is both heterogeneous and inconsistent. Families with a higher inclination towards the exchange

¹⁸ The stability of the equilibrium requires the dowry demand curve ($D_D D_D$) to be steeper than the dowry offer curve ($D_S D_S$). The following is the intuitive explanation. The excess demand for dowry is defined as, $ED(l_F^S) = D_d(l_F^S) - D_s(l_F^S)$. For any lower level of $l_F^S (< l_F^{S*})$, there exist excess demand for dowry ($ED > 0$) such that l_F^S begins to adjust towards the rightward direction which causes both D_D and D_S to fall. For $ED \rightarrow 0$,

D_D must fall at a higher rate than D_S [i.e., $\left| \frac{\partial D_d}{\partial l_F^S} \right| > \left| \frac{\partial D_s}{\partial l_F^S} \right|$].

of dowry have a high value of the parameter k on the bride's side or a high value of the parameter γ on the groom's side. A high value of k (high γ) leads to a higher dowry offer curve (higher dowry demand curve) for some given level of female education.

Fig. 3(a). Heterogeneous Social Norms among the Bride Families

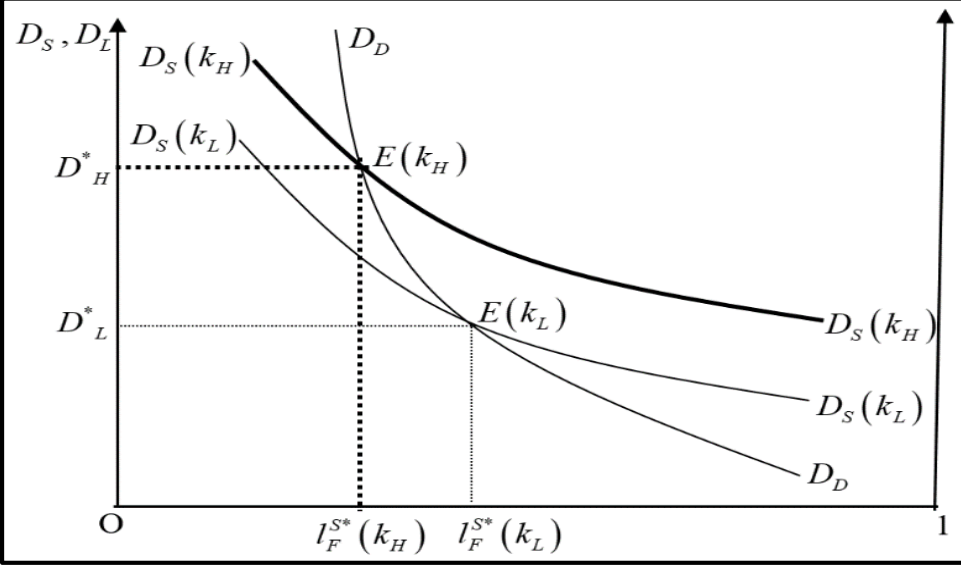
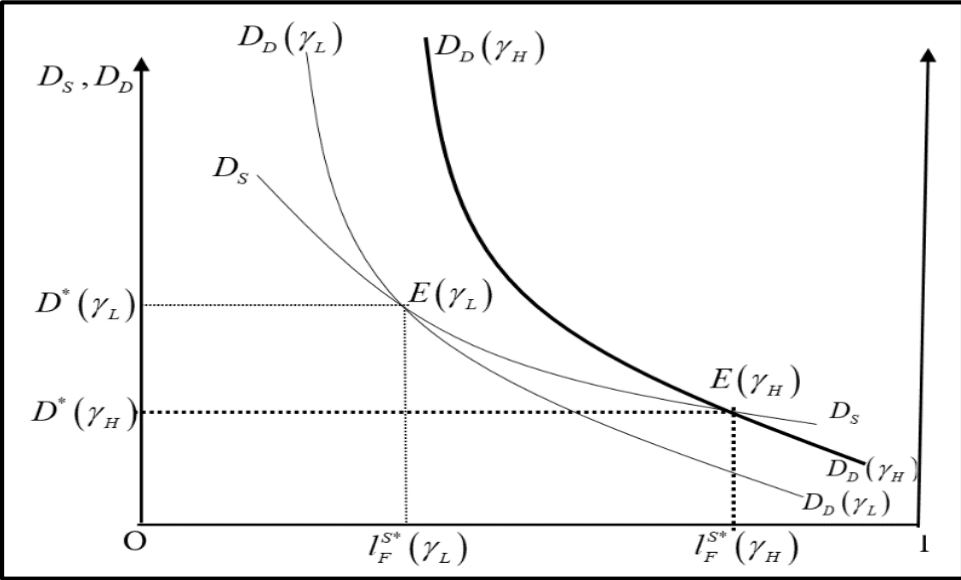


