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Essays on Human Capital

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DISSERTATION

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Dedication

For Shikha, the only woman who gave me the audacity to call her "Maa."

For Gobinda, an extraordinary father, who still owes me a Christmas tree.

For all my teachers, who participated in this wonderful journey of mine.

For all my students, who e-mailed me late night asking why elasticity for Q.5 is -0.7?

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… and Albuquerque, New Mexico

a different USA within the USA, where I stayed for almost six years.

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Abstract

The first essay: Agriculture in Nepal is the most critical sector for economic growth – it directly benefits the poor, and a considerable proportion of the population derives their livelihoods from agriculture. This essay uses the 2017–2018 baseline survey data from Nepal Seed and Fertilizer (NSAF) project funded through the USAID's "Feed the Future" program. The essay explores a causal relationship between agronomical knowledge and productivity-enhancing farming decisions. Evidence indicates that there are significant, consistent, and positive returns to agronomical knowledge via engaging in advisory contact through traditional agricultural extension. Given the drawback of the institutional irregularity of advisory services, the essay proposes a modern approach

aiming at environmental sustainability and resiliency – such as, silicon valley solutions, e.g., a two-way IVR advisory system, can be initiated.

The second essay: Being from backward castes or classes, as well as being a Muslim, in India is associated with institutional discrimination that has economic costs. Using the 2011–2012 National Sample Survey data, this essay identifies that caste and religion still rule the modern Indian labor market. Results indicate that discrimination is evident in socio-religious earnings gaps. A recent ongoing debate is whether or not to incorporate caste as an identity in global development policies in addition to gender, race, and religion. When castes are inherited identities and mutually exclusive, they can play a significant role in shaping life opportunities. This research suggests that we need to take caste and religious discrimination seriously and address the inequality problem through the Sustainable Development Goals.

The third essay: This essay explores the possible linkages between dotal (dowry-paying) heterosexual marriages and women's educational attainment in India. It adopts an implicit market for marriages and formulates an intra-household mechanism of human capital investment. Using data from the 2006–2009 Rural Economic and Demographic Survey and the 2011–2012 India Human Development Survey, this essay examines the contesting theories of how dowry may affect the educational attainment of women. This essay discusses the role of legislative reforms at the individual and the local government level as well. Evidence from the essay suggests that some policies may not achieve the desired goals but can collect a few debris on the way to a more gender-progressive society.

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The First Essay

Agronomical Knowledge

Abstract

Agriculture in Nepal is the most critical sector for economic growth – it directly benefits the poor, and a considerable proportion of the population derives their livelihoods from agriculture. This essay uses the 2017–2018 baseline survey data from Nepal Seed and Fertilizer (NSAF) project funded through the USAID's "Feed the Future" program. The essay explores a causal relationship between agronomical knowledge and productivity-enhancing farming decisions. Evidence indicates that there are significant, consistent, and positive returns to agronomical knowledge via engaging in advisory contact through traditional agricultural extension. Given the drawback of the institutional irregularity of advisory services, the essay proposes a modern approach aiming at environmental sustainability and resiliency – such as, silicon valley solutions, e.g., a two-way IVR advisory system, can be initiated.

1.1 Introduction

Major South Asian and South-East Asian economies in the 1980s-90s have gone through reforms. Liberalization is one of the fundamentals of economic reform policies. But at the same time, the globalization of agriculture is being exposed to several challenges. There are opportunities to improve their agrarian sector on the one hand, as well as cheap imports from the developed countries. The South Asian countries' potential to intensify the agricultural produce and export is evident as agriculture is one of the labor-intensive sectors. Due to subsidies, mostly in cash crops, South Asian agriculture is experiencing a downturn in technological capacity in staple crops. Agriculture in Nepal is the most critical sector for economic growth- it benefits the poor. So, intensifying production would lead to an increment in agricultural incomes. It can be the key to fighting poverty, as a considerable proportion of the population derives its livelihood from agriculture.

Agricultural diversification in high-value cash crops is recognized as an essential risk-coping strategy. If staple and cash crop diversification are performed appropriately, it can augment farm-level income, employ more people, and conserve the biodiversity of agricultural landscapes (Ramesh Chand, 1996; Ryan and Spencer, 2001). Crop diversification[1] is defined as the farm-level cultivation of a multitude of crops, and this is fundamental to ensure food security (Khoury et al., 2014). It is a challenge to efficiently apply agronomical knowledge on agricultural practices (Tscharntke et al., 2012). The Food and Agricultural Organization (FAO) and the United Nations (UNs) claim that a 70-100 percent of excess demand for food would be witnessed by 2050, as the global population is approaching 8 billion in a few years (Godfray et al., 2010). An increase in crop diversification and

[1] Crop diversification is a subset of agricultural biodiversity, which refers to all possible inter- and intra-groups diversities for wild and domesticated species, plants, and crops – the evolution of which is subjected to natural as well as farmers' selection (Smale et al., 2003).

adoption of hybrid seeds is vital in reducing poverty, hunger, malnutrition, and strengthening capacity for adaptation to climate change (UNs Sustainable Development Goals, 2015).

There is a need to enlarge the scope of access to agricultural inputs, such as high-yielding varieties (HYV) of seeds and fertilizers among the smallholder farmers. It is essential because the smallholder farmers are very reluctant to adopt new technological advances as they feel comfortable with traditional practices. Nepal has the potential to promote advanced technologies in the agrarian sector, in addition to farm-level input subsidies. There are a few public and private investments, including agricultural extension services and micro-credit opportunities. This study investigates the effect of agronomical literacy/knowledge on crop diversification and the adoption of hybrid seeds in rice cultivation – one of the most consumed crops in Nepal.

1.2 A Review of Literature

The idea of diversification can carry different connotations. For example, at the country level, it is found as an inter-sectoral movement of labor resources that leads to a structural transformation of agriculture, industry, and services. But intra-agricultural diversification is meant to be a crop, livestock, and resource shifts: from a small mix of vegetables to a bigger bucket of crops and livestock. And it involves risks, and returns are usually an expected utility type revenue function. Hence, an optimum portfolio of income is necessary to identify. In the context of risk management in developing economies, factors often identified for resource degradation, are poverty, risk, and uncertainty. However, if the underlying assumptions are not explicitly stated, it is difficult to establish the causal links. For example, one of the several possible implications is – the attitude of risk-aversion results in poor/ill management of natural resources. Risk plays a crucial role in deciding the level of agro-biodiversity. Leathers and Quiggin (1991) argue that the

nature of agribusiness risks is a deciding factor for farmers' land allocation. Risk-averse farmers would probably adopt larger scale crop diversification, anticipating the uncertainty, which leads to a diverse agro-ecosystem (Di Falco and Perrings, 2005).

In developing countries, the adoption and diffusion of fertilizer and hybrid seeds have been slow but have increased over time. The literature suggests different theoretical models of a representative farmer's decision to adopt hybrid seeds, advanced technology, and crop diversification. The seminal paper by Feder & Slade (1984) introduces a human capital model with land constraints. The central idea of the model is that farmers with higher educational attainment have more agronomical knowledge, which helps them improve their farming. Typically, these farmers are more likely to switch to hybrid seeds and are more aware of the risk-averse technique of crop diversification. Isham (2002) extends this model by incorporating social capital as a decision variable in accumulating better information, e.g., hybrid adopting neighbors play a crucial part for other farmers. Ghadim & Pannell (1999) also emphasize 'learning by doing' as they argue that social capital sometimes accelerates the adoption of hybrid seeds and technology. Hence, the importance of agronomical knowledge is unputdownable. It is not guaranteed that having access to extension services, access to agro-vets, or access to the agricultural market always leads to a change in perception about adopting hybrid seeds or diversifying crops. We may argue that agronomical knowledge itself can be one of the determinants of farmers' decision/adoption process. And agronomical literacy is gained through years of experience and regional extension services in agriculture, helping to shape perceptions about agriculture's innovation. Hence, it is relevant to identify the causal relationship between agronomical knowledge (through extension services) and farmers' agricultural decisions.

The primary research questions are: does agronomical knowledge positively affect the adoption of (1) hybrid seeds and (2) crop diversification? If yes, does

access and distances to agricultural extension services play a significant role in building agronomical knowledge?

1.3 Source of Data and Descriptive Statistics

The data used in this study were collected through a questionnaire administered by the Nepal Seed and Fertilizer (NSAF) project funded through the United States Agency for International Development (USAID). NSAF is a five-year project (2016-2021) under USAID's Feed the Future umbrella aimed to improve seed and fertilizer value chains in the 20 districts in the Feed the Future Zone of Influence (ZOI). The principal aim of the project is to improve the capacity of both the public and private sectors in their respective roles in the development and dissemination of advanced technologies related to seed and fertilizer. The project also focuses on increasing collaboration between both seed and fertilizer sectors such that the private sector enterprises increasingly rely on government institutions as sources of innovation and knowledge. The public sector recognizes private sector partners as robust conduits for extending knowledge and new technologies.

[Figure 1.1 here]

The NSAF project activities focus on strengthening value chains of 6 target crops (rice, maize, lentil, tomato, cauliflower, and onion) in 25 NASF districts. The activities will aim at integrating best practices (technology packages) from seed and fertilizer components of the project. The project surveyed 13 districts among 25 NSAF districts (see Figure 1.1), and these districts were divided into seven strata. These districts also cover two ecological zones in Nepal, namely Hill and Terai. From these districts, the project collected data from 600 households, 95 Agro-vets, 10 Seed Companies, and 13 District Agricultural Development Offices.

For this study, we have selected only 1,932 individual farmers from the 600 households involved in rice production. Before discussing the methodology

adopted, it is important to see the summary statistics of key variables (see Table 1.1). Our primary outcomes of interests are (1) the number of crops yielded in last year, which is a raw proxy of crop diversification (see Figure 1.2), and (2) the use of hybrid rice seeds. On the other hand, the primary explanatory/dependent variable is an unweighted index of agronomical knowledge (see Supplementary Information 1). The descriptive statistics of outcome and explanatory variables are presented in Table 1.2. It is noteworthy that although the hybrid seed is relatively easy adopting technology; only 33 percent of the rice farmers use the HYV seeds.

[Table 1.1 here]

[Figure 1.2 here]

The most familiar econometric technique in the empirical literature of agronomical decision-making is to model the representative farmer's decision as a latent variable, considering a Probit or Logit regression. On the other hand, a few studies use 'decision' as a selection variable (Croppenstedt & Demeke, 1996). There might be a link between the 'decision' and improved seed varieties, which is recognized by Doss & Morris (2001). They use a two-stage model of fertilizer adoption and maize variety adoption. Many studies link the agricultural extension services with farmers' decisions of technology adoption and profitability. Cawley et al. (2015) discuss biases involved in such estimation to the nexus of extension services and farm-level outcomes. Following the idea, we estimate the count model of the number of crops using Poisson and the binary outcome model for hybrid seed adoption with Logit regression. These are represented in the following system:

$Number\_of\_crops_i = \beta_0 + \beta_1 * agro\_knowledge + X_i'\beta + \varepsilon_i$: Poisson regression

$Use\_of\_hybrid\_seed_i = \beta_0 + \beta_1 * agro\_knowledge + X_i'\beta + \mu_i$: Logit regression

[Table 1.2 here]

1.4 Results

Table 1.3 reports the ordinary least squares and Poisson results for the first model: i.e., agronomical knowledge shapes the crop diversification decision. Also, an exposure variable has been used, which indicates the maximum number of crops cultivated in a single year. From Table 1.3, it is evident that agronomical knowledge is likely to increase the practice of crop diversification. Specifically, a one-unit increment in the knowledge index boosts diversification by 0.13 marginal increase in crop cultivation numbers.

It is to be noted that despite a positive effect of educational attainment on crop diversification (increases by 0.22), as the distance (measured in minutes by walking distance) to agricultural extension center increases, the rate of risk-averse strategy for crop diversification falls. Specifically, one minute of extra walking distance to extension services is likely to reduce the numbers of crop diversification by 0.23. Results for another outcome of interest, i.e., the decision to adopt hybrid seeds, are presented in Table 1.4, which indicates that an additional unit of agronomical knowledge increases the probability of adopting the hybrid rice seeds by 3.33 percentage points. Once again, the distance to extension services is a discouraging factor, resulting in a decline of 14.37 percentage points in the probability of hybrid adoption. Comparing Table 1.3 and Table 1.4, it can be said that while female farmers are more into choosing HYV rice seeds, they are not likely to diversify their crops, unlike the male counterparts.

[Table 1.3 here]

[Table 1.4 here]

This encourages us to inquire whether agronomical knowledge is an endogenous variable. Supplementary results from a control function approach with distance to extension services as the instrumental variable are presented in

Supplementary Information 2. These are preliminary results from (a) exponential conditional mean (ivpoisson) and (b) instrumental probit control function (ivprobit) regressions, and not fully unbiased. We require a more robust control function modeling to redress the potential endogeneity issues.

1.5 Limitations

There are certain limitations to this preliminary study. First, as we have considered only those farmers whose primary crop cultivation is rice, we could not use a standardized crop diversification index as an outcome variable. In the advanced version of this study, we will take all farmers into account, and Shannon's crop diversity index will substitute the number of crops. Here, we will use a 'subsistence' level of crop diversification as an exposure variable. Secondly, the agronomical knowledge index is unweighted based on nine questions asked to the farmers, which needs to be standardized with weights suggested by the literature. Third, farm income could not be controlled due to lack of information but can be proxied by farm expenditure on seed and fertilizer, etc. Furthermore, issues with non-randomness in extension services placement, and robust control function approach are to be considered in the advanced version of this study.

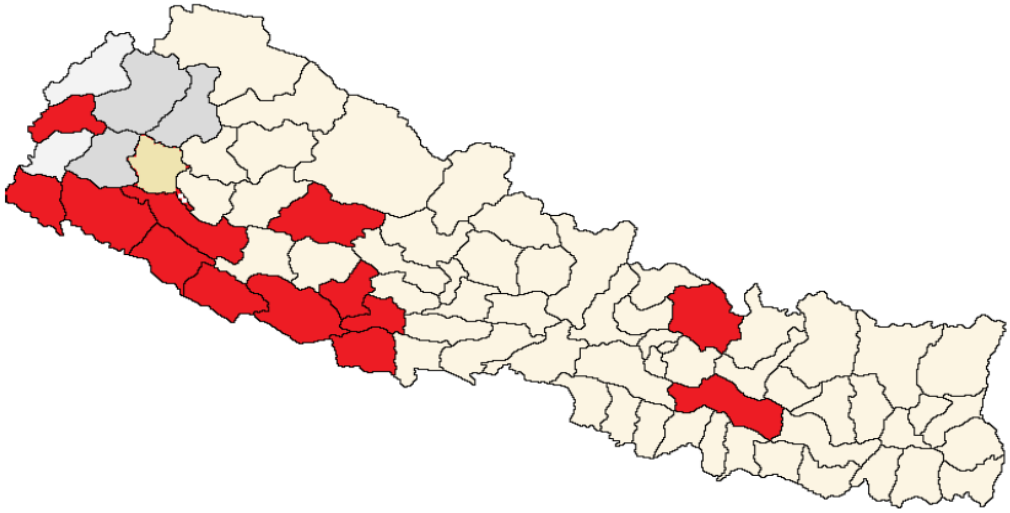
1.6 Concluding Remarks

The study analyzes the state of crop diversification and the adoption of hybrid seeds in Nepal. We found that agronomical literacy has significant and positive effects on both. It is generally seen in South-Asian countries that crop diversification sees a gradual transformation from staple crops to cash crops. Also, cash crops (e.g., coffee, cotton, etc.) have an attractive market value compared to rice. Still, Nepal has shown that agronomical literacy can affect the farmers' perception and adoption decision of staple hybrid and diversification.

There are many equally important concerns for agricultural decision-making. The availability of seed and fertilizers are the main ones. Then the major constraint is the affordability of the same. These are sometimes intertwined with eco-political conditions. Especially, subsidy and price support policies in agricultural development directly overlap with climate concerns, e.g., certain price supports are provided after sudden climate shocks. We may discuss a few policy perspectives from our preliminary results. First, agronomical knowledge is pivotal in the adoption of risk-averse practices and more sophisticated technologies. Thus, a call for the improvement of agronomical education among smallholder farmers is required. It will lead to intensified productivity and revenue gains in the long-run food production of Nepal. Secondly, we should prioritize the issue of land reallocation carefully as it can expand the scope of hybrid adoption, e.g., Operation Barga (land reforms) in West Bengal, India can be seen as a land reform policy on hand. Thirdly, the significance of female farmers reflects the importance of household resources. Improvement in HYV adoption among small farmers should be addressed with resource constraints in female-headed households and micro-credit opportunities.

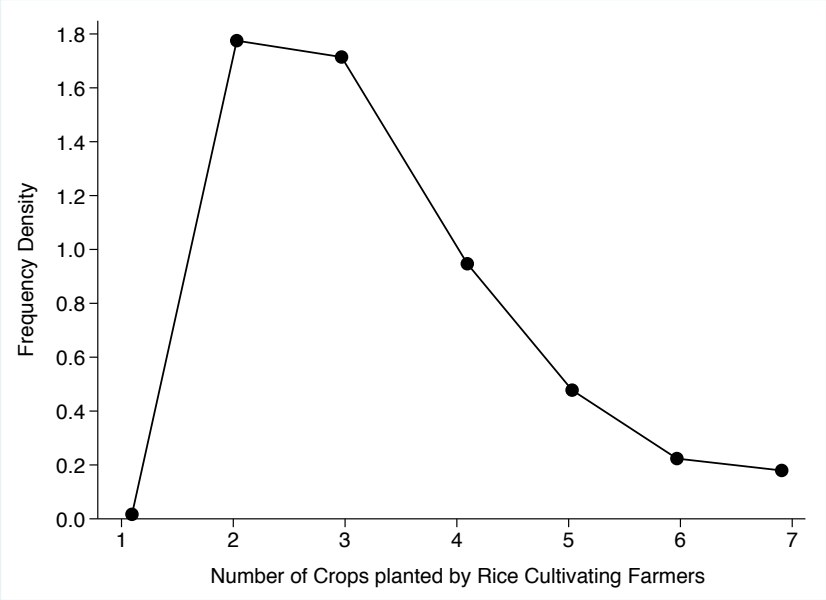
Figures and Tables

Figure 1.1 NSAF Baseline Survey Districts (Red-colored districts)



Source: NSAF Baseline survey, preliminary draft

Figure 1.2 Crop diversification by the number of crops



Source: NSAF data

Table 1.1 Descriptive Statistics of Socioeconomic and Some Selected Variables

Variables	Mean
Age	45.28
Female (%)	47.62
Caste (Base: Other Castes)	
Upper Castes (%)	38.87
Education Level (Base: High School)	
Above High School (%)	29.91
Access to Agro-Vet within 60 minutes of walking distance (%)	92.24
Access to Agri-market within 60 minutes of walking distance (%)	85.97
Access to Agri-extension by walking distance (%)	
Under 30 minutes	57.92
Between 30-60 minutes	25.62
Between 60-120 minutes	10.51
Beyond 120 minutes	5.95
Attendance in Agri-fair in Last 2 Years (%)	10.66
Observations*	1,932

*Source: Authors' calculation from the NSAF data, * Observation for Education level is 1,518*

Table 1.2 Descriptive Statistics of Outcome and Explanatory Variables

Variables	Percentage Share
Use of Hybrid Rice Seeds	33.44
Crop Diversification by Number of Crops	
1	0.31
2	33.28
3	32.14
4	17.75
5	8.95
6	4.19
7	3.36
Agronomical Knowledge Index (0-9 Scale)*	
0	31.68
1	19.25
2	10.14
3	12.58
4	8.44
5	7.30
6	4.24
7	3.62
8	1.19
9	1.55

*Source: Authors' calculation from the NSAF data¸ * See Supplementary Information 1*

Table 1.3 Poisson model for Crop Diversification

	Dependent Variable: Number of Crops				
	(1)	(2)	(3)	(4)	(5)
Variables	OLS	OLS	Poisson	Poisson	Poisson with Exposur
Agronomical Knowledge	0.221***	0.154***	0. 204***	0.1339***	0.1339***
	(0.0142)	(0.0171)	(0.00375)	(0.01468)	(0.0212)
Age		-0.00697***		-0.00677***	-0 0067
		(0.00251)		(0.00247)	(0.0043)
Female		-0.259***		-0.2547***	-0.2547***
		(0.0658)		(0.0633)	(0.0973)
Caste (Base: Other Castes)					
Upper Castes		0.0556		0.0634	0.0634
		(0.0650)		(0.0628)	(0.0979)
Education Level (Base: High School)					
Above High School		0.232***		0.2220***	0.2220**
		(0.0689)		(0.0667)	(0.1039)
Agro-Vet within 60 minutes		0.286***		0.3438***	0.3438
		(0.105)		(0.1037)	(0.2134)
Agri-fair meeting		0.0505		0.0362	0.0362
		(0.110)		(0.0979)	(0.1425)
Constant	2.788***	2.722***	1.036***	0.943***	-1.002***
	(0.0341)	(0.200)	(0.0113)	(0.0653)	(0.116)
Region Fixed Effects	-	*Yes*	-	*Yes*	*Yes*
Observations	1,932	1,518	1,932	1,518	1,518
R-squared/Pseudo R-squared	0.150	0.256	0.039	0.039	0.039
Log Likelihood	-	-	-2560.85	-2560.85	-2560.85

Marginal effects for Poisson regressions, robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from NSAF Data

Table 1.4 Logit model for Adoption of Hybrid Seeds

	Dependent Variable: Use of Hybrid Rice Seed (Yes/No)			
	(1)	(2)	(3)	(4)
Variables	OLS	OLS	Logit	Logit
Agronomical Knowledge	0.0430***	0.0323***	0.0417***	0.0333***
	(0.00482)	(0.00600)	(0.0047)	(0.0062)
Age		0.00277***		0.0031***
		(0.000977)		(0.0010)
Female		0.0403*		0.0461*
		(0.0235)		(0.025)
Caste (Base: Other Castes)				
Upper Castes		-0.205***		-0.2175***
		(0.0228)		(0.0234)
Education Level (Base: High School)				
Above High School		0.000181		-0.0095
		(0.0242)		(0.0268)
Agro-Vet within 60 minutes		-0.0560		0.0475
		(0.0435)		(0.0758)
Agri-fair meeting		0.0566		0.0591
		(0.0425)		(0.0454)
Constant	0.239***	0.329***	-1.134***	-1.499**
	(0.0140)	(0.0849)	(0.0715)	(0.659)
Region Fixed Effects	-	*Yes*	-	*Yes*
Observations	1,932	1,518	1,932	1,518
R-squared/Pseudo R-squared	0.044	0.171	0.039	0.158
Log Pseudolikelihood	-	-	-1189.46	-807.42

Marginal effects for Logit regressions, robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from NSAF Data

Supplementary Information 1

Agronomical Knowledge related Survey Questions

Which of these is not a maize variety?

Arun-2

Manakamana 3

Deuti

Govinda-1

Don’t know

Srijana is a variety of which crop?

Wheat

Cauliflower

Tomato

Rice

Don’t know

Which is generally not true about hybrid seeds?

Are usually more expensive

Are good for saving seeds for subsequent years

Do not generally produce uniform plants and uniform fruits.

Generally need less fertilizer but more water than other improved varieties

Don’t know

Have you seen this symptom in rice plant?

Yes

No

Which is the most likely plant nutrient deficient in the above rice plant?

Nitrogen

Potassium

Phosphorus

Zinc

Don’t know

Have you seen this symptom in maize plant?

Yes

No

What plant nutrient do you think is deficient in the above picture of maize plant?

Nitrogen

Potassium

Phosphorus

Zinc

Don’t know

Have you seen this symptom in maize plant?

Yes

No

What plant nutrient do you think is deficient in the above picture of maize plant?

Nitrogen

Potassium

Phosphorus

Zinc

Don’t know

Supplementary Information 2

Results for Control Function Approach

Control function (ivpoisson GMM) Results for Crop Diversification

	Dependent Variable: Number of Crops		
	(1)	(2)	(3)
Instrumented: Agronomical Knowledge			
Instrument: Distance to Agricultural Extension Services (in Minutes of Walk)			
Variables	30 < t ≤ 60	60 < t ≤ 90	90 < t ≤ 120
Agronomical Knowledge	0.388***	0.389***	0.381***
	(0.0703)	(0.0602)	(0.0562)
Constant	0.764***	0.765***	0.762***
	(0.0616)	(0.0623)	(0.0619)
Region fixed Effects	*Yes*	*Yes*	*Yes*
Observations	1,518	1,518	1,518

Marginal effects, robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from NSAF Data

Control function (ivprobit chi-squared) Results for Adoption of Hybrid Seeds

	Dependent Variable: Use of Hybrid Rice Seed		
	(1)	(2)	(3)
Instrumented: Agronomical Knowledge			
Instrument: Distance to Agricultural Extension Services (in Minutes of Walk)			
Variables	30 < t ≤ 60	60 < t ≤ 90	90 < t ≤ 120
Agronomical Knowledge	0.984***	0.780***	0.919***
	(0.226)	(0.198)	(0.290)
Constant	-1.666***	-1.922***	-1.873***
	(0.417)	(0.359)	(0.395)
Region Fixed effects	*Yes*	*Yes*	*Yes*
Observations	1,518	1,518	1,518

Marginal effects, robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from NSAF Data

The Second Essay

The Cost of Being “Backward”

Abstract

Being from backward castes or classes, as well as being a Muslim, in India is associated with institutional discrimination that has economic costs. Using the 2011–2012 National Sample Survey data, this essay identifies that caste and religion still rule the modern Indian labor market. Results indicate that discrimination is evident in socio-religious earnings gaps. A recent ongoing debate is whether or not to incorporate caste as an identity in global development policies in addition to gender, race, and religion. When castes are inherited identities and mutually exclusive, they can play a significant role in shaping life opportunities. This research suggests that we need to take caste and religious discrimination seriously and address the inequality problem through the Sustainable Development Goals.

2.1 Introduction

Formal analysis of labor market discrimination in economics started with *The Economics of Discrimination* (1957), one of Becker's seminal works. This set up the entry point for social scientists by showing how racial discrimination occurs in a competitive market for labor. Racial discrimination involves two aspects: prejudices towards whites and prejudices against minorities. Becker identified preferences in cross-racial interaction as an aversion behavior (Charles and Guryan, 2008). Sometimes, discrimination is also motivated by occupational segregation over a long period.

Labor is considered a heterogeneous entity whose participants have accumulated a different amount of human capital. This comes from the application of capital theory to labor market decisions and outcomes. The formulation by Friedman and Kuznets (1945), and Mincer (1962) provides a view of the life cycle of earnings, and how it is closely related to periodic investment in human capital. Measuring human capital is an arduous task, but can be proxied with certain indicators such as education and experience. Access to human capital is a major issue in a developing country like India due to its historical pattern of social hierarchy. On top of that, institutional discrimination is a significant factor in deciding labor market outcomes, even with an equal achievement of human capital. Being a reliable and essential indicator of inequality, identifying the earnings gap and its causal factors may lead us to the core of the inequality problem. For India, it is not only race and religion, but also a regressive caste system which is relevant.

To understand the differences in socio-religious groups, we must discuss the role of castes and religions in the Indian society. There are five broader groups of castes among the Hindus, which is the major religion in the country: Brahmin (the priest), Kshatriya (the warrior), Vaishya (the trader), Shudra (the laborer), and Achhut (the "untouchable"). The first three castes form the "High-Caste" Hindu

(HH) group, while Shudras are the "backward" caste Hindus. These four groups consider the "untouchables" as "outsiders" even though they are Hindus. By the Constitution of India, they are now referred to as 'Scheduled Castes (SCs)' and 'Scheduled Tribes (STs)'. In society, these castes are like memberships acquired at birth (Borooah et al., 2014).

It is often argued that caste issues are irrelevant in today's modern India. In a counterargument, we can say that historical inequality in wealth, land, and labor market access is based on castes. Colonial India saw the distribution of land ownership among "higher" castes only. Even though a few land reforms happened in some pockets of independent India, it was only? partly successful. There is no concrete evidence that any convergence happened between "higher" and "lower" castes people. Unfortunately, the rate of wealth growth among "higher" castes is much more than that of "lower" castes. This is a definite hint of continuing caste-based discrimination (Bharti, 2018).

The second major religion in India is Islam. A major section of the Muslims is socially and educationally disadvantaged, and a caste-like occupational hierarchy is seen as well (Krishnan, 2010).

[Figure 2.1 here]

The question of earnings inequality has been the central focus of development studies for a long time. Since Kuznets (1955) proposed the inverted-U hypothesis of economic growth and economic inequality, several empirical studies have been conducted. Most of these studies univocally conclude that India is still on the left side of the inverted-U shape, like other developing countries. Ravallion (2014) argues that from a distance it looks like economic inequality is falling in developing countries. But this is only due to a decrease in inequality between countries. Instead, within-country inequality has been rising for the last two decades. This study sets a new interest among social scientists to further

investigate the issue of earnings inequality. For a developing country like India, the challenge is that equitable growth is intertwined with the maintenance of high economic growth.. To get an overview of India's earnings inequality, we present the percentile shares of total earnings of workers (see Figure 2.1). The bottom 50 percent of the income ladder earns only about 18 percent of total income, whereas the top 10 per-cent earns 36 percent of it. And, 46 percent of the total earnings are shared by the middle 40 percent on the income ladder. This represents how unequal the Indian labor market outcome is.

This study aims to identify whether or not discrimination is one of the major factors shaping unequal labor market outcomes. In order to capture both castes and religions, we form socio-religious groups that are used throughout the essay. Research analyzing inequality and discrimination in India mainly concentrates on gender- and caste-centric poverty. This essay contributes to the literature by considering both castes and religions when studying discrimination.

The essay is organized as follows. Section 2.2 reviews seminal and recent literature. Section 2.3 provides a brief idea about the Indian labor market, presenting the National Sample Survey (NSS) data and descriptive statistics. Section 2.4 talks about the methodologies we adopt. Empirical results are presented and discussed in Section 2.5. And the essay concludes in Section 2.6 with some additional discussion from a policy perspectives.

2.2 A Review of Literature

Most of the earnings gap studies limit their approach by analyzing gender discrimination. But studying caste and religious discrimination is crucial in order to understand a societal structure like that of India. A few studies on India have estimated the poverty gap and linked the same with hierarchic caste distribution. Gang et al. (2002) show that caste discrimination can explain up to 59 percent of the poverty gap between "high" and "low" castes of workers. On the other hand,

Kijima (2006) finds that there exists a significant gap in per capita consumer expenditure across different castes; and almost 50 percent is due to discrimination in the labor market. This gap has remained stagnant over the 'on-the-way to liberalization' period (1983 – 1999) of the Indian economy. Recent findings suggest that overall, earnings inequality has increased over time. Mukherjee and Majumder (2011) show that during the period from 1993 – 2004, spatial- and occupational-level disparities in earnings increased to nearly twice their size, and the role of the entry barrier is evident.

The NSS data show that there is a huge earnings gap among regular salaried urban laborers. Madheswaran and Attewell (2007) find that caste discrimination leads to a 15 percent reduction in earnings for equally qualified vulnerable caste workers. It is alarming that there is a prominent signal of occupational discrimination via an unequal pay structure as set by urban employers. Borooah (2005) argues that one-third of the pay gap is due to caste-based institutional discrimination. It is found that occupational discrimination begins to operate at the initial stage of a job application (Thorat & Attewell, 2007). Deshpande and Newman (2007) suggest that caste, class, family background and networks matter the most in what should be? meritocratic private sector jobs. Hence, hiring practices become less transparent. Borroah (2005) empirically shows that if tribes and other vulnerable castes were paid equally, their poverty level would decrease significantly, even up to 12 percentage points. However, in the informal labor markets, caste discrimination is almost absent (Deininger et al., 2013). The discrimination literature rarely goes into occupational and/or industrial subdivisions and does not discuss the role of religions in the Indian labor market.

Azam (2012) suggests that part of employers' prejudice might indicate past discrimination rather than the current absolute value of discrimination coefficient. The method of estimation is therefore crucial to leave out or take into the likelihood of prejudice. The historical discrimination argument refers to an idea that "socially

backward" caste/class workers have already been deficient in human capital attainment for a long time. Hence, it is difficult to differentiate the endowment and discrimination component in mean-based estimation.

The present study, therefore, adds value on three counts. First, it takes both castes and religions into account. Secondly, it uses the two-digits National Classification of Occupations (NCO) and National Industrial Classification (NIC) in forming matching-based likelihoods. And, finally, the study discusses results using both parametric and nonparametric estimation techniques.

2.3 Source of Data and Descriptive Statistics

This essay uses the 2011-12 employment and unemployment data of NSS – which is a nationally representative household-level survey, considered to be a good source to get information on a worker's earnings, demographic and household characteristics, accumulated human capital, occupation, industry, and other job-specific characteristics. The main variable of interest is the difference in (log of) earnings across different socio-religious groups.

The caste system in India is complex and the historical hierarchy is occupation-specific (as discussed in the introduction section). NSS categorizes information on social groups and religions separately, which we merge and re-classify into eight different socio-religious groups. The distinct categories (shaded boxes) for our analysis are identified as follows (see Figure 2.2).

[Figure 2.2 here]

2.3.1 Sample Selection

The National Sample Survey Office (NSSO) defines 'work' as an activity status which may be of two types: (a) primary activity, and (b) secondary activities. This essay takes primary activity and up to the first secondary activity, combining what

NSS calls 'Usual Principal and Subsidiary Status' (UPSS). We restrict our analyses to the working samples who are either (1) regular salaried, or (2) casual laborers, and each computation is weighted for the working population (see Table 2.1). Because of a segmented structure (formal versus informal) of the labor market, our main analyses have been carried out separately for the regular salaried workers (about 23 percent of total workers), and for the casual laborers (about 21 percent). We have omitted the category of 'self-employed workers' (about 56 percent) to address the institutional discrimination only. On top of that, regular salaried and casual workers have enough information on job-specific characteristics which we use for the matching purpose in the nonparametric setup.

[Table 2.1 here]

2.3.2 Descriptive Statistics

The NSS data tell us that STs, SCs, Muslims, and OBCs are the most vulnerable groups for both genders (see Figure 2.3). For both female and male workers, almost 75 per cent of Tribals earn less than the overall mean level of earnings, indicated by the vertical reference line. Additionally, there are regional (see Figure A.2.1), sectoral (see Figure A.2.2), and gender inequalities (see Figure A.2.3) too, which are shown as supplementary figures in the appendix section.

[Figure 2.3 here]

The average working age individual in the sample is 36 years old, shares their household with more than three other members, has an average of 6 years of educational attainment (on a scale of 0-15 years).[1] More people are engaged in the non-agricultural activities (66 per cent), but almost 65 per cent of workers are based in the rural areas. This is a classic example of a dual economy with rapid

[1] It is important to note here that educational attainment measure is done by following the World Bank methodology (Psacharopoulos & Arriagada, 1986).

urbanization, in transition. One can notice that the share of female workers varies around 20-30 per cent but accounts for only about 14 percent for Muslims (both Muslims OBCs and other Muslims). Educational attainment, for female (compared to male counterpart) and for vulnerable socio-religious groups (compared to HHs) is considerably low. As shown in the descriptive statistics (see Table 2.2), while a representative regular salaried worker earns $9 daily, a casual worker's income is only $3/day. This wage differential stands alone throughout different socio-religious groups as well. Within the regular salaried workers, there is a diversity across groups, e.g., while a HH worker earns about $11.49 per day, a Muslim OBC earns only $5.55, the lowest. Also, ST, SC, and other vulnerable groups earn comparatively less than the HHs. The descriptive statistics and visual inspection (Table 2.2 and Figure 2.3) lend a perceptible earnings gap among the privileged and vulnerable groups.