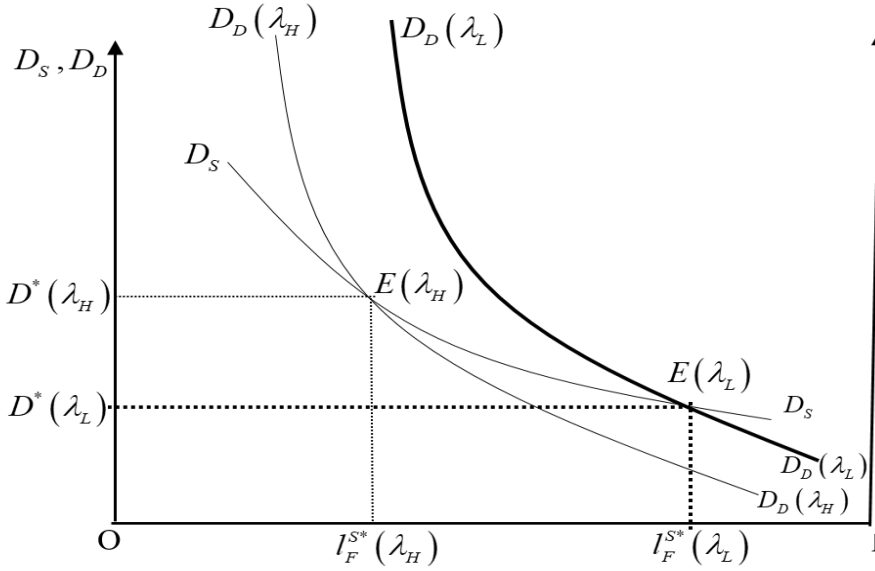
Fig. 3(b). Heterogenous Social Norms among the Groom Families



Bride's family is categorised in terms of $k \in \{k_H, k_L\}$, where $k_H > k_L$ which is represented by the respective dowry offer curve in Figure 3(a). For bigoted families (k_H type) the equilibrium amount of dowry is higher and the level of female education is

lower compared to the liberal families (k_L type). Similarly, the groom's family is categorised in terms of $\gamma \in \{\gamma_H, \gamma_L\}$, where $\gamma_H > \gamma_L$ which is represented by the respective dowry demand curve in Figure 3(b). However, in this case, for the bigoted families (γ_H type) the equilibrium amount of dowry is lower and the level of female education is higher compared to the liberal families (γ_L type). This seemingly counterintuitive result can be explained as follows. The demand for dowry is higher for γ_H type families relative to γ_L type, in response to this excess demand for dowry the bride's family is incentivised to increase the bride's level of education such that the equilibrium converges to a lower amount of dowry $D^*(\gamma_H)$ relative to $D^*(\gamma_L)$.¹⁹

Fig. 4. Heterogeneity in Aversion Towards Bride's Labour Market Participation among the Groom's Families



The aversion towards the bride's labour market participation skipping the household works is subjectively valued by the groom's family which is the source of heterogeneity that can be observed across different societies or regions. This subjective nature of the groom's family is indexed by the parameter $\lambda \in \{\lambda_H, \lambda_L\}$, where $\lambda_H > \lambda_L$. Figure 4 depicts that conservative families (λ_H) have a lower demand for dowry compared to families with a liberal attitude towards the bride's labour market engagement (λ_L). This leads to a counterproductive outcome in terms of higher (lower) equilibrium amount of dowry ($D^*(\lambda_H)$ for the former (latter) type and lower (higher) bride's equilibrium level of education, respectively. The following proposition summarises the results.

Proposition 1: Social heterogeneity in terms of (i) higher k leads to higher equilibrium amount of dowry and lower-level bride's education, (ii) higher γ leads to

¹⁹ This counterintuitive result is consistent with the stability condition discussed in footnote 11.

lower equilibrium amount of dowry and high level of bride's education, and (iii) higher λ leads to higher equilibrium amount of dowry and lower-level bride's education.