[Table 2.2 here]

For the empirical estimation purpose, various demographic features and income generating characteristics are used for comparison among socio-religious groups. We call these characteristics 'matching variables' and select these based on their (significant) impact on workers' earnings. This follows from the human capital model of earnings (Mincer, 1974).

2.4 Methodology: Parametric and Nonparametric Decomposition of Earnings Gap

This essay concentrates on estimating the earnings gap by socio-religious groups. Interpretation of the earnings gap is different for different estimation methods. If the estimated gap considers the difference between the distributions of two group's observable characteristics, the decomposition of the earnings gap is more accurate. Here, the assumption of 'out of common support' plays a vital role, which ignores

the prevalence of differences in observable characteristics (Chakraborty et al., 2020; Karki and Bohara, 2014). Rather, it is more practical to assume that there is a likelihood of finding one group of workers in the higher-earning occupations or industries than the others. One parametric decomposition method that assumes 'out of common support', where comparisons are based on the mean-level characteristics, is Blinder-Oaxaca (Blinder, 1973; Oaxaca, 1973) decomposition. Suppose we have two groups, say, Tribal workers (STs) and HHs. The primary outcome variable is earnings, and the difference in outcome variables for two groups is $D = E(y_{hh}) - E(y_{st})$; where $E(y)$ denotes the expected earnings accounted for socio-religious differences in the set of predictor variables. Linear regression for this model would be: $y_g = x'_g\beta + \varepsilon_g$ where $E(\varepsilon_g) = 0$ and $g \in \{hh, st\}$. The mean earnings gap is then the difference in linear predictions: $D = E(y_{hh}) - E(y_{st}) = E(x_{hh}\beta_{hh}) - E(x_{st}\beta_{st})$. The socio-religious differences to the overall earnings gap can be written as: $D = [E(x_{hh}) - E(x_{st})]'\beta_{st} + E(x_{st})'(\beta_{hh} - \beta_{st})$.

This method is used as twofold decomposition where earnings gap (D) is decomposed into two parts: (i) gap due to endowments (E) and (ii) gap due to coefficients (C). The first component (E) represents the most significant slice of the gap in earnings, which belongs to the group differences (due to endowment); and the second part (C) contributes to the group differences in coefficients and the unobservable characteristics (due to coefficients). We compute the decomposition from the viewpoint of the underprivileged groups (say, the STs), that is, the group differences in the regressors are weighted by the vulnerable group of workers' coefficients for determining (E). In other words, the endowment effect measures the expected change in the STs' average earnings if they had HHs endowment (represented by human capital characteristics) levels. Analogously, for (C), the differences in coefficients are also weighted by STs' predictor levels, that is, the coefficient effect measures the expected change in the ST workers' average earnings if they had HHs workers' coefficients. It is a major concern that this decomposition

method suffers from "the index number problem" (Madheswaran and Singhari, 2016) – assumptions about the prevailing non-discriminatory wage structure. To solve this problem, we employ another parametric decomposition following Cotton (1988), and Oaxaca and Ransom (1994), which propose that the true non-discriminatory or, pooled wage β^* lies somewhere between the wage structures for STs and HHs, respectively: $\beta^* = \Omega\,\widehat{\beta}_{hh} + (I - \Omega)\,\widehat{\beta}_{st}$; where I is identity matrix and Ω is relative weight matrix.[2] In that case, the socio-religious differences to the overall earnings gap can be written as: $D = [E(x_{st}) - E(x_{hh})]'[W\beta_{st} + (I - W)\beta_{hh}] + [(I - W)'E(x_{st}) + W'E(x_{hh})]'(\beta_{st} - \beta_{hh})$; where the relative weights for STs $\widehat{W} = \Omega$.

But these decomposition techniques might fail to identify any historical discrimination (Ñopo, 2008). Van de Walle and Gunewardena (2001) argue that past discrimination against socially "backward" class Vietnamese may have isolated them into remote geographic regions. Hence, these workers lack certain productivity-enhancing characteristics. Ignoring this past discrimination may increase the endowment effect of the earnings gap, resulting in an overestimation of differences in human capital. The potential misspecification due to differences in support of the individual characteristics can be accounted for with Ñopo's matching algorithm (Arabsheibani et al., 2018). Thus, another decomposition method is used which assumes different probabilistic distributions of comparable individual characteristics including human capital. Let, y represents the earnings of a worker and $\overrightarrow{X}$ is the vector of the worker's human capital and labor market characteristics. Let, $f_{hh}(x)$, and $f_{st}(x)$ denote the cumulative distributions of that worker's individual characteristics $\overrightarrow{X}$, conditional upon she is a representative of the group of HHs and Tribal workers (STs), respectively. Their corresponding probability measures are $\mathrm{d}f_{hh}(x)$ and $\mathrm{d}f_{st}(x)$. In other words, $f_{hh}(x) = P(X \leq x)\,\mathrm{d}f_{hh}(x)$ and

[2] $\Omega = (X'X)^{-1}(X'_{hh}X_{hh})$ and $X'X = X'_{hh}X_{hh} + X'_{st}X_{st}$; where X is the observation matrix for pooled sample, and X_{hh} & X_{st} represent the observation matrices for HHs and ST samples, respectively.

$f_{st}(x) = P(X \leq x)\, \mathrm{d}f_{st}(x)$. Now, these distributions are used to model the expected earning streams conditional on human capital characteristics and group representations, i.e., $E\big(y \mid {}_{hh,\ X}\big) = g_{hh}(X)$ and $E\big(y \mid {}_{st,\ X}\big) = g_{st}(X)$. It follows that $E(y \mid {}_{hh}) = \int_{s_{hh}} g_{hh}(X)\, \mathrm{d}f_{hh}(x)$ and $E(y \mid {}_{st}) = \int_{s_{st}} g_{st}(X)\, \mathrm{d}f_{st}(x)$; where s_{hh} and s_{st} are the 'support' of the characteristic's distributions for HHs and Tribal workers, respectively. Finally, the earnings gap between HHs and STs can be defined as: $\Delta = E(y \mid {}_{hh}) - E(y \mid {}_{st})$.

The nonparametric method takes the fact into its account that s_{hh} and s_{st} can be very different from each other, i.e., HHs may have certain advantageous labor market characteristics that Tribal workers may not have. This is a fourfold decomposition, where two components account for discrimination and the endowment effect over the matched characteristics; and the other two components represent unmatched characteristics: $\Delta = \Delta_o + \Delta_x + \Delta_{hh} + \Delta_{st}$. Here, Δ_o and Δ_x are calculated over the common distributions (known as out of common support); and Δ_{hh} and Δ_{st} are computed over the differences in distributions (known as differences within common support). For example, Δ_{hh}, where hh denotes, say, HHs, is a component of the earnings gap due to differences within common support between two subsections of HHs. The first subsection is those HHs, whose distribution of characteristics perfectly matches with that of STs; and the second subsection is those HHs, whose characteristics do not match with that of Tribal workers. On the other hand, Δ_{st}, where st denotes, say, STs, is a component of the earnings gap due to differences within common support between two subgroups of STs. The first subgroup is those STs, whose distribution of characteristics perfectly matches with that of HHs; and the second subgroup is those STs, whose characteristics do not match with that of HHs. Δ_{hh} and Δ_{st} are zero when the distribution of characteristics is exactly matched between all HHs (or STs) and STs (or HHs). Alternatively, these are also zero if on average all STs and HHs are

identically paid.[3] The remaining components, Δ_o, and Δ_x are very similar to the two elements of the Oaxaca-Blinder method: C and E, respectively. This decomposition involves a procedure of one-to-many matching which creates a partitioned dataset based on matched and unmatched characteristics of two groups. Therefore, it avoids any parametric restrictions. Overall, this nonparametric method suggests that workers are paid identically in case of identical human capital and observable labor market characteristics. Hence, caste, religion, and gender should not matter if they are already being paid equally.

Ñopo (2008) first estimated Peru's gender gap during 1986 – 1999 using this matching-based nonparametric decomposition technique. In recent times, the method has been applied in a few South American, European and South Asian studies on gender and racial discrimination. For example, the intra-female earnings gap between natives and immigrants in Spain is found to be significant as immigrant women are segregated in ill-paid jobs (Nicodemo & Ramos, 2011). Karki and Bohara (2014) use the Ñopo method and find that Nepalese *Dalits* do not possess some favorable labor market entry characteristics, compared to other castes. This gets intertwined with employers' prejudice against *Dalits*, and as a result, they earn significantly less than other workers.

This essay uses both parametric and nonparametric methods to estimate different contributors of socio-religious earnings gaps. We use human capital characteristics as matching variables, controlling for relevant labor market characteristics such as occupations and industries.[4]

[3] In that case, matching in the distribution of characteristics does not even matter.

[4] Estimations are also controlled for State fixed effects and robust standard errors are clustered at the district levels. The nonparametric estimates control for an extended set of matching variables which includes nature of jobs, membership of workers' union, social security, and other labor market characteristics.

2.5 Empirical Results and Discussions

First, the relationship between earnings and human capital is estimated following the Mincerian earnings theory. Empirical estimation for an individual worker i can be formulated as follows: $Y_i = \beta_0 + \beta_1 Edu_i + \beta_2 X_i + \gamma_i + \varepsilon_i$; where Y_i is the natural logarithm of the daily earnings of individual i, Edu_i is her educational attainment, X_i is the set of demographic, household, and employment-related controls (age, sex, socio-religious groups, marital status, household size, region, employment sector & status, etc.), γ_i denotes state/industry/occupation fixed effects.

2.5.1 Mincerian Equation: Ordinary Least Squares

The testing of Mincerian equation confirms the theoretical consistency of our data that we use for earnings decompositions. The ordinary least squares (OLS) results (see Table 2.3) suggest that age, education, married status, urban and non-agricultural sector are positively associated with the workers' earnings. On the other hand, coefficients for female, vulnerable socio-religious groups, household size, casual workers show a negative relation for individual earnings. Specifically, an extra year of educational attainment leads to a significant 3-6 per cent increase in the earnings. Similarly, if worker A is an extra year experienced (proxied by age) than worker B, *ceteris paribus*, worker A earns 3-4 percent higher than worker B. Larger families are disincentives toward a worker's earning function, as suggested by negative coefficients of household size.

[Table 2.3 here]

Female workers earn significantly less than their male counterpart. On average, a woman earns around 30-35 percent less than a man. All vulnerable socio-religious groups earn significantly less than HHs. For example, Tribal workers' earning is about 13-18 percent lower than that of HHs. Urban workers get paid higher (about 17-22 percent) than workers in rural areas. Similarly, non-

agricultural employment tends to earn more than the agricultural sector. Most of the results are robust and consistent with different specifications of state, industry, and/or occupational fixed effects.

2.5.2 Parametric Decomposition: Blinder-Oaxaca

We present the earnings decomposition results separately for regular salaried workers and casual laborers. All results from Table 2.4 onwards take the column (4) specification of the OLS results, where we take State and Occupational fixed effects.[5] Table 2.4 and Figure 2.4 report the socio-religious gap in mean earnings (column D) of the workers, predicted difference due to endowments (column E) and difference due to discrimination/coefficients (column C). We consider the underprivileged groups to be our reference group/base category and address the vulnerability of different socio-religious groups in comparison with the HHs. We find that the Muslim OBCs are the most vulnerable group of regular salaried workers compared to the HHs, as the earnings gap is about 62 percent; but most of this gap is due to the differential endowments in human capital. The Hindu OBCs, Other OBCs, and STs are found to be the most discriminated against groups in the labor market, as their earnings gaps can be attributed to the coefficient (C) component by 24 – 42 percent.

[Table 2.4 here]

[Figure 2.4 here]

It is interesting to note that in most of the cases for regular salaried workers, the primary factor of earnings disparity is the differences in the human capital

[5] We also check without controlling for occupations but only industries, the results are similar and consistent, and available upon request.

endowment. In fact, looking at the stacked column graph presenting the Blinder-Oaxaca decomposition results for regular salaried workers, it is evident that a majority of socio-religious earning gaps are attributed (shaded yellow areas) to the endowment effect (see Figure 2.4). But it is to be noted that these unequal labor market outcomes could be a long-run result of historical discrimination, for example, lesser opportunity to invest in human capital, inaccessibility to quality education and health, etc., which may have caused the vulnerable sections to achieve lower endowments. However, the parametric decomposition results are very much similar and consistent with other research studies (see Azam, 2012; Bhaumik & Chakrabarty, 2007; Borooah, 2005; Deininger et al., 2013). On the other hand, the labor market for casual workers is mostly favorable for vulnerable groups except for STs - tribal casual laborers earn 19 per cent less than the HHs. Majority of the socioreligious earnings gaps for casual workers are attributed to the discrimination component, but this may be misleading due to the limitations as discussed in the methodology section. There may be selection bias involved as "backward" groups are overly populated in ill-paid/casual jobs.

2.5.3 Parametric Decomposition: Oaxaca-Ransom

The Oaxaca-Ransom decomposition results are reported in terms of percentage share of each component in Table 2.5 and Figure 2.5, separately for regular salaried workers and casual laborers. The estimates are technically different from the Blinder-Oaxaca results, as one can see that this method presents the coefficient effect (C) into two categories: (1) due to advantage of being "forward" which is sometimes also referred as an "overpaid to forward groups", and (2) due to disadvantage of being "backward" *aka* "underpaid to backward groups".

[Table 2.5 here]

[Figure 2.5 here]

Once again, endowment effects (E) play a significant role in explaining the difference in earnings of the workers belonging to different socio-religious groups. In case of the regular salaried workers, the share of wage gap due to endowment varies from 62-99 per cent. In terms of "underpayment" to the "backward" groups, Hindu OBCs and Other OBCs are the most disadvantaged groups, as they are penalized by almost 23 per cent and 27 per cent respectively as compared to a regular salaried HH. On the other hand, HHs earn significantly more than SCs and STs due to some of their prevailing labor market advantages. In terms of total coefficient effects, the Oaxaca-Ransom method suggests that discrimination plays a crucial role in socio-religious earnings gap and may contribute around 14-38 per cent in some cases (see Figure 2.5). As compared to the Blinder-Oaxaca, these estimates are more accurate in the sense that this decomposition approach takes into account the cost of being underprivileged as well as the perks of being "favored" in the labor market.

2.5.4 Nonparametric Decomposition: Ñopo Matching

Table 2.6 and Figure 2.6 present the nonparametric estimation results of socio-religious earnings gaps, i.e. $\Delta = \Delta_o + \Delta_x + \Delta_{hh} + \Delta_{non-hh}$. Two components in this decomposition result, Δ_x (Explained-III) and Δ_o (Unexplained) are analogous to the two summands of the Blinder-Oaxaca method: E and C respectively.[6] The last component Δ_{non-hh} represents the vulnerable group(s) in each formulation, i.e., STs, SCs, OBCs, Muslims, etc. On the other hand, Δ_{hh} represents the reference categories throughout the results, i.e., the HHs. One may compare these two components as homologous to the sub-components of coefficient effect (C) in the

[6] It is important to note that in the course of creating conditional cumulative distribution functions for matching variables, the nonparametric method has used more than half of the vulnerable group's samples- a maximum of 84 per cent of vulnerable groups. This confirms the robustness of the model that more than half of the samples are exhausted in nonparametric regressions.

Oaxaca-Ransom approach: (1) due to advantage of being "forward", and (2) due to disadvantage of being "backward".

The Ñopo estimates are technically different from the former results because of (a) additional matching variables are included in this technique, and (b) the raw difference is presented in relative terms as multiplication of the vulnerable group's average earnings. Table 2.6 reports that each of the vulnerable groups are underpaid as compared to the HHs. Specifically, the adjusted earnings gap between regular-salaried HHs and Muslim OBCs is the largest, 89 per cent, while that with SCs is about 57 per cent, 47 per cent with Other Muslims, and almost 40 per cent with Tribal workers; given that they possess similar endowment of human capital. Labor market and job characteristics are controlled for in these results to better perform the one-to-many matching.

Δ_o can be viewed as a proxy to the "noisy" discrimination (Goraus & Tyrowicz, 2014), which significantly contributes in most of the earning differences among the regular salaried workers, varying around 45-96 per cent. Once again, the nonparametric method confirms that in terms of earnings, Tribals, Muslims and other backward class/caste workers are worse off than the socially privileged workers. It is interesting to note here that all Δ_{hh} coefficients are positive whereas all Δ_{non-hh} coefficients are negative, which is in the line of the nonparametric decomposition method (see the methodology section). A negative Δ_{non-hh} coefficient indicates that workers of vulnerable groups have some less/not favorable characteristics except human capital, which work against them in the labor market, which is suggestive of predominant historical discrimination already in place. On the other hand, a positive Δ_{hh} coefficient implies that the reference group workers have some advantages in entering the labor market compared to the vulnerable ones.

[Table 2.6 here]

[Figure 2.6 here]

Figure 2.6 presents the stacked column graph of nonparametric decomposition results for regular-salaried workers and casual laborers separately. Socio-religious earnings gaps for regular salaried are, to some extent, evenly attributed to Δ_o, Δ_{hh}, and Δ_{non-hh}, which implies that institutional discrimination and favorable (to higher earnings in labor market) social hierarchy play crucial roles in determining the earnings gap. This is unlike Blinder-Oaxaca results which suggest that most of these gaps in earnings are due to human capital endowment differentials.

2.6 Concluding Remarks

This essay examines if one of the major sources of earnings gap in the Indian labor market is discrimination. Both parametric and nonparametric methods indicate the existence of institutional discrimination. The latter technique instead finds that discrimination is the major source of the earnings gap. It is worth mentioning that using the nonparametric technique; we can look after minute details of labor force participation characteristics.

Over the past two decades, India has experienced a rising supply of heterogeneous workers. The earnings gap, to some extent, improved in favor of the vulnerable group of workers. There has been a moderate improvement in Tribal and other "backward" classes' educational qualifications, which contributed to a reduction in earning gaps. But also, this phenomenon got counterbalanced by unfavorable labor market appreciation towards high-skilled Tribal, "backward" classes, and Muslims. This is very similar to the case of women workers as well (Lee & Wie, 2017). Discrimination-induced inequalities are a serious policy concern.

The eleventh five-year plan (2007 – 2012) (Planning Commission, 2008) by the Indian government aimed to reduce discrimination in earnings and other

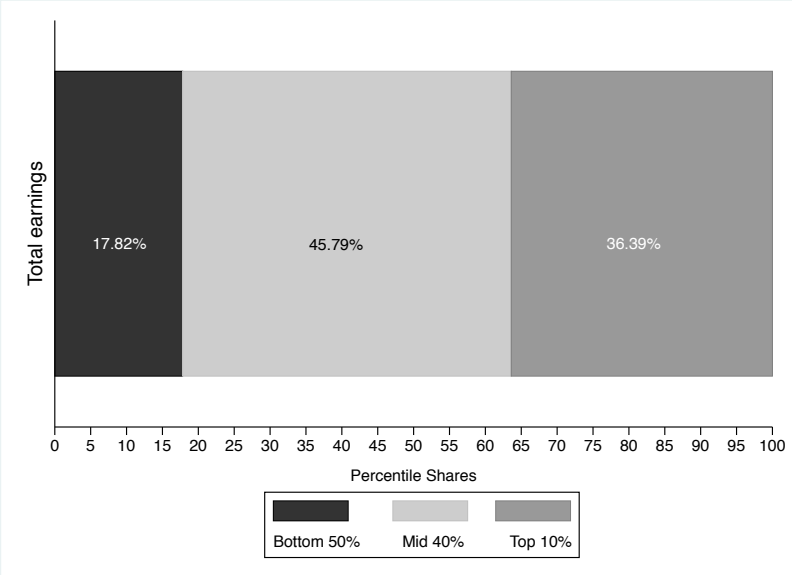
inequalities, by focusing on the removal of rural-urban differences. This has led to abrupt urbanization – cities to megacities, towns to cities, and villages faced forceful industrialization. The twelfth five-year plan (2012 – 2017) (Planning Commission, 2011) admits that it is a case of persistent inequalities, which cannot be solved overnight by urbanization of rural areas. The government declaration also mentions that India's record in regard to solving inequality problems is far from even satisfactory, as discriminatory practices on the grounds of caste, religion, and ethnicity are rampant. A nation obsessed with economic growth now needs to shift its focus to economic development. Be its employment opportunities, where terms and conditions are discriminatory; be its productive assets, where vulnerable socio-religious groups still do not have land and property rights – the entitlements need to be reorganized.

Basu (2001) discusses that a consensus has been growing in favor of "inclusive growth" by improving the capabilities of a vulnerable class of society. This involves the endowment of both physical and human capital assets. Achieving a system of affordable education, healthcare, etc., needs immediate attention so that the social hierarchy takes a backseat. Following the theory of intersectionality, it is difficult because the lives of poor people are already jeopardized with low earnings and the age-old hierarchical nature of society. The blockage of discriminatory attitudes based on socio-religious superiority should be cleared first, and then we can talk about a "modern" India (Borooah et al., 2014). As of now, it is the first and foremost duty of the democratic government to focus on narrowing the endowment differentials across all socio-religious groups. This is crucial as the difference in educational attainment and investment for other human capital, for example, skills and training make the employers prejudiced against certain groups of workers (Becker, 1957). This leads to a vicious cycle of discrimination decade after decade. An important policy priority should be promoting vulnerable groups' empowerment in society in changing the common perception of their occupational roles and labor market contributions.

A recent ongoing debate exists over whether or not to incorporate caste as an identity in global development policies besides gender, race, and religion. Mosse (2018) raises a valid question – when castes are inherited identities and mutually exclusive, it plays significant roles in shaping life opportunities. To address the inequality problem, caste and religious discrimination need to be taken seriously. Sustainable Development Goals (SDGs). ??

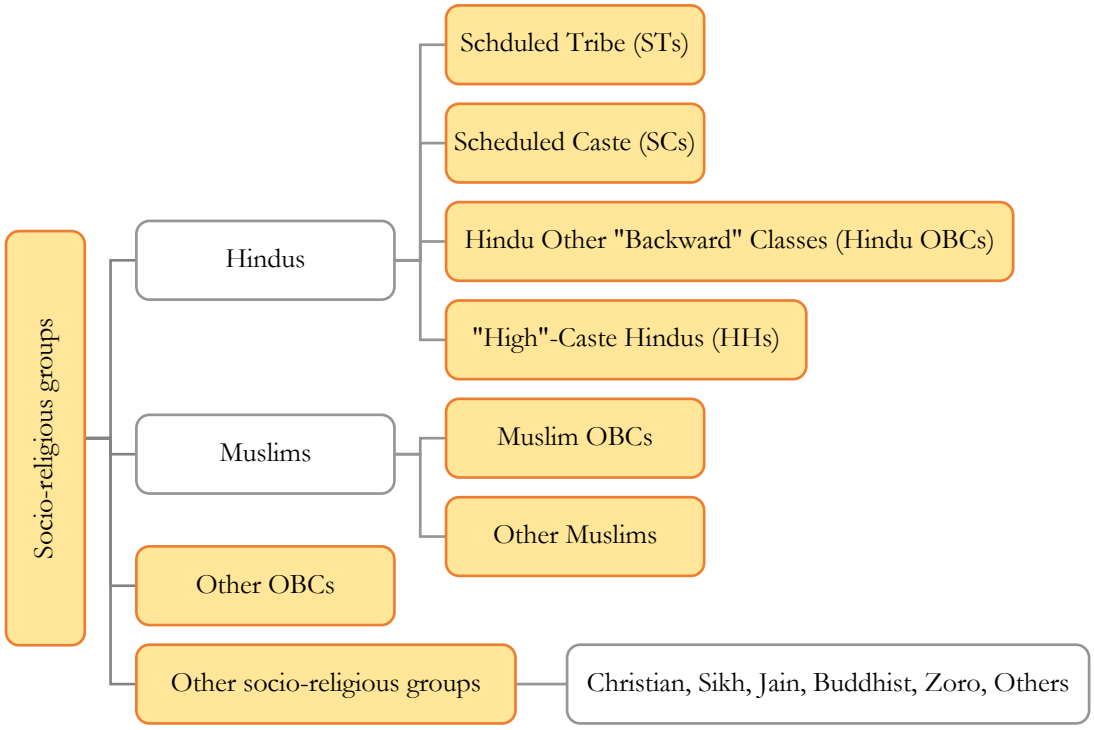
Figures and Tables

Figure 2.1 Percentile shares of total earnings by workers



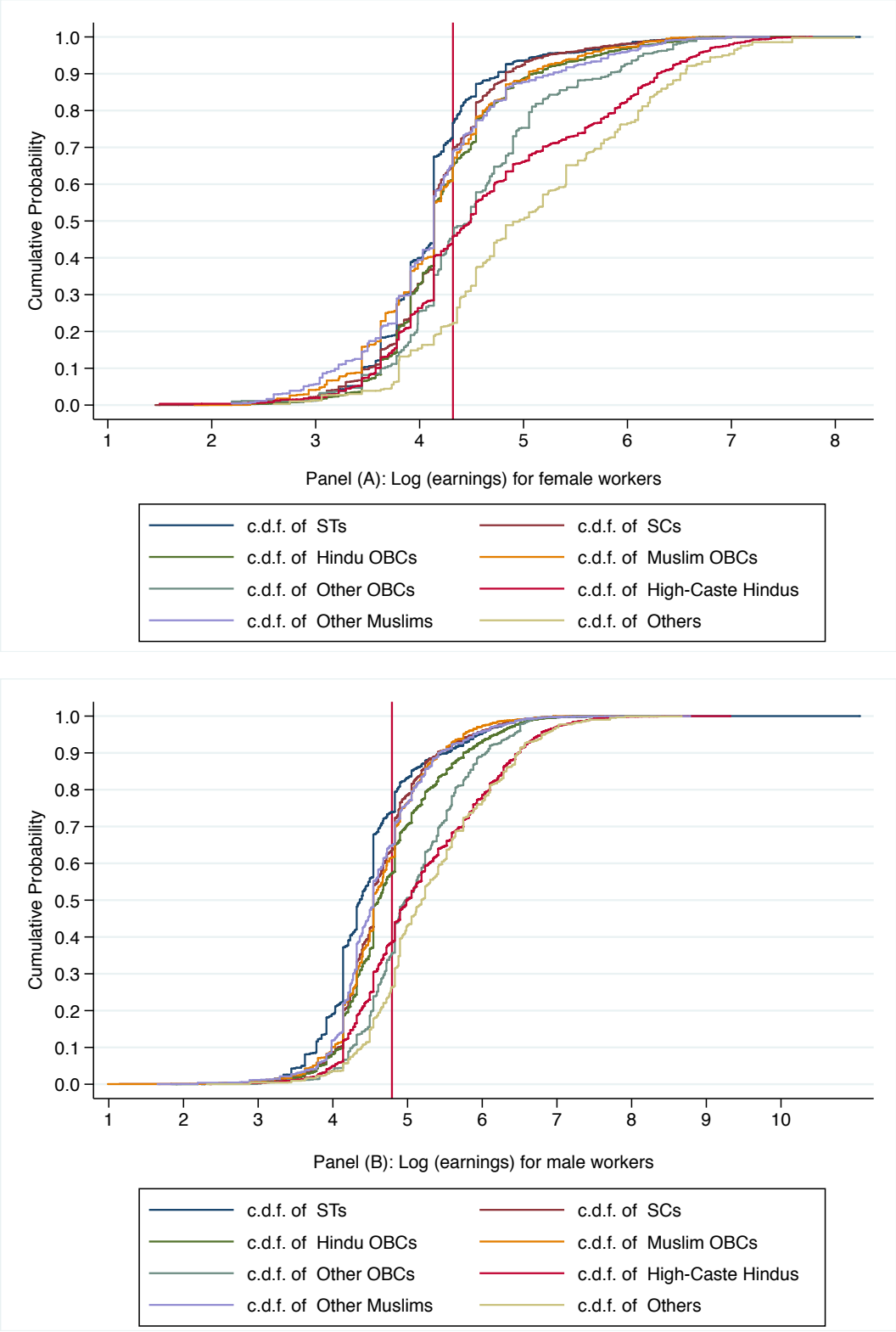
Source: Authors' calculation from the 2011-12 National Sample Survey (NSS) data

Figure 2.2 Classification of socio-religious groups from NSS data



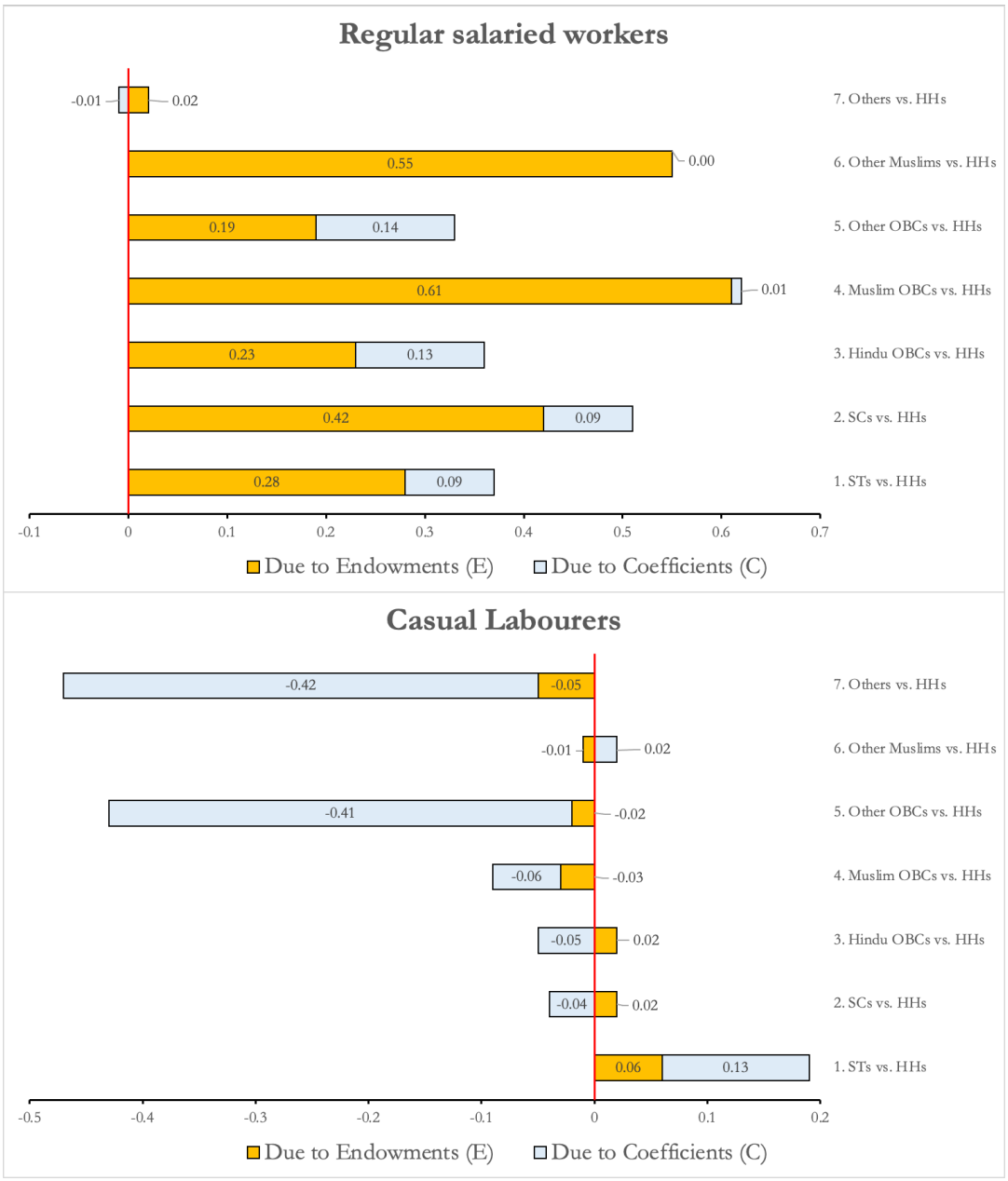
Source: The 2011-12 NSS data classification

Figure 2.3 Cumulative distribution of earnings for socio-religious groups



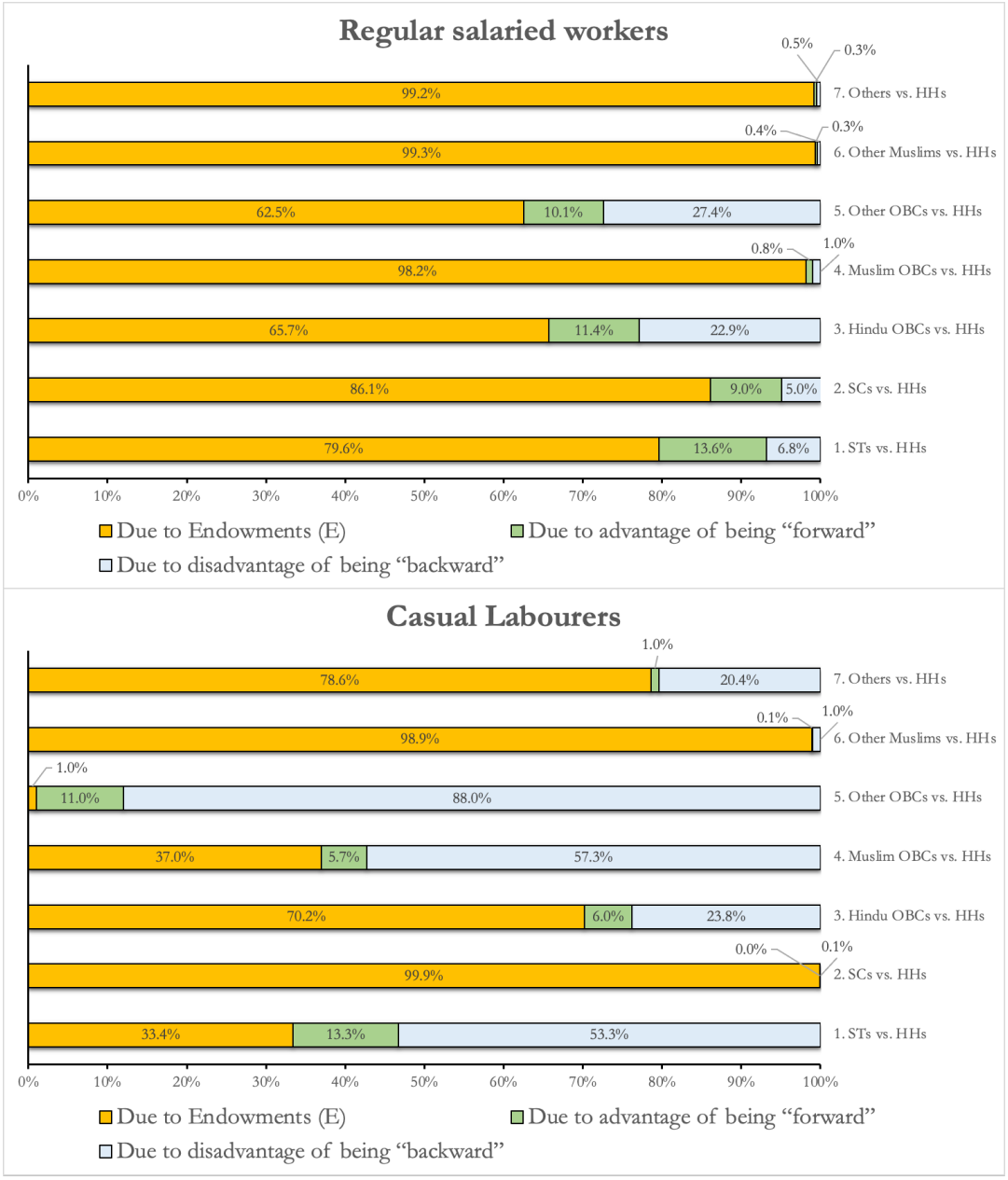
Source: Authors' calculation from the 2011-12 NSS data