4.2. Economic Status and Gender-based Income Disparity

The custom of the dowry varies with the relative economic status of both bride's and groom's families.

Fig. 5(a). Economic Status of the Groom's Family

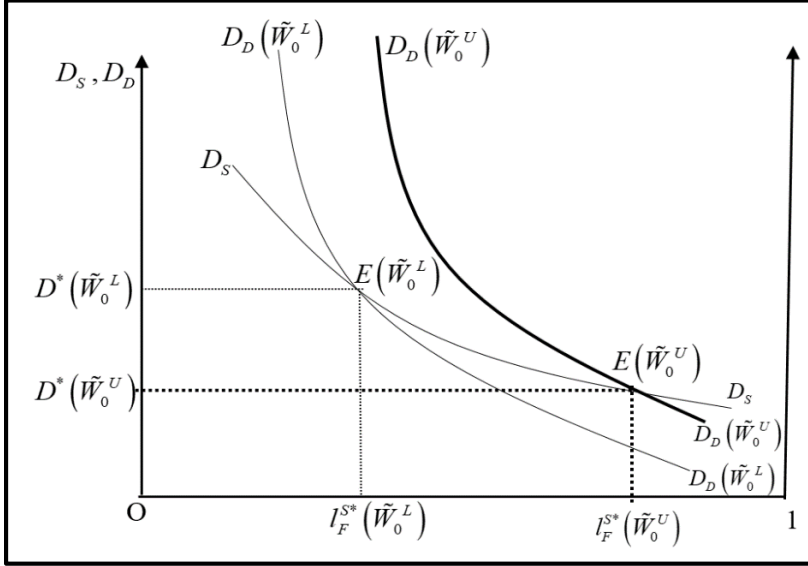
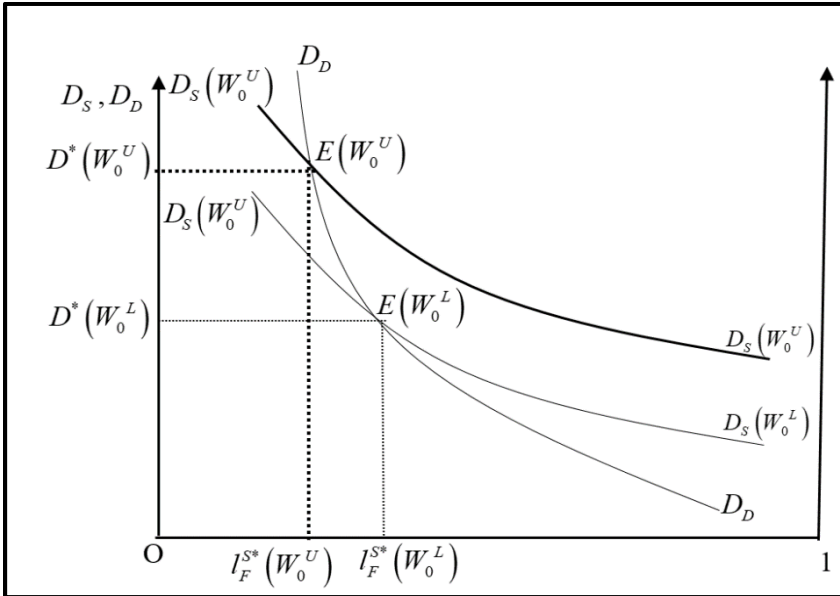
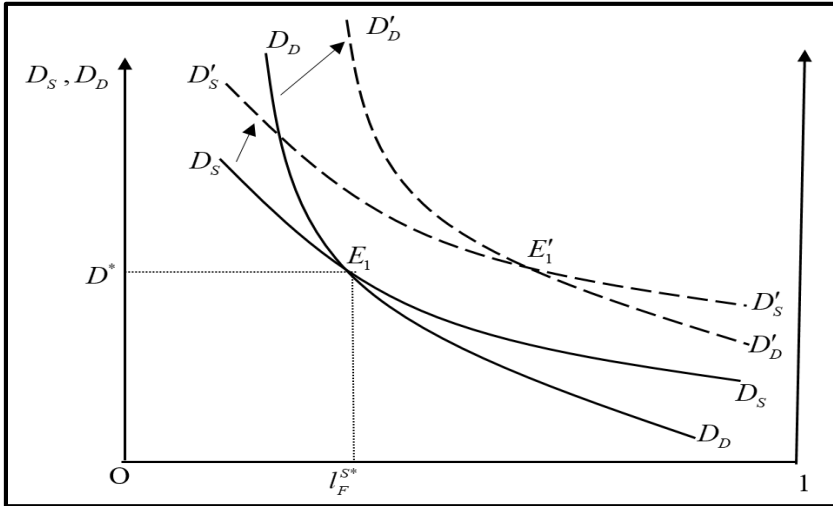