Figure 2.4 Blinder-Oaxaca decomposition results for regular salaried workers and casual laborers



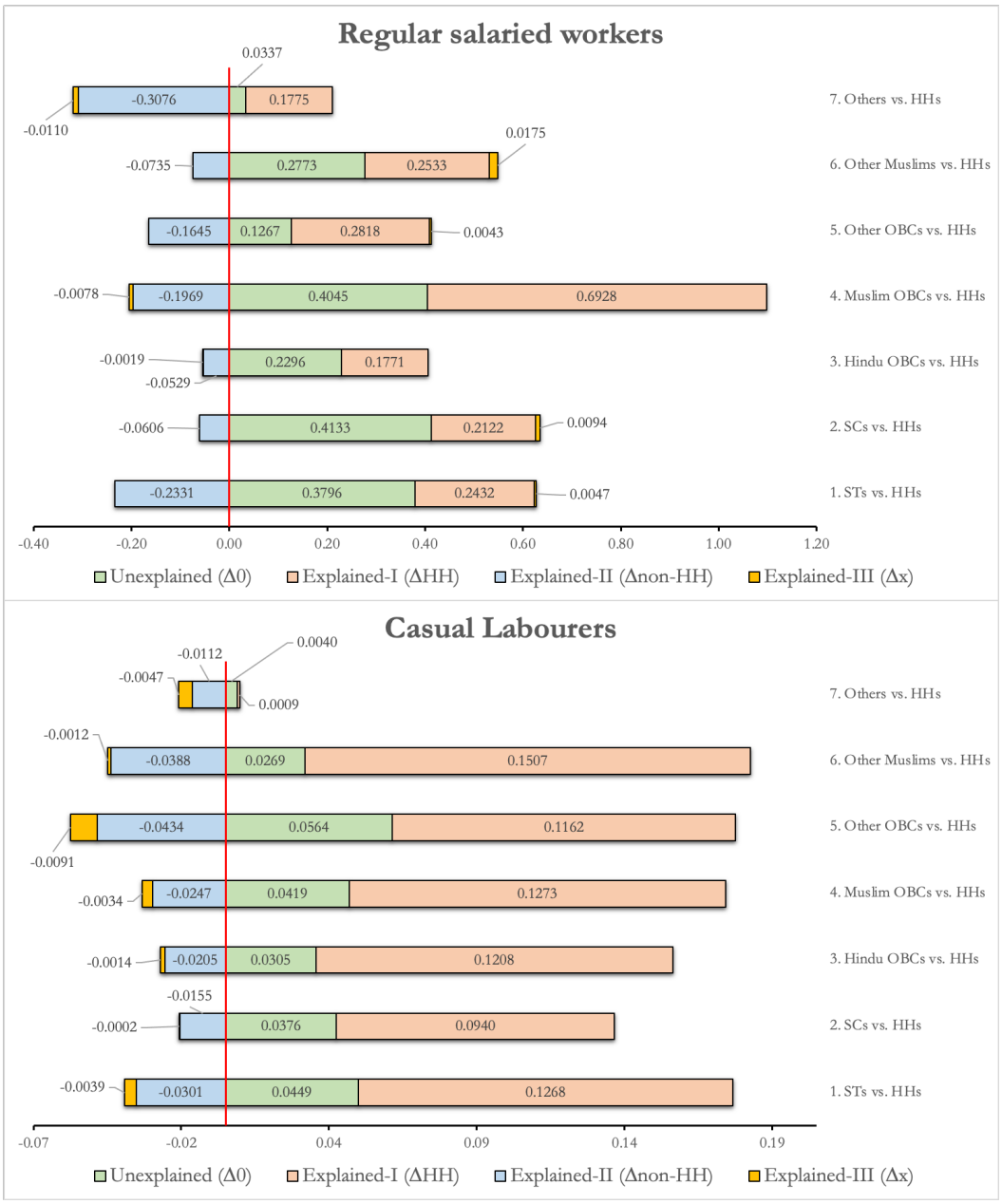
Source: Authors' calculation from the 2011-12 NSS data

Figure 2.5 Oaxaca-Ransom decomposition results (in % share) for regular salaried workers and casual laborers



Source: Authors' calculation from the 2011-12 NSS data

Figure 2.6 Nonparametric decomposition (Ñopo matching) results for regular salaried workers and casual laborers



Source: Authors' calculation from the 2011-12 NSS data

Table 2.1 Samples using NSS's 'Usual Principal and Subsidiary Status' (UPSS)

UPSS	Number of workers	Percentage share	Sample included in analyses?
Self-employed workers	95,519	55.44%	No
Regular Salaried workers	40,197	23.33%	Yes
Casual Laborers	36,565	21.22%	Yes
Total	172,281	100%	

Source: Authors' calculation from the 2011-12 National Sample Survey (NSS) data

Table 2.2 Descriptive statistics of socioeconomic and some selected variables

Variables	Pooled	STs	SCs	Hindu OBCs	Muslim OBCs	Other OBCs	High-Caste Hindus (HHs)	Other Muslims	Other socio-religious groups
	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)	Mean (S.E.)
Age (in years)	36.13 (0.04)	36.00 (0.13)	36.00 (0.10)	36.52 (0.08)	33.27 (0.19)	37.84 (0.37)	37.13 (0.09)	33.18 (0.18)	38.56 (0.30)
Female (%)	22.90	31.14	24.56	24.25	14.02	22.89	19.16	13.87	28.72
Marital Status (Base: Otherwise)									
Married (%)	73.51	75.90	74.13	74.12	67.26	70.77	75.27	64.99	71.41
Household size	4.69 (0.01)	4.73 (0.02)	4.77 (0.01)	4.54 (0.01)	5.63 (0.04)	4.31 (0.05)	4.35 (0.01)	5.40 (0.03)	4.48 (0.05)
Educational attainment	6.08 (0.01)	4.07 (0.04)	4.70 (0.03)	6.04 (0.03)	4.75 (0.07)	8.09 (0.15)	9.40 (0.04)	4.82 (0.06)	9.82 (0.12)
Real daily earnings (in USD)*									
Regular salaried	8.57 (0.05)	7.78 (0.20)	6.57 (0.09)	7.47 (0.07)	5.55 (0.13)	7.59 (0.26)	11.49 (0.13)	6.23 (0.16)	11.80 (0.40)
Wage ratio to HHs	0.75	0.68	0.57	0.65	0.48	0.66	1.00	0.54	1.03
Casual workers	3.03 (0.01)	2.45 (0.02)	3.04 (0.02)	3.09 (0.02)	3.32 (0.04)	4.84 (0.13)	3.02 (0.04)	2.95 (0.03)	4.92 (0.14)
Wage ratio to HHs	1.00	0.81	1.05	1.02	1.10	1.60	1.00	0.98	1.63
Region (Base: Rural)									
Urban (%)	34.53	16.43	24.20	32.22	37.41	48.40	56.55	39.70	57.30
Broad employment sector (Base: Agriculture)									
Non-agriculture (%)	66.45	48.66	58.17	63.68	75.42	80.16	83.71	73.47	91.38
Observations	70,529	9,079	14,379	21,395	3,743	1,076	14,590	4,719	1,548

Source: Authors' calculation from the 2011-12 NSS data

** Real daily earnings are calculated from current daily status (CDS) weighted for the work intensity scores (1.00 = full day, 0.50 = half day). 1 USD equals 47.92 INR for the financial year 2011-12.*

Table 2.3 Ordinary least squares (OLS) results for the Mincerian equation

	Dependent variable: Log (Real daily earnings)			
Variables	(1)	(2)	(3)	(4)
Age	0.0408***	0.0390***	0.0331***	0.0332***
	(0.00234)	(0.00230)	(0.00226)	(0.00223)
Age-squared	-0.000375***	-0.000361***	-0.000312***	-0.000320***
	(2.88e-05)	(2.82e-05)	(2.77e-05)	(2.73e-05)
Educational attainment	0.0624***	0.0591***	0.0453***	0.0336***
	(0.000943)	(0.000951)	(0.00108)	(0.00113)
Sex (Base: Male)				
Female	-0.302***	-0.326***	-0.332***	-0.352***
	(0.0103)	(0.0104)	(0.0102)	(0.00983)
Socio-religious groups (Base: High-caste Hindus)				
STs	-0.185***	-0.164***	-0.183***	-0.133***
	(0.0174)	(0.0182)	(0.0181)	(0.0170)
SCs	-0.119***	-0.142***	-0.142***	-0.0838***
	(0.0137)	(0.0137)	(0.0132)	(0.0128)
Hindu OBCs	-0.124***	-0.153***	-0.147***	-0.102***
	(0.0128)	(0.0132)	(0.0128)	(0.0121)
Muslim OBCs	-0.111***	-0.158***	-0.134***	-0.113***
	(0.0181)	(0.0181)	(0.0177)	(0.0172)
Other OBCs	-0.0209	-0.134***	-0.135***	-0.119***
	(0.0307)	(0.0312)	(0.0286)	(0.0276)
Other Muslims	-0.125***	-0.112***	-0.103***	-0.0705***
	(0.0197)	(0.0193)	(0.0189)	(0.0183)
Other socio-religious groups	0.142***	0.0352	0.0424	-0.00262
	(0.0348)	(0.0363)	(0.0344)	(0.0316)
Marital Status (Base: Otherwise)				
Married	0.0951***	0.102***	0.0965***	0.0957***
	(0.0115)	(0.0113)	(0.0110)	(0.0106)
Household size	-0.0125***	-0.00848***	-0.00842***	-0.00520***
	(0.00196)	(0.00193)	(0.00190)	(0.00183)
Region (Base: Rural)				
Urban	0.199***	0.198***	0.221***	0.177***
	(0.00965)	(0.00972)	(0.0100)	(0.00997)
Broad employment sector (Base: Agriculture)				
Non-agriculture	0.188***	0.161***	0.832***	0.0728***
	(0.00989)	(0.0102)	(0.0346)	(0.0230)
Constant	3.341***	3.643***	3.782***	4.883***
	(0.0436)	(0.0477)	(0.0469)	(0.131)
State Fixed Effects		Yes	Yes	Yes
Industry Fixed Effects			Yes	
Occupational Fixed Effects				Yes
Observations	70,523	70,523	70,523	70,523
R^2	0.412	0.439	0.486	0.511

Robust standard errors clustered at district levels are in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 NSS data

Table 2.4 Blinder-Oaxaca decomposition results for regular salaried workers and casual laborers

Socio-religious Groups	Earnings Gap (D)	Due to Endowments (E)	Due to Coefficients (C)
1. STs vs. HHs			
Regular Salaried workers	0.37***	0.28***	0.09***
	(100%)	(76%)	(24%)
Casual Laborers	0.19***	0.06***	0.13***
	(100%)	(32%)	(68%)
2. SCs vs. HHs			
Regular Salaried workers	0.51***	0.42***	0.09***
	(100%)	(82%)	(18%)
Casual Laborers	-0.02*	0.02***	-0.04***
	(100%)	(-100%)	(200%)
3. Hindu OBCs vs. HHs			
Regular Salaried workers	0.36***	0.23***	0.13***
	(100%)	(64%)	(36%)
Casual Laborers	-0.03*	0.02***	-0.05***
	(100%)	(-67%)	(167%)
4. Muslim OBCs vs. HHs			
Regular Salaried workers	0.62***	0.61***	0.00
	(100%)	(98%)	(2%)
Casual Laborers	-0.09***	-0.03***	-0.06***
	(100%)	(33%)	(67%)
5. Other OBCs vs. HHs			
Regular Salaried workers	0.33***	0.19***	0.14***
	(100%)	(58%)	(42%)
Casual Laborers	-0.43***	-0.02	-0.41***
	(100%)	(4%)	(96%)
6. Other Muslims vs. HHs			
Regular Salaried workers	0.55***	0.55***	-0.00
	(100%)	(100%)	(0%)
Casual Laborers	0.01	-0.01	0.02
	(100%)	(-100%)	(200%)
7. Others vs. HHs			
Regular Salaried workers	0.01**	0.02**	-0.01**
	(100%)	(200%)	(-100%)
Casual Laborers	-0.47***	-0.05***	-0.42***
	(100%)	(76%)	(24%)

Percentage shares of all summands are in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 NSS data
Note: A positive estimate indicates some advantageous labor market situations for "forward" groups while a negative estimate indicates advantages for "backward" groups.

Table 2.5 Oaxaca-Ransom decomposition results (in % share) for regular salaried workers and casual laborers

Socio-religious Groups	Due to Endowments (E)	Due to Coefficients (C)	
		Due to advantage of being "forward"/ overpayment to "forward" groups	Due to disadvantage of being "backward"/ underpayment to "backward" groups
1. STs vs. HHs			
Regular Salaried workers	79.6% (0.0161)	13.6% (0.0782)	6.8% (0.0931)
Casual Laborers	33.4% (0.0027)	13.3% (0.0001)	53.3% (0.0031)
2. SCs vs. HHs			
Regular Salaried workers	86.1% (0.0665)	9.0% (0.0018)	5.0% (0.0521)
Casual Laborers	99.9% (0.0001)	0.0% (0.0000)	0.1% (0.0000)
3. Hindu OBCs vs. HHs			
Regular Salaried workers	65.7% (0.0217)	11.4% (0.0090)	22.9% (0.0720)
Casual Laborers	70.2% (0.0045)	6.0% (0.0005)	23.8% (0.0001)
4. Muslim OBCs vs. HHs			
Regular Salaried workers	98.2% (0.0100)	0.8% (0.0010)	1.0% (0.0003)
Casual Laborers	37.0% (0.0846)	5.7% (0.0077)	57.3% (0.0232)
5. Other OBCs vs. HHs			
Regular Salaried workers	62.5% (0.0090)	10.1% (0.0455)	27.4% (0.0666)
Casual Laborers	1.0% (0.0000)	11.0% (0.0000)	88.0% (0.0001)
6. Other Muslims vs. HHs			
Regular Salaried workers	99.3% (0.0801)	0.3% (0.0105)	0.4% (0.0072)
Casual Laborers	98.9% (0.0001)	0.1% (0.0016)	1.0% (0.0000)
7. Others vs. HHs			
Regular Salaried workers	99.2% (0.0204)	0.3% (0.0081)	0.5% (0.0152)
Casual Laborers	78.6% (0.0018)	1.0% (0.0006)	20.4% (0.0030)

Bootstrapped standard errors are in parentheses
Source: Authors' calculation from the 2011-12 NSS data
Note: Results for the pooled decomposition method with Ω (Omega) as weights are reported here.

Table 2.6 Nonparametric decomposition (Ñopo matching) results for regular salaried workers and casual laborers

Socio-religious Groups	Earnings Gap (Δ)	Unexplained (Δ_0)	Explained-I (Δ_{HH})/ Due to advantage of being "forward"	Explained-II (Δ_{non-HH})/ Due to disadvantage of being "backward"	Explained-III (Δ_x)	Explained Total
1. <u>STs vs. HHs</u>						
Regular Salaried workers	0.3944 (100%)	0.3796 [0.001] (96%)	0.2432 (62%)	-0.2331 (-59%)	0.0047 (1%)	0.0147 (4%)
Casual Laborers	0.1376 (100%)	0.0449 [0.002] (33%)	0.1268 (92%)	-0.0301 (-22%)	-0.0039 (-3%)	0.0927 (67%)
2. <u>SCs vs. HHs</u>						
Regular Salaried workers	0.5743 (100%)	0.4133 [0.002] (72%)	0.2122 (37%)	-0.0606 (-11%)	0.0094 (2%)	0.1610 (28%)
Casual Laborers	0.1159 (100%)	0.0376 [0.002] (32%)	0.0940 (81%)	-0.0155 (-13%)	-0.0002 (0%)	0.0784 (68%)
3. <u>Hindu OBCs vs. HHs</u>						
Regular Salaried workers	0.3520 (100%)	0.2296 [0.002] (65%)	0.1771 (50%)	-0.0529 (-15%)	-0.0019 (-1%)	0.1224 (35%)
Casual Laborers	0.1293 (100%)	0.0305 [0.002] (24%)	0.1208 (93%)	-0.0205 (-16%)	-0.0014 (-1%)	0.0988 (76%)
4. <u>Muslim OBCs vs. HHs</u>						
Regular Salaried workers	0.8926 (100%)	0.4045 [0.002] (45%)	0.6928 (78%)	-0.1969 (-22%)	-0.0078 (-1%)	0.4881 (55%)
Casual Laborers	0.1410 (100%)	0.0419 [0.000] (30%)	0.1273 (90%)	-0.0247 (-18%)	-0.0034 (-2%)	0.0991 (70%)
5. <u>Other OBCs vs. HHs</u>						
Regular Salaried workers	0.2484 (100%)	0.1267 [0.001] (51%)	0.2818 (113%)	-0.1645 (-66%)	0.0043 (2%)	0.1217 (49%)
Casual Laborers	0.1202 (100%)	0.0564 [0.000] (47%)	0.1162 (97%)	-0.0434 (-36%)	-0.0091 (-8%)	0.0638 (53%)
6. <u>Other Muslims vs. HHs</u>						
Regular Salaried workers	0.4746 (100%)	0.2773 [0.000] (58%)	0.2533 (53%)	-0.0735 (-15%)	0.0175 (4%)	0.1974 (42%)
Casual Laborers	0.1376 (100%)	0.0269 [0.000] (20%)	0.1507 (109%)	-0.0388 (-28%)	-0.0012 (-1%)	0.1107 (80%)
7. <u>Others vs. HHs</u>						
Regular Salaried workers	-0.1075 (100%)	0.0337 [0.002] (-31%)	0.1775 (-165%)	-0.3076 (286%)	-0.0110 (10%)	-0.1412 (131%)
Casual Laborers	-0.0110 (100%)	0.0040 [0.000] (-36%)	0.0009 (-8%)	-0.0112 (102%)	-0.0047 (43%)	-0.0149 (136%)

Percentage shares of all summands are in parentheses, standard errors for Δ_0 are in brackets.
Source: Authors' calculation from the 2011-12 NSS data

The Third Essay

A Marriage Story

Abstract

This essay explores the possible linkages between dotal (dowry-paying) heterosexual marriages and women's educational attainment in India. It adopts an implicit market for marriages and formulates an intra-household mechanism of human capital investment. Using data from the 2006–2009 Rural Economic and Demographic Survey and the 2011–2012 India Human Development Survey, this essay examines the contesting theories of how dowry may affect the educational attainment of women. This essay discusses the role of legislative reforms at the individual and the local government level as well. Evidence from the essay suggests that some policies may not achieve the desired goals but can collect a few debris on the way to a more gender-progressive society.

3.1 Introduction

A rational choice approach to the family, or household economics, started with *A Treatise on the Family* (1981), another seminal work by Gary S. Becker. Before that, Becker already sets the premise for an implicit "marriage market" in his much-discussed work, *A Theory of Marriage: Part I & II* (1973, 1974); where a competitive market model assumes (1) a person finds or, tries to find a mate in reference to well-being maximization in a family, and (2) the "marriage market" clears. The *Beckerian* idea of bargaining within marriages is actually indebted to the theory of human capital investment, and the linking agents are dowry and bride price. For example, Sen (1998) argues that the expected gains from a heterosexual marriage differ for women and men primarily because of the differences in their human capital acquisition, and that's what leads to a financial transfer at the time of marriage. Now, financial transfers between families during marriages has been well documented in historical texts. In fact, the Babylonian civilization, Renaissance Europe, Roman and Byzantine empires, Chinese Song period - all have had signs of marital wealth transfers (Calvi & Keshar, 2020).

In this context, the Indian subcontinent is special in the sense that: (1) a majority of marriages are "arranged" (by the family) in nature (see Figure 3.1), (2) a family formation follows the idea of patriarchy and virilocality (see Figure 3.2), and (3) a clear sign of educational hypergamy, that is "marrying up" exists (see Figure 3.3). On top of that, dowry is a ubiquitous phenomenon in Indian marriages (see Figure 3.4), despite the fact that, since 1961, it is illegal to pay or receive dowry. The financial transfers via dowry (and bride price in some cases) are so "lumpy" (Becker, 1981) that it typically exceeds a year of household earnings (Anukriti et al., 2019; Chiplunkar & Weaver, 2019).

[Figure 3.1 here]

[Figure 3.2 here]

[Figure 3.3 here]

[Figure 3.4 here]

The idea of 'marriage as a wonderful institution' plays an instrumental role in shaping cultural norms that are practiced historically. Religions and castes are also part of this institution. A popular Hindu (the major religion in India) belief is that a person is incomplete and unholy as long as (s)he is not married (Prakasa, 1982). According to the 1981 census, 99 percent of Indian men aged 25, and women aged 20, were married (Rao, 1993). As discussed earlier, marriage is a family affair in India rather than a union of two persons - children's parents decide the age of marriage, use their social networks in finding partners who satisfy the sacramental sanctities such as socioeconomic status, religion, and caste. Typically, the prevalence of inter-caste and inter-religion marriages is low in India (see Figure 3.5), which could have been a possible driver for removing barriers related to the socio-religious inequalities (Deolalikar & Rao, 1998; Banerjee et al., 2013). This has long-term economic consequences in terms of human capital accumulation and development (Fernández & Rogerson, 2001).

[Figure 3.5 here]

Historically, there is a regional difference in financial transfers between families during marriages. First, the practice of bride price (a marital wealth transfer from groom's family to bride's family) was popular among the "High-Caste" Hindus in South India (Srinivas, 1989). On the other hand, the practice of dowry is more of a North Indian custom (Kolenda, 1987). In the Hindu ideology, dowry is considered as a voluntary *dakshina* (financial and other gifts) during the act of *kanyadaan* (giving away daughters). But over time, dowry has become a "social evil" - sometimes even obligatory for a marriage. There are contesting theories (see Table 3.1) on the evolution and modern practices of dowry, as summarized by Chiplunkar & Weaver (2019). First, the *Sanskritization* hypothesis (Srinivas, 1956)

argues that in an attempt to advance on the social ladder, the "Lower-Caste" Hindus, for example, *Shudras* (the laborers) and *Achhuts* (the "untouchables") simply started to imitate the dowry practices of "High-Caste" Hindus, for example, *Brahmins* (the priest), *Kshatriyas* (the warrior), and *Vaishya* (the trader). Secondly, Becker (1973) sees dowry as a competitive market clearing price paid for marriages. Third, there exists a marriage squeeze - a competitive market of scarce grooms and surplus brides; which raises the effective "price" of a marriage, in this case, dowry (Caldwell et al., 1983; Rao, 1993). Fourth, Anderson's (2003) modernization explanation theorizes that in case of a positive assortative match based on the wealth of a bride's family and the (earning) capability of a groom, the amount of dowry becomes key. Fifth, according to Botticini and Siow (2003), dowry is a pre-mortem bequest from the altruistic parents to their daughters, which is partially motivated by the gender-biased inheritance laws. Sixth, bargaining over the amount of dowry in a standard search and match model of "marriage market" happens due to the human capital differentials, which eventually translates to the differences in earnings. Finally, due to the societal pressure of "keeping up with the Joneses" dowry is widely practiced (Bhalotra et al., 2018). There are other economic and non-economic possibilities as well, that are discussed by Chiplunkar and Weaver (2019).

[Table 3.1 here]

The question of why dowry (?) has been the central focus of social scientists for a long time. Also, there is a considerable amount of literature focusing on the consequences of dowry. This study aims to identify the possible linkages between dotal (dowry-paying) heterosexual marriages and women's educational attainment in a country like India, where there is a significant gender disparity in terms of human capital accumulation (see Figure 3.6).

[Figure 3.6 here]

The essay is organized as follows. Section 3.2 discusses an analytical background for the discourse of dowry and human capital. Section 3.3 introduces two sources of data: (1) India Human Development Survey (IHDS) and (2) Rural Economic and Demographic Survey (REDS). Section 3.4 talks about the empirical models and identification strategies based on the legislative reform at the individual level. Results are discussed in section 3.5. The essay concludes in section 3.6 summarizing the takeaways.

3.2 An Analytical Background

The economics of "marriage market" sees dowry as a hedonic price that neutralizes the differences between a bride's qualities and that of a groom. Following Rosen's (1974) implicit market modelling, we say that both the bride's and groom's family maximize their respective utilities as if they are homogeneous in terms of intra-family choices. The bride's (or, groom's) household utility is a function of its own characteristics, a vector of household consumption and a groom's (or, bride's) household characteristics; which is maximized subject to a budget constraint involving own family wealth and dowry (or, bride price). Essentially, the bride's household faces an intertemporal utility maximization, where a trade-off exists between the bride's educational attainment (given the groom's human capital) and the amount of dowry (see Becker & Tomes, 1976; Rao, 1993; Khan et al., 2019). From the existing literature, we can map a few possibilities linking dowry and women's educational attainment (see Figure 3.7).

3.2.1 Possibility 1: A "Good" Equilibrium

A representative woman is highly educated with the highest level of skills, and a perfect matching occurs without any dowry. Although this maximizes a bride's family utility, the utility of groom's family is uncertain. But, overall, this is a socially desirable outcome if we view dowry as a "social evil." As a lemma to this case, the

amount of dowry deceases with the educational attainment of a woman - a bride pays lesser dowry as her human capital increases (Foster & Rosenzweig, 1999).

3.2.2 Possibility 2: A "Bad" Equilibrium

A representative woman is not educated with (near) zero level of skills, and imperfectly matched with a highly educated groom where dowry payment is obligatory. This is not a socially desirable outcome and a typical case of extreme educational hypergamy. And if a tradition of high dowry payment exists, it hampers women's educational attainment.

3.2.3 Possibility 3: A "Not So Good" Equilibrium

A representative woman is moderately educated with a moderate level of skills, and imperfectly[1] matched with a moderately educated groom. This is a socially desirable outcome as the woman is somewhat educated; but this is not socially optimum as the incidence of dowry still remains. As a lemma to this case, there is a scope for dowry viewed as a groom price and opens up a possibility of sophisticated educational hypergamy at the upper portion of the ladder. Essentially, the amount of dowry may increase with the educational attainment of a woman - a bride pays higher dowry as her human capital increases. It may seem counterintuitive, but it has two components: (1) a highly educated and skilled woman enters a truncated "marriage market" with limited options for choosing a groom (Lahiri & Self, 2008), and (2) a compensation to groom's family is paid to avoid the tradition of patrilocality (Dasgupta & Mukherjee, 2008).

[1] Here, "imperfectly" refers to the social stigma and/or any exogenous factors promoting dotal marriages.

3.2.4 Possibility 4: Dowry ≠ f(Women's Education)

If the theory of altruistic parents' pre-mortem bequest for their daughters is valid to its full extent, then dowry is independent of the women's educational attainment. Also, it should not depend on the groom's human capital either (Botticini & Siow, 2003).

[Figure 3.7 here]

Most of the dowry studies limit their approach by analyzing a direct relationship between the amount of dowry and women's educational attainment. And, there are a number of studies which support possibility 3, that is, a bride pays higher dowry as her human capital increases (Rao, 1993; Dalmia & Lawrence, 2005). But addressing the plausible endogeneity associated with the dowry is crucial in order to understand the implications for human capital investment for girl children in a societal structure like that of India.

3.3 Sources of Data and Key Variables

This essay uses the 2011-12 India Human Development Survey (IHDS) and 2006-2009 Rural Economic and Demographic Survey (REDS) datasets.

3.3.1 IHDS 2011-2012

The India Human Development Survey-II (IHDS-II), 2011-2012 is a nationally representative, multi-topic survey of 42,152 households in 1,420 villages and 1,042 urban neighborhoods across India. The households are mostly panel of those who were interviewed in the IHDS-I in 2004-2005. The IHDS is a collaborative research program of the National Council of Applied Economic Research (NCAER) and the University of Maryland. This survey records both household-level and individual-

level responses to questions regarding education, marriage practices and perception about marital transfers (Desai & Vanneman, 2018).

3.3.2 REDS 2006-2009

The Rural Economic and Demographic Survey (REDS), 2006-2009 is a nationally representative, multi-topic survey of 16,382 households in 242 villages in the 17 most populous states across India. The REDS is a periodic survey program of the National Council of Applied Economic Research (NCAER), and so far four rounds of data are collected - 1971, 1982, 1999, and the latest in 2006-2009. The households in the latest round are also mostly panel of those who were interviewed in 1999. This survey records both household-level and individual-level responses to questions regarding education, marriage practices, and actual marital transfers (Anukriti et al., 2019).

3.3.3 Sample Selection

First, we use each dataset to answer different research questions. For example, for the initial part of this study we aim to identify possible linkages between dotal marriages and women's educational attainment - for this we use the IHDS 2011-2012 data as it provides information on perception about marital transfers. And, for the latter part where we evaluate the impact of legislative reforms - we use the REDS 2006-2009 data, which records the actual monetary value of marital transfers. To keep a parity between analyses from two datasets, we restrict our sample to rural India only.

For the IHDS 2011-2012 data, we cherry-pick rural households with at least one girl children aged between 5 years and 21 years at the time of survey. The reason behind this is that the Indian children start their schooling around the age of 5, on average; and by the age of 21, their undergraduate education is completed (or, expected to be completed). Also, as per the 2011 Census data, the mean age at

marriage is 21.2 for women. Thus, the decision of human capital investment for girl children is mostly undisturbed by the preferences of their potential groom's families. On the other hand, we restrict our REDS 2006-2009 sample to the Hindu, Buddhist, Jain and Sikh[2] women who were at least 21 years old (at the time of survey) and their mothers were 53 years or older at the time of survey.[3] Once again, the 21 years cut-off age ensures (or, is expected to ensure) an opportunity for undergraduate completion.

3.3.4 Key Variables in IHDS 2011-2012

As we focus on the human capital accumulation which is decided by the girl child's parents, the educational attainment[4] (measured in 0 to 15 years) is the primary variable of interest. For incorporating the role of cultural norms in regard to dotal marriages, it is important to anticipate the parents' expectation about dowry payments. Recent research suggests that parents of girl children in India respond to expected "lumpy" dowry by saving significantly much more in advance (Anukriti et al., 2019). This savings for dowry could have an impact on the parental decision about investing in their daughter's education. Hence, we rely on the IHDS information: "… for a family like yours, … how much cash … are given as gift at

[2] The purpose of restriction based on religion is discussed in section 3.4, where we introduce the role of legislative reform at the individual level.

[3] The reasoning behind 53 years or elder mothers is also discussed in section 3.4.

[4] It is important to note here that educational attainment measure is done by following the World Bank methodology (Psacharopoulos & Arriagada, 1986).

the time of the daughter's marriage?" (Desai & Vanneman, 2018) - we call this variable 'expected dowry.'[5,6]

In addition to these two key variables, we include all relevant covariates and controls at different levels, for example - age, educational attainment of the household head, the highest educational attainment of any adult woman in the household, land owned by the household, socio-religious groups, household size, number of male and female siblings, educational infrastructure at the district, media exposure and autonomy (decision-making power) of women in the household. Also, for endogeneity corrections and other robustness checks, we use a few additional variables, which are discussed in empirical model section 3.4.

3.3.5 Key Variables in REDS 2006-2009

Once again, the human capital accumulation for the girl children is proxied with the women's educational attainment[7] (measured in 0 to 15 years). The actual monetary value of marital transfers is retrospective information that we use from the REDS 2006-2009 dataset. There is a valid concern that this information may suffer from a recall bias. However, given the fact that marriage itself is a unique life event, it is unlikely that respondents' recalls are significantly biased. But, there is another serious concern of over- and/or under-statement of the dowry amount. By exploiting the panel nature of the REDS data, we rule out such possibilities of

[5] The average 'expected dowry' values almost x20 of the average household income per year. This once again confirms that the bride's family faces a crucial trade-off between human capital investment and savings for dowry. In fact, both the REDS 2006-2009 and IHDS 2011-2012 data suggest that the 'expected dowry causes (especially) fathers to significantly increase their labor supply, measured in working hours (see Anukriti et al., 2019).

[6] Value of 'expected dowry' is measured in real terms using the Consumer Price Index (CPI) for agricultural workers as the deflator (Base: 2010 = 100): hereby, in 2010 Indian Rupees (INR).

[7] Once again, the educational attainment measure follows the World Bank methodology (Psacharopoulos & Arriagada, 1986).

temporal biases and measurement errors,[8] and we use the REDS 2006-2009's 'actual dowry' information for all analyses.[9]

Other than these two primary variables of interest, we also use variables such as age at marriage, parental education, household size, number of male and female siblings, land owned by the natal household, whether inherited any land, father's year of death, and all other relevant covariates and controls at different levels.[10]

3.4 Empirical Models and Identification Strategies

This essay initially concentrates on estimating the women's educational attainment and how that is affected by the 'expected dowry', be written as: $Y_i = \beta_0 + \beta_1 D_i^E + \eta_i X_i + \eta_h X_h + \eta_d X_d + \varepsilon_i$; where Y_i is the educational attainment of the woman i and D_i^E is her 'expected dowry' - hence, β_1 is our coefficient of interest. X_i denotes the individual level covariates, X_h represents the household level covariates, and X_d are the district level covariates. ε_i are the associated errors.[11]

However, there is a plausible endogeneity related to the 'expected dowry', that is, the women's educational attainment might affect the expectation about the future dowry amount. In that case, a typical Ordinary Least Squares (OLS) estimator for β_1 would be biased. Hence, we model the 'expected dowry' amount

[8] For identifying any systematic biases in dowry recalls, we compare between two waves: (1) the 1999 wave and (2) the 2006-2009 wave. We perform a simultaneous-quantile regression of the dowry distribution (25^{th}, 50^{th}, and 75^{th}) for 5-year periods with state fixed effects, across two different waves. Based on the results, we reject the possibility of any significant biases in the retrospective information collected in the REDS data.

[9] Value of 'actual dowry' is also measured in real terms using the Consumer Price Index (CPI) for agricultural workers as the deflator (Base: 2010 = 100): hereby, in 2010 Indian Rupees (INR).

[10] Once again, the purpose of using these variables is discussed in section 3.4, where we discuss the role of legislative reform at the individual level.