Fig. 5(b). Economic Status of the Bride's Family



It follows from Figure 5 (a) that the equilibrium exchange of dowry is lower while the equilibrium level of bride's education is higher among the groom families with high initial wealth (\tilde{W}_0^U) relative to those with a lower level of wealth (\tilde{W}_0^L). On the other hand, the high economic status of the bride's family (W_0^U) leads to a higher equilibrium exchange of dowry at a cost of a lower level of the bride's education relative to families belonging to lower economic status (W_0^L). This has been shown in Figure 5 (b).

Fig. 6. Increase in Gender-Based Income Disparity



An increase in W_M^S or a fall in W_F^S widens gender-based income disparity implied by an increase in $\frac{W_M^S}{W_F^S}$. This causes an escalation (rightward shift) of both dowry demand and dowry offer curve (Figure 6). The change in the equilibrium amount of dowry and the level of the bride's education hinges on the relative magnitude of shift of both $D_D D_D$ and $D_S D_S$ curve. Among several possible equilibria, there exists an equilibrium at which the equilibrium amount of dowry falls and the level of the bride's education improves whenever the shift in $D_D D_D$ curve dominates the shift in $D_S D_S$ curve. The following proposition is immediate.

Proposition 2: *Examining the economic factors, it is obtained that (i) the practice of dowry is higher among the well-off bride's families while it is lower for the groom's families belonging to higher economic class and the equilibrium level of education is lower (higher) for the former (latter), (ii) a higher level of gender-based income disparity may lead to lower equilibrium exchange of dowry while the equilibrium level of bride's education improves under some sufficient conditions.*

4.3. Unemployment

The labour market in developing nations is distorted by the presence of both male and female unemployment. This causes variation in the willingness to offer dowry,

$\delta = k \left(\frac{W_M^S(1-u_M)}{W_F^S l_F^S(1-u_F)} \right)$ and propensity to demand dowry, $\vartheta = \gamma \left(\frac{W_M^S(1-u_M)}{W_F^S l_F^S(1-u_F)} \right)$, where,

u_M and u_F is the male and female unemployment rate defined on the interval $[0,1]$, respectively. It also lowers the consumption of the groom's family in period 2 i.e., $Z_2 = CW_M^S(1-u_M) + W_F^S l_F^S(1-u_F) + D_d$.

Thus, optimisation in presence of male and female unemployment yields the following dowry offer and dowry demand, respectively.

$$D_s = k \frac{W_M^S(1-u_M)}{W_F^S l_F^S(1-u_F)} \left(\frac{\beta}{1+\beta} \right) \{W_0 + (s-b-W_F)l_F^S + W_F\} \dots \dots \dots (12)$$

$$D_d = \frac{\tilde{\beta} \{ \lambda + \gamma^2 + (W_F^S(1-u_F) + \gamma \lambda) l_F^S \} W_M^S \tilde{W}_0(1-u_M) - (W_F^S l_F^S(1-u_F))^2}{W_F^S l_F^S(1-u_F) (1 + \tilde{\beta} (1 - \lambda l_F^S)) (\gamma + W_F^S l_F^S(1-u_F))} \dots (13)$$

The additional properties related to unemployment are as follows.

$$(xiv) \quad \frac{\partial D_s}{\partial u_M} = - \frac{k \beta W_M^S \{W_0 + W_F + (s-b-W_F)l_F^S\}}{W_F^S l_F^S(1+ \beta)(1-u_F)} < 0$$

$$(xv) \quad \frac{\partial D_s}{\partial u_F} = \frac{k \beta W_M^S(1-u_M) \{W_0 + W_F + (s-b-W_F)l_F^S\}}{W_F^S l_F^S(1+ \beta)(1-u_F)^2} > 0$$

$$(xvi) \quad \frac{\partial D_d}{\partial u_M} = - \frac{\tilde{\beta} W_M^S \tilde{W}_0 \gamma (1 - \lambda l_F^S)}{W_F^S l_F^S(1-u_F) \{1 + \tilde{\beta} (1 - \lambda l_F^S)\}} < 0$$

$$(xvii) \quad \frac{\partial D_d}{\partial u_F} = \left[\frac{\vartheta (W_F^S l_F^S)^2 (1-u_F) \{W_F^S l_F^S(1-u_F) + 2\gamma\}}{W_M^S(1-u_M) \{1 + \tilde{\beta} (1 - \lambda l_F^S)\} \{W_F^S l_F^S(1-u_F) + \gamma\}^2} + \frac{C \gamma W_M^S(1-u_M)}{W_F^S l_F^S(1-u_F)^2} \right] > 0$$

An increase in male (female) unemployment lowers (elevates) both the willingness to offer dowry by the bride's family and the propensity to demand dowry by the groom's family.

For, $u_F, u_M \in (0,1)$, if $\Delta u_F > 0 > \Delta u_M$ then both the parameters δ and ϑ will be higher that causes a rightward shift in both $D_D D_D$ and $D_S D_S$ curve. The final change in equilibrium values hinges on the relative magnitude of the shift. If the shift in $D_S D_S$ curve dominates the shift in $D_D D_D$ curve, then the equilibrium amount of dowry increases while the effect on the bride's education remains ambiguous. On the other hand, if $\Delta u_M > 0 > \Delta u_F$ then both the parameters δ and ϑ will be higher that causes a leftward shift in both $D_D D_D$ and $D_S D_S$ curve. If the shift in $D_S D_S$ curve dominates the shift in $D_D D_D$ curve, the equilibrium amount of dowry plummets while the effect on the bride's education remains ambiguous.

Proposition 3: *An increase in female (male) unemployment and decrease in male (female) unemployment may inflate (plummets) the equilibrium exchange of dowry while the effect on the bride's level of education remains ambiguous.*

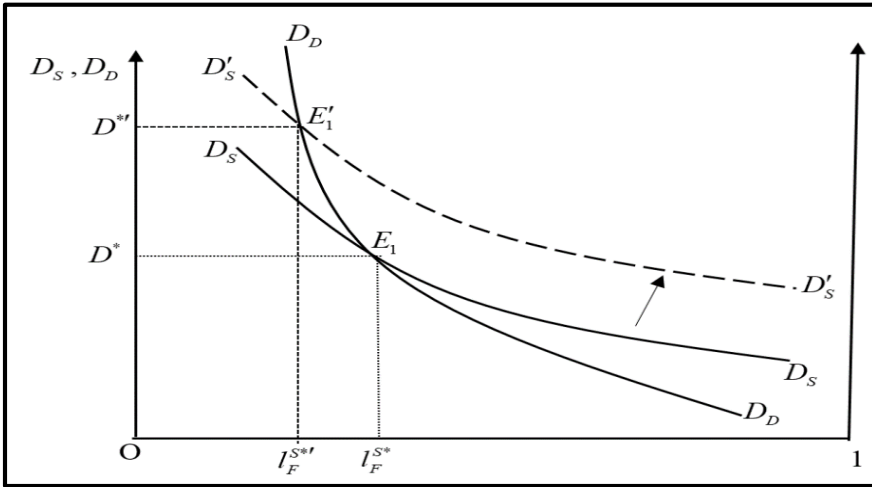
Consider the following extreme possible cases in the labour market: $\{(u_M, u_F)\} = \{(0,1), (1,0), (1,1), (0,0)\}$

First, in the case of full-employment of male and absolute unemployment of female both the $D_D D_D$ and $D_S D_S$ curve becomes vertical such that for any given level of bride's education the equilibrium amount of exchange of dowry could take any positive value provided that both the $D_D D_D$ and $D_S D_S$ curve coincides, or, equilibrium would cease to exist. Second, in the case of full employment of female and absolute unemployment of male, there would be no possible equilibrium since D_S becomes zero and D_D becomes indeterminate. Third, when both males and females are fully unemployed, the solution becomes indeterminate. Finally, the case of full employment of both males and females reduces to the usual case of intermediate equilibrium solution which has already been discussed in the earlier section of the paper.