[11] Fixed effects are applied for the states and birth cohorts. State-specific linear trends are also accounted for.

as follows: $D_i^E = \alpha_0 + \alpha_1 Y_i + \gamma_i X_i + \gamma_h X_h + \gamma_d X_d + \gamma_S S + \xi_i$; where S is any exogenous shifter of 'expected dowry.' α_1 is the coefficient capturing the effect of educational attainment on the 'expected dowry' amount D_i^E, and γ_S is the coefficient of interest indicating the impact of exogenous shifter on D_i^E.

Identifying the potential scenario of reverse causation, we rely on the literature of bi-directional causality, where the regressor causally affects the key dependent variable and receives a causal impact from the same regressand (Basu, 2015). In such cases, the sign of the asymptotic bias in the OLS estimator β_1 becomes useful: $Sign\ of\ asymptotic\ bias\ in\ \beta_1 = Sign\left(\frac{\alpha_1}{1-\alpha_1\beta_1}\right)$. In case the bias is positive (or, negative) then the OLS provides an upper (or, lower) bound of true partial effect. In case where α_1 and β_1 are non-zero and of the opposite signs, then $Sign\ of\ bias\ in\ \beta_1 = Sign\ (\alpha_1)$.[12] On the other hand, if α_1 and β_1 are of the same sign, the bias depends on whether $(1 - \alpha_1\beta_1) \gtrless 0$ (see Basu, 2015 for more details).

3.4.1 Endogeneity Issues: Instrumental Variable (IV)

It may be the case that gender progressive and altruistic parents inherently invest more in their daughter's human capital, and also, out of the bequest motive, give away physical capital for her future securities. Hence, we must address this endogeneity with some exogenous factors S that do not possess the first-order direct impact on the (parental decision of) human capital investment for the girl children but would definitely affect the amount of 'expected dowry.' We exploit the IHDS 2011-2012 data for identifying two such exogenous shifters.

[12] In case $\alpha_1 > 0$, the 'expected dowry' shoots up with a potential increase in the women's educational attainment, which implies an increased marginal cost of education, and essentially translates in to either (a) investment reluctances in girl child's human capital, or (b) dowry viewed as a groom price only. As a result, $\beta_1 < 0$ - this is the possibility 3: a "not so good" equilibrium. On the other hand, if $\alpha_1 < 0$, then the altruistic parents would invest more in their daughter's education, in turn it will produce $\beta_1 > 0$, that is an expectation of higher future dowry leads to an increase in the women's educational attainment - this is the possibility 1: a "good" equilibrium.

IV 01: Suitable Boys in the Neighborhood

We find evidence for a stable trend that the rural "marriage market" is highly concentrated within the natal district of the brides - about 83 per cent of the marriages that occurred between 1970-2010 are within the same district, and 95 percent of these marriages are intra-*jaati* (within the same sub-caste). Hence, we calculate the proportion of marriageable men and call this measure "suitable boys in the neighborhood"[13]. Theoretically, if the supply of marriageable men is higher, a downward movement occurs along the demand curve for 'expected dowry', which in turn, reduces the price of actual dowry. On top of that, this proportion of "suitable boys in the neighborhood" also proxies for the social networks, which is highly instrumental in the Indian "marriage market" (as discussed in the introduction section).

IV 02: Expected Dowry $(-i)$

Following Aizer (2010) and Makino (2019), we construct another instrument called "expected dowry $(-i)$": $\overline{D^E_{ids}} = \frac{1}{n-1}\sum_k D^E_{k-i}$; where $\overline{D^E_{ids}}$ is the mean value of 'expected dowry' as indicated by other respondents in the same district d and from the same socio-religious group s, except for the respondent representing i. $\overline{D^E_{ids}}$ does not affect the human capital decision for i but affects the amount 'expected dowry' of i. Theoretically, if others from the same socio-religious groups in the same district

[13] By "suitable boys", we refer to the potential matches within the same socio-religious groups - Hindu *Brahmins*, Hindu STs, Hindu SCs, Hindu OBCs, and Muslims, having an age differences of +3 years (at the time of survey). The reasoning behind +3 years is that the average age difference of a representative wife and her representative husband is +3.19 years according to the IHDS 2011-2012 data. And, "neighborhood" simply means the natal district for the girl children. An example: for an 18 years old Hindu *Brahmin* girl in the *Birbhum* district of West Bengal, we calculate the proportion of 18+3=21 years old Hindu *Brahmin* boys within West Bengal among all unmarried men (at the time of survey) living in *Birbhum* district. To avoid any loss of information due to primary sample selection (as discussed in the data section) we use the full information dataset for calculating this instrument variable. We also conduct a sensitivity analysis comparing the effects of proportion of marriageable from the limited observations model and the full observations model - the results are similar and consistent, and available upon request.

are paying higher dowries, it creates a “keeping up with the Joneses” effect in the “marriage market” (as discussed in the introduction section).

Apart from the above, it is also key to address the role of any/all gender progressive legislative reforms as the sources of exogenous variation.

3.4.2 Legislative Reforms at the Individual Level

(A) Anti-Dowry Laws

1961: Dowry Prohibition Act

In an attempt to abolish the dowry culture, the Government of India (GOI) enacted the Dowry Prohibition Act in May 1961 (see Figure 3.8). The law defines a dowry as “any property or valuable security given or agreed to be given either directly or indirectly (a) by one party to a marriage to the other party to the marriage or (b) by the parents of either party to a marriage or by any other person to either part to the marriage or to any other person at or before or any time after the marriage in connection with the marriage of said parties.” Also, the punishment was either a fine of 5,000 INR or six months in the prison (GOI Act # 28 of 1961, 1961). Despite this legislative reform, dowry continued to be a cultural norm in Indian weddings. Chowdhury (1998) argues that provisions in the 1961 Act were fundamentally weak and insufficient for actual prosecutions.

1985: Dowry Prohibition Amendment/Rules

With a rising number of dowry related deaths and violence, a contemporary feminist movement starts in India in the late 1970s (Majumdar, 2005). As a response, the GOI amends the original 1961 Act by updating some of the provisions, such as increasing the punishment up to 15,000 INR or five years of imprisonment (with a clause of non-bailable offences). Also, a list of gifts or presents exchanged is supposed to be maintained by both the bride’s and the groom’s families (GOI Act

63 of 1984, 1085)[14]. A few studies show that there was a sharp increase in the court cases related to dowry disputes (e.g., Menksi, 1998; Alfano, 2017).

2005: Protection of Women from Domestic Violence Act

Given the high persistence of dowries and dowry-related crimes, the GOI finally brings a comprehensive legislative reform in 2005 which promises to provide immediate actions and civil remedies (GOI Act # 43 of 2005, 2005).

[Figure 3.8 here]

There are a number of researchers who examine the effect of the impact of these anti-dowry laws on dowries and other outcomes of interests. For example, Alfano (2017) confirms that the 1985 amendment can be associated with a significant decline in both gross and net[15] dowry payments. Also, these reforms are found to improve the sex-ratios and some degree of changes in parental preferences for a boy child (Bhalotra et al., 2020). But, recent studies show that abolishing dowry has some 'unintended consequences' as well, such as the intra-household allocation of resources to married women has substantially decreased, which also indicates a 'feminization of poverty' (Calvi & Keskar, 2020).

In a related but different context, Roychowdhury and Dhamija (2021) provide causal evidence that the violation in the nature of hypergamous marriages has triggered the incidences of domestic violence. We find suggestive evidence that the tradition of hypergamy somewhat flattens out in the post-1985 marriages (see Figure 3.3), but India might not be special as there is a worldwide advance in women's education. Esteve et al. (2012) confirm that there is a trend reversal of

[14] These amendments came in to effect from October 02, 1985, These rules do not apply to the marital payments in a wedding where the Muslim Personal Law (*Shariiat* laws) are in effect.
[15] $Gross\ dowry = dowry\ paid$, and $Net\ dowry = dowry\ paid - brideprice\ received$.

educational hypergamy in most of the countries over the last few decades (see Figure 3.9).

A recent study by Agarwal (2020) reveals a striking Indian tradition, where, for women, it is much easier to inherit land as a widow than as a daughter. Hence, we are intrigued by the question of whether dowries, in fact, may serve as pre-mortem bequests and what are the implications for women's human capital accumulation and bargaining power *aka* the economic right to property ownership. The intergenerational transfers of physical and human capital are directly associated with long-term development (Blinder, 1973; Becker & Tomes, 1979). And, it has far-reaching importance for the developing economies thriving for a more gender-progressive society, like that of India (World Bank, 2012).

[Figure 3.9 here]

(B) Inheritance Law Reforms

The underlying cultural and gender dynamics of the inheritance laws across societies are complex. But, targeted policies (based on equity and efficiency) in favor of women are considered gender progressive (Duflo, 2003). In India, the inheritance laws mostly differ by (1) religion and (2) types of property. For Hindus, two schools of law exist, (a) *Dayabhaga*, where a son (widow or daughter in the absence of son) inherits the property only after his father's death (practiced in the states of West Bengal and Assam) and (b) *Mitakshara*, where a son has the right to inherit the property 'by birth' (Carroll, 1991). The *Mitakshara* differentiates between two types of property, (1) individual property and (2) joint ancestral property, including land. It is true to some extent that with *Dayabhaga*, women had a greater probability of inheritances (Agarwal, 1995). But, overall, both the systems were patrilineal and inherently biased against women (Deininger et al., 2012).

1956: Hindu Succession Act

In an attempt to remove the existing gender disparity, in 1956, the GOI codifies the Hindu Succession Act (HSA) that applies to intestate inheritances[16] (see Figure 3.10). According to the HSA 1956, Hindu daughters have equal inheritance rights (to that of her brothers) to individual property and a notional portion of joint ancestral properties (GOI Act # 30 of 1956, 1956; Roy, 2015). Here, the idea of coparcenary is key, where a typical patrilineal dynasty is considered mainstream. The male line of coparceners receives their share of joint ancestral properties as if a hypothetical distribution takes place among all male and female heirs, where a daughter gets none of it since she 'settles in her conjugal family.'[17] In a nutshell, though the HSA 1956 intends to fight for women's inheritance rights, it fails to make women coparceners.

1976 – 1994: Hindu Succession Act Amendments

To eliminate this legal loophole of coparcenary, state governments started amending the original 1956 HSA. The first state was Kerala in 1976, which abolishes the system of joint ancestral properties altogether and assigns equal share to all legal heirs, irrespective of gender. Following which, a few other states amended a provision of direct and gender equal inheritance rights 'by birth': Andhra Pradesh in 1986, Tamil Nadu in 1989, Karnataka and Maharashtra in 1994.[18,19] Though each amendment was different in minute details, they were very similar in

[16] Intestate succession refers to the absence of any property will, which, in a way, strengthens the *Mitakshara* idea of right to inherit 'by birth.'

[17] Think of this notional/hypothetical distribution as an apple pie divided among five members (three sons and two daughters), but the pie is being enjoyed by three members (sons) only since the other two members (daughters) 'may eat pie elsewhere.'

[18] It is interesting to note that all these states are the southern states, which historically have a reputation of being gender progressive societies (with higher human capital accumulation).

[19] In 2005, GOI enacted HSAA for all India, except Jammu & Kashmir (GOI Act # 39 of 2005, 2005).

the spirit. We may lump? them together and refer to them as the Hindu Succession Act Amendments (HSAA). One of the biggest contributions of the HSAA is that the daughters' share is no more notional/hypothetical and cannot be taken away (by a will or forcefully) by the patrilineal dynasty. But there is a caveat to the HSAA as this equal coparcenary rights to the daughter applies only if she was unmarried at the time of reform.[20]

[Figure 3.10 here]

3.4.3 Identification Strategies

(A) Sample Selection *Revisited*

The HSAA 1976-1994 allows us to explore the impacts of these legislative reforms on women's human and physical capital, in a natural experiment setup. We use the REDS 2006-2009 data which contains information on education, marriage practices, and actual marital transfers (in retrospect). As briefly discussed in the section of sample selection, we restrict our sample to the Hindu, Buddhist, Jain and Sikh women who were at least 21 years old at the time of survey. First, the HSAA applies to Hindus, Buddhists, Jains, and Sikhs only.[21] Secondly, the 21 years cut-off age ensures (or, is expected to ensure) an opportunity for undergraduate completion. Thirdly, we also restrict our samples to landed households only, because land is the primary joint ancestral property commonly held in rural India. Finally, to rule out any intergenerational spillover or confounding factors related to HSAA, we restrict the samples to the daughters, whose mothers were 53 years or older at the time of survey. This cut-off ensures that the samples' mothers remain unexposed to the potential benefits of HSAA. Since the average age at marriage for women is around 21 in the REDS dataset, a mother has to be at least 21 years old

[20] Once again, the tale of 'eating pie elsewhere' continues.

[21] Almost 93 per cent of women in the full REDS dataset belong to these four religions.

in 1976 (when the first HSAA happened in Kerala). Hence, that mother's age would be at least 53 years in 2008.[22] These four sample selection criteria leave us with 5,005 observations (Hindu, Buddhist, Jain and Sikh women), who were at least 21 years old in 2008, whose mothers were at least 53 years old in 2008, and whose households had land as joint properties.

(B) Identification

We employ the identifications as the exposure of HSAA 1976-1994 can be determined by three non-trivial factors, namely

(1) *State of birth*: a woman is born in an HSAA amended state,
(2) *Year of birth*: a woman is young and unmarried[23] when her natal state passed the HSAA; and
(3) *Father's year of death*: a woman's father is alive at the time of state amendment.

These three altogether decide whether a woman is eligible to receive benefits of the legislative reforms via HSAA 1976-1994. Hence, the causal impact of HSAA can be identified with a triple differences or difference-in-difference-in-difference (DDD) estimation.[24]

The treatment group consists of women who were ≤ 18 years old with a living father at the time her natal state passes the HSAA, while other women are in the control group. We select the cut-off for ≤ 18 years as this is the legal age for

[22] For the 2006-2009 wave, about 85 per cent of the REDS were conducted in 2008. Hence, a representative mother has to be $(2008 - 1976 + 21) = 53$ years old in 2008 (following Roy, 2015).

[23] The reason we choose the *year of birth* instead of an identification based on the marital status (say, *unmarried at HSAA*), is to avoid a serious bias of self-selection, e.g., a woman could decide not to marry if she is expecting a reform soon, given her father is alive.

[24] The key identifying assumption is *father's year of death*: if there was no inheritance law reform, there would not be any systematic differences between the outcomes for women whose father dies before the reform and after the reform.

women to be married (see Figure 3.11). Balance tests for pre-HSAA trends are carried out at different levels, such as (a) between the treated and control states, and (b) within the treated states, but between the households where a father dies pre-HSAA versus post-HSAA. All key variables and covariates are systematically indifferent except the age of parents, as households where the father dies post-HSAA are inherently much younger than the households where the father dies pre-HSAA.

[Figure 3.11 here]

Given the triple differences framework, following Roy (2015) we estimate: $Y_{ist} = \alpha_s + \delta_t + \gamma_s t + \beta_1 \omega_{is(t \geq t_s - 18)} + \beta_2 F_i + \beta_3 \omega_{is(t \geq t_s - 18)} * F_i + \eta \overrightarrow{X_{ist}} + \varepsilon_{ist}$; where Y_{ist} is the relevant dependent variable for a woman i who is born in state s, in the year t. So, $\omega_{is(t \geq t_s - 18)}$ is a binary indicator for a woman i of the birth cohort t, who is ≤ 18 years old at the time of HSAA in her natal state t_s (1), zero otherwise. F_i is also a binary indicator whether the father of woman i dies pre-HSAA (0) or post-HSAA (1). Our coefficient of interest is β_3 that captures the causal impact of HSAA on women in the treatment group as compared to the control group. α_s are the usual state fixed effects that capture time-invariant state-specific characteristics; δ_t account for the birth cohorts fixed effects, ruling out the possibilities of confounding effect due to any macro-level disturbances/shocks; $\gamma_s t$ represent the state-specific linear trends by the birth cohort; $\overrightarrow{X_{ist}}$ is a vector of household level controls; and ε_{ist} are the associated errors.

3.5 Empirical Results and Discussions

First, the direct relationship between educational attainment and 'expected dowry' is estimated with the OLS model: $Y_i = \beta_0 + \beta_1 D_i^E + \eta_i X_i + \eta_h X_h + \eta_d X_d + \varepsilon_i$ (as discussed in section 3.4). Y_i is the educational attainment of the woman i and D_i^E is her 'expected dowry' - β_1 is our coefficient of interest. X_i denotes the individual

level covariates, X_h represents the household level covariates, and X_d are the district level covariates. ε_i are the associated errors. Fixed effects are applied for the states and birth cohorts. Robust two-way clustered (at the district and household levels) standard errors are calculated.

3.5.1 Results: Ordinary Least Squares

The OLS results are presented in Table 3.2. Most of the covariates seem to have expected linkages to women's educational attainment. For example, with rising age, a girl child is more likely to get higher education. Education levels of the household head and the highest educated woman in the family influence the girl child's educational attainment. On the other hand, historically "backward" socio-religious groups, such as Hindu STs, SCs, OBCs, and Muslim girl children are likely to be less educated than their *Brahmin* peers. A greater number of siblings negatively affect women's educational attainment.

Most importantly, the 'expected dowry' has a significant and positive impact on the women's educational attainment, thereby suggesting as the expectation about future dowry amount rises, parents tend to invest more in girl child's human capital. But, this estimate of β_1 could be biased (as discussed in section 3.4) and we address the endogeneity correction with an instrumental variable approach.