4.4. Female-specific Education Subsidy Policy

The government in developing nations attempts to employ education subsidies as a policy instrument towards encouraging female education among an economically backward section of society. Conventional wisdom suggests that this policy might have positive influences not only by encouraging female participation in skill acquisition activities but also lowers the incidence of dowry. However, this may turn counterproductive by incentivising the exchange of dowry.²⁰

Fig. 7. Education Subsidy to the Bride's Family



²⁰In India, there are several central and state level programmes to promote female empowerment in general and incentivise female education in particular. For example, “Sukanya Samriddhi Scheme” (Government of India), “Kishori Shakti Yojana” (Government of Odisha), “Ladli Social Security Allowance” (Government of Haryana), “Kanyashree Prakalpa” (Government of West Bengal), “Bhagyalakshmi Scheme” (Government of Karnataka) and “Rupashree Prakalpa” (Government of West Bengal) etc. among many others. Bride families has the opportunity to divert the amount of cash subsidy towards payment of dowry and other marriage related expenditures. For instance, in the case of “Bhagyalakshmi Scheme” 76.7 percent of beneficiaries used the money for marriage purpose (Prabhu, 2020). Or in the case of “Rupashree Prakalpa” a grant of Rs. 25000 is provided to the economically backward families for marriage expenditures which may aggravate the problem of dowry.

An increase in education subsidy lowers the net opportunity cost of schooling, thus for any given level of the bride's education, the dowry offer curve shifts rightward from D_sD_s to $D'_sD'_s$ (Figure 7) that leads to an increase in the equilibrium amount of dowry exchange and a lower level bride's education. This paradoxical outcome can be offered in the following explanation. The bride's family uses a subsidy in the form of cash to finance the dowry instead of investing in the bride's education or skill acquisition.²¹ The following proposition is immediate.

Proposition 4: *Subsidised education for the girl child and specifically targeted programmes for gender empowerment aggravate the incidence of dowry and lower the level of female education.*

5. CONCLUSION

The literature on dowry in general and gender studies, in particular, has constituted the core of analytical study and empirical investigation and has been one of the significant pillars of socio-economic and cultural action for the freedom of women and gender empowerment. However, methodologically this paper is a neo-classical exercise to reflect on the socially reinforcing relation between men and women, post-payment of dowry and marriage. The paper is a question-mongering exercise in the sense that we attempt to explain the incidence of dowry and suggest policy measures in a given socio-cultural context. Given this backdrop, the paper makes an analytical attempt to explore certain economic aspects of the choice of female education and the prevalence of dowry. In so doing, a model based on intertemporal utility maximisation is developed for both the representative bride's and groom's families. The bride's family offers dowry which is conditioned by the bride's skill level, and on the other hand, how the groom's family demands the amount of dowry, which is contingent on the level of expenditure on the groom before reaching his adulthood financed by his guardian (assuming that the net benefit is positive), and what a bride can earn in the labour market. Thus the paper attempts to capture the interface between gender studies and the economics of the labour market.

The effects of various economic policies and implications of socio-cultural norms have been analysed, suggesting many interesting avenues for future research. First, socially conservative bride families are inclined towards higher dowry payment at the time of marriage, which dissuades the bride from skill acquisition. On the other hand, the bride's education is relatively higher when conservative groom families have a high penchant for dowry. This counterintuitive result can be explained due to the bride's family's attempt to bring down the amount of dowry by imparting a high level of education to the daughter. A high inclination of the groom's family towards the bride's household work results in a higher exchange of dowry and a lower level of the bride's education. Second, the practice of dowry is higher among the wealthier bride families while it is lower for the wealthier groom families, and the level of the bride's education is lower (higher) for the former (latter). Second, the effect of gender-based income disparity on the amount of dowry and the bride's level of education remains ambiguous and hinges

²¹In comparison to cash subsidy, a kind subsidy could be more effective to curb the practice of dowry and promote female education. This is because a high transaction cost is associated with the conversion of kind subsidy into cash subsidy.

on the relative strength of demand-supply. Third, an increase in female (male) unemployment may inflate (plummet) the equilibrium exchange of dowry. Finally, it is obtained that subsidised education for the girl child and specifically targeted programme for gender empowerment may aggravate the incidence of dowry.

The model is based on the neoclassical theory of optimisation. Accordingly, the model does not intend to address complex issues of capabilities intertwined with ethnic groups, family structure, and religion. This is one of the main limitations of this paper. However, these issues will give scope for future research.

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