[Table 3.2 here]

3.5.2 Results: Instrumental Variable (IV) Two Stage Least Squares (2SLS)

As discussed in section 3.4 and subsection 3.4.1, we model the first stage as follows: $D_i^E = \alpha_0 + \alpha_1 Y_i + \gamma_i X_i + \gamma_h X_h + \gamma_d X_d + \gamma_S S + \xi_i$. S is any exogenous shifter of 'expected dowry.' We choose two instrumental variables as a proxy to S, IV 01: "suitable boys in the neighborhood" and IV 02: "expected dowry $(-i)$." α_1 is the

coefficient capturing the effect of educational attainment on the 'expected dowry' amount D_i^E, and γ_S is the coefficient of interest indicating the impact of exogenous shifter on D_i^E. The second stage follows: $Y_i = \beta_0 + \beta_1{}^* \widehat{D_i^E} + \eta_i X_i + \eta_h X_h + \eta_d X_d + \varepsilon_i$.

The IV-2SLS results are presented in Table 3.3. Both the IVs are statistically significant and have expected directional effects. A negative coefficient of IV 01: "suitable boys in the neighborhood" indicates a reduction in the 'expected dowry' amount as the proportion of marriageable men increases. On the contrary, a positive coefficient of IV 02: "expected dowry $(-i)$" portrays the "keeping up with the Joneses" effect in the "marriage market" (as discussed in subsection 3.4.1).[25]

[Table 3.3 here]

Most importantly, we find that the 'expected dowry' has a negative and significant impact on the girl child's educational attainment, which supports the theory of increased marginal cost of education. Essentially, an expectation of higher dowry payment in the future hampers the present human capital investment for the girl children. The estimate of $\beta_1{}^*$ in Table 3.3 (IV 4 column) is -0.012, which implies a loss of 1.2 years of women's education. Other covariates seem to have expected linkages to the women's educational attainment. Results are consistent across different specifications per controls and fixed effects.

3.5.3 Robustness Checks and Sensitivity Analysis

We run a few checks for robustness and sensitivity for the results. First, the educational attainment variable most likely gets censored from both lower limit (0

[25] We perform multiple tests related to the endogeneity and the IVs. For identification of endogeneity in the 'expected dowry' variable, the Wu-Hausman *F-statistics* $F = 23.07$ ($p = 0.000$) suggest there is endogeneity problem. The Sargan-Hansen over-identification test ($p = 0.51$) suggests that we cannot reject the null of 'instruments are valid.' The Kleibergen-Paap *rk* Lagrange Multiplier (LM) test ($p = 0.01$) rejects the null of 'instruments are under-identified.' Because we cluster the standard errors at the district and household levels, we measure the first stage effective *F-statistics* ($F = 32.16$) following Olea and Pflueger (2013).

year) and upper limit (15 years). We run an IV-Tobit model to address this censoring issue (see Table 3.4). With this implementation, the estimates of β_1^* becomes more negative and remains significant. For example, the estimate of -0.018 in Table 3.4 (column 4) indicates a loss of 1.8 years of women's education due to an increase in the 'expected dowry.' We also check if these impacts are influenced by any extreme values in the 'expected dowry' amount. Thus, we take the logarithm of these values (see Table 3.5) and results remain consistent and significant.[26] We take a long shot at the implications to the case of educational hypergamy (the possibility 2, as discussed in subsection 3.2.2). With a Logit specification for all married samples,[27] we find suggestive evidence that an expectation of higher dowry payment promotes the practice of hypergamy (see Table 3.6).

[Table 3.4 here]

[Table 3.5 here]

[Table 3.6 here]

3.5.4 Results: Impacts of Inheritance Law Reforms

Results from alternative specifications of the DDD (as discussed in subsection 3.4.3) $Y_{ist} = \alpha_s + \delta_t + \gamma_s t + \beta_1 \omega_{is(t \geq t_s - 18)} + \beta_2 F_i + \beta_3 \omega_{is(t \geq t_s - 18)} * F_i + \eta \overrightarrow{X_{ist}} + \varepsilon_{ist}$ are presented in this subsection. Recall that Y_{ist} is the relevant dependent variable for a woman i who is born in state s, in the year t. $\omega_{is(t \geq t_s - 18)}$ represents a woman i of the birth cohort t, who is ≤ 18 years old at the time of HSAA in her natal state t_s. F_i is indicates whether the father of woman i dies the post-HSAA period. Our

[26] We also check if the consistency of results holds after dropping states one by one which have the unexpectedly higher 'expected dowry' on an average. Results are available upon request.

[27] These results are from all married samples. It does not fit the sample selection criteria of $5 - 21$ years girl children. One must not draw a causal inference here as it is a suggestive evidence only.

coefficient of interest is β_3 that captures the causal impact $\left[\omega_{is(t \geq t_s - 18)} * F_i\right]$ of HSAA on women in the treatment group as compared to the control group.

(A) Likelihood of Women's Land Inheritance

First, we analyze the impact of HSAA on the likelihood of a women's land inheritance. Y_{ist} is a binary indicator: $Y_{ist} = 1$ if a woman actually inherits land from her father, and $Y_{ist} = 0$ if she does not (see Table 3.7).

Results in Table 3.7 indicate no difference in the effects between the treatment group and control group, that is, there is virtually no impact of HSAA on the probability of women's land inheritance, as $\beta_3 = 0$ for $\left[\omega_{is(t \geq t_s - 18)} * F_i\right]$. This remains robust and consistent across different specifications, such as inclusion of the fixed effects for states, birth cohorts, and state-specific linear trends. Our results are in the line of previous evidence by Brulé (2012) and Roy (2015) but contradicts with the findings by Deininger et al. (2012).[28]

[Table 3.7 here]

(B) Amount of Actual Dowry Paid

Looking at the zero impact on the likelihood of women's land inheritance, we suspect that there might be an alternative channel of intergenerational transfer of physical capital, such as dowry as pre-mortem bequest (Botticini & Siow, 2003).

We take Y_{ist} as the logarithm of actual dowry payments at the time of marriage (measured in 2010 INR). Table 3.8 suggests that there is, indeed, a significant impact on the amount of dowry, but it is not what we expected - the proposition of alternative transfer via dowry seems not to be the case. Rather, across

[28] Deininger et al. (2012) focuses on Maharashtra and Karnataka only where HSAA happens in 1994. On the other hand, we use all different timing of HSAA in different states, which accounts for more external validity. For more discussion, see Chakraborty et al. (2021).

various specifications, we find robust and consistent indications that for the treatment group of women, the average dowry amount has fallen by 41 per cent to 48 per cent. This finding is consistent with the visual evidence of the 'dowry deflation' in the post-1985 marriages (see Figure 3.8).

This finding strongly suggests that a reform primarily aiming at establishing the equal economic rights for women *can* influence behavioral changes in cultural norms such as the (mal)practice of dowry.[29]

[Table 3.8 here]

(C) Women's Educational Attainment

Results from Table 3.7 and Table 3.8 create a missing link, that is, if the likelihood of women's land inheritance is not increased due to HSAA and the average dowry is declining as well - what could be the underlying form of intergenerational transfer? Is it human capital instead of physical capital? This question motivates us to look into the impact of HSAA on women's educational attainment.

Here, we take Y_{ist} as the educational attainment (0 - 15 years). We find that there is a significant and positive impact of HSAA on the educational attainment of the treatment group (see table 3.9). In fact, we see an additional 1.7 - 1.9 years of educational attainment on average.

Altogether, we get a viable explanation to the missing link that the inheritance law reform plays an instrumental role in the intergenerational transfers of capital. It is unfortunate and discriminatory that daughters are still being excluded from inheriting joint ancestral properties, but parents are 'compensating' them by investing more in their education.

[29] The term '(mal)practice' is used in the context of dowry as a "social evil."

[Table 3.9 here]

3.5.5 Robustness, Consistency and Placebo Tests

We run a few checks for robustness, falsification and placebos for our results. First, if there is an increase in women's educational attainment due to HSAA, it is most likely that there is a delay in women's age at marriage as well. Studies have shown that a rising age at marriage is causally associated with women's wellbeing such as bargaining power in the conjugal family, decline in domestic violence, etc. (Roychowdhury & Dhamija, 2021).

We take Y_{ist} as women's age at marriage. We find that there is a significant and positive impact of HSAA on the treated group of women's age(s) at marriage (see table 3.10). Results suggest that there is an average delay of 1.0 - 1.1 years of getting married. This finding further strengthens the results we get for a rising educational attainment for women due to the legislative reform on inheritance. Relying on the empirical evidence gathered, we formulate an implied mechanism for the impact of HSAA on intergenerational transfer of capital (see Figure 3.12).

[Table 3.10 here]

[Figure 3.12 here]

We also check if the results differ when an interaction variable ($State * Birth\,cohorts$) is introduced. The coefficient of interest, that is, β_3 for $\left[\omega_{is(t \geq t_s - 18)} * F_i\right]$ does not change, but the level effect for age specific indicators can no longer be identified. Results are reported in Tables 3.7, 3.8, 3.9, and 3.10. Though, theoretically, the DDD estimator is the causal difference between the actual difference-in-difference (DD) and the placebo DD, we check if the consistency of results holds after introducing an additional placebo, an alteration in the timing of state-specific HSAA, that is, hypothetical reforms at different times. We also perform robustness checks & heterogeneity analyses based on different

definitions of the 'treatment group' such as introducing a treatment of *unmarried at HSAA* (instead of *year of birth* treatment), age-group specific falsifications, etc. (following Brulé, 2012; Deininger et al., 2012; Goyal et al., 2013; Roy, 2015).[30]

3.6 Concluding Remarks

Using two sources of data, viz. IHDS 2011-2012 and REDS 2006-2009, this essay throws light on two important things: (1) the possible linkages between dotal marriages and women's educational attainment in rural India, and (2) if legislative reform at the individual level has any impact on the above relationship.

For the first research question, we establish a plausible endogeneity in the direct relationship between educational attainment and 'expected dowry.' We use an endogeneity-corrected IV-2SLS approach and find that the 'expected dowry' hampers women's educational attainment. A mechanism is established that an expectation about higher dowry disincentivizes parents to invest in a girl child's human capital which costs her about 1-2 years of education on average. Results indicate that among four possibilities, a "bad" equilibrium (and, to some extent, a "not so good" equilibrium) is a more likely phenomenon in India.

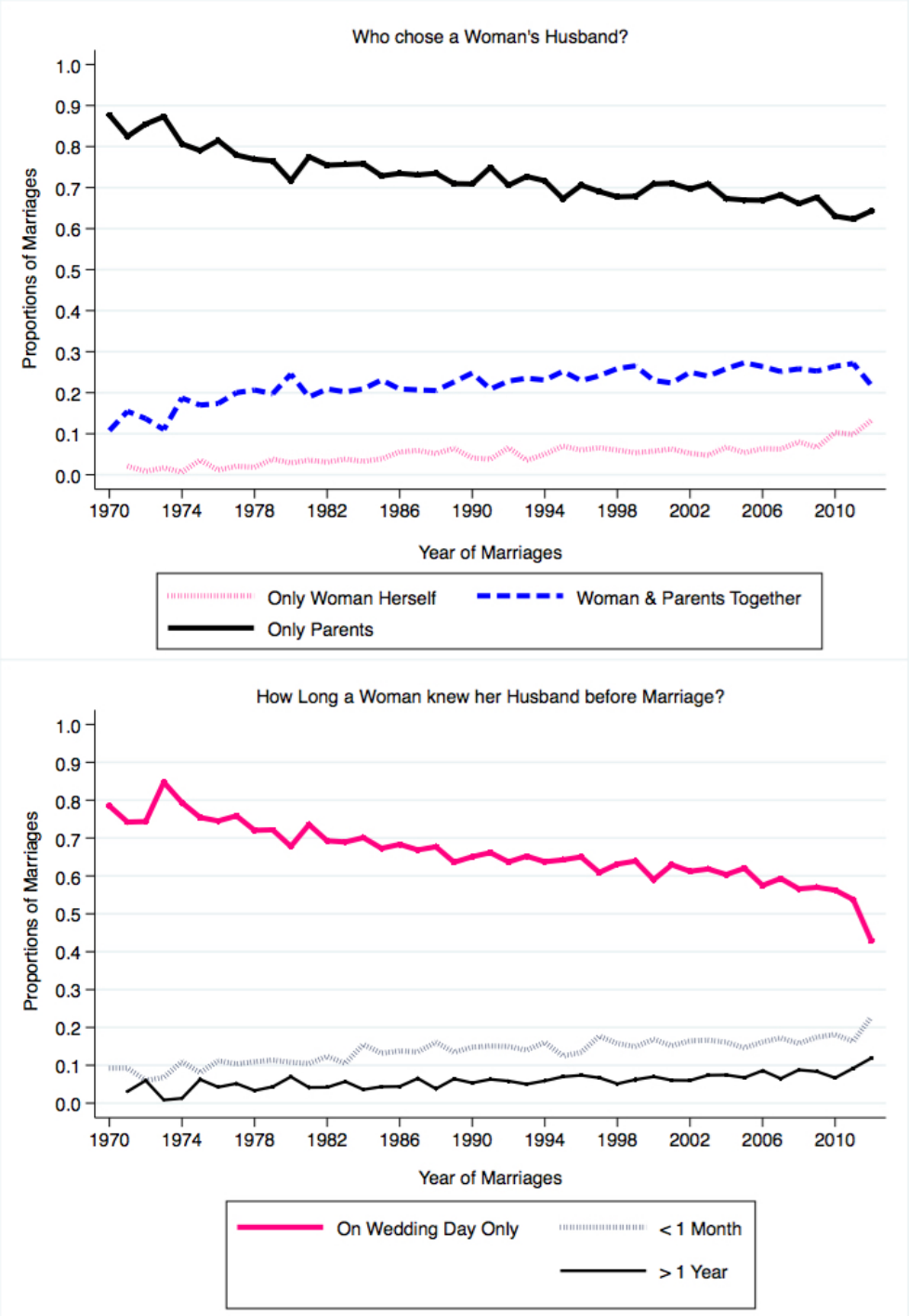
Our second research question concentrates on the legislative impact on the above relationship. We focus on the intergenerational transfers of capital and employ a triple differences setup to exploit the HSAA 1976-1994 state level reforms as a natural experiment. The findings suggest that the expected first order impacts of inheritance reform has not been materialized as Indian women are still being disinherited from their ancestral properties. This is a serious concern as several studies show that property ownership gives women not just economic rights but also positively influences their intra-household bargaining power. Brulé (2020)

[30] Our main set of results are in the line of Brulé (2012) and Roy (2015). For a very few sub-group analyses, we find similarities with the results of Deininger et al. (2012) and Goyal et al. (2013). The results are available upon request.

discusses that legislative reforms at the local government level can be effective in promoting gender equality, for example, women's political representation at the *Gram Panchayat* level can act as a credible lobby for women's inheritance rights. Nevertheless, this study also finds that due to HSAA, parents are more likely to invest in their girl children's human capital - so, there is some encouraging behavioral changes in cultural norms.

Figures and Tables

Figure 3.1 The “arranged” nature of Indian marriages

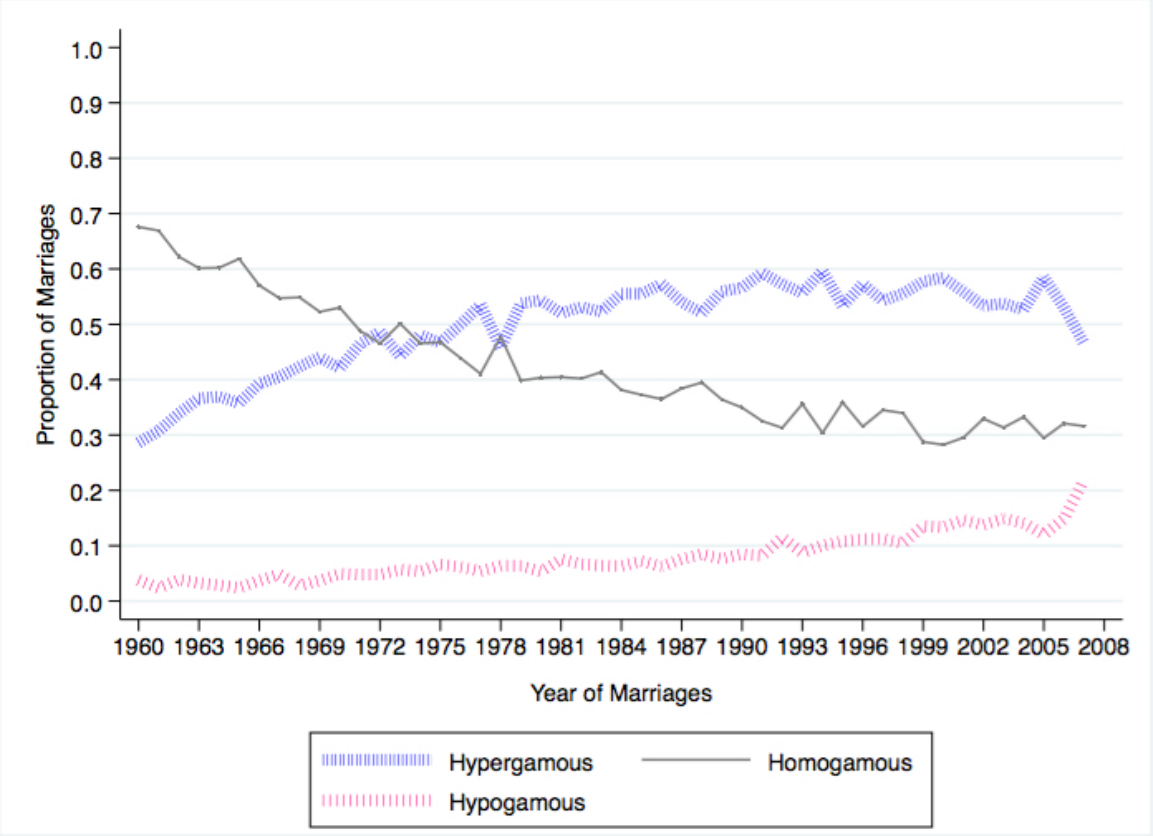


Source: Authors’ calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.2 The inherent patriarch of family formation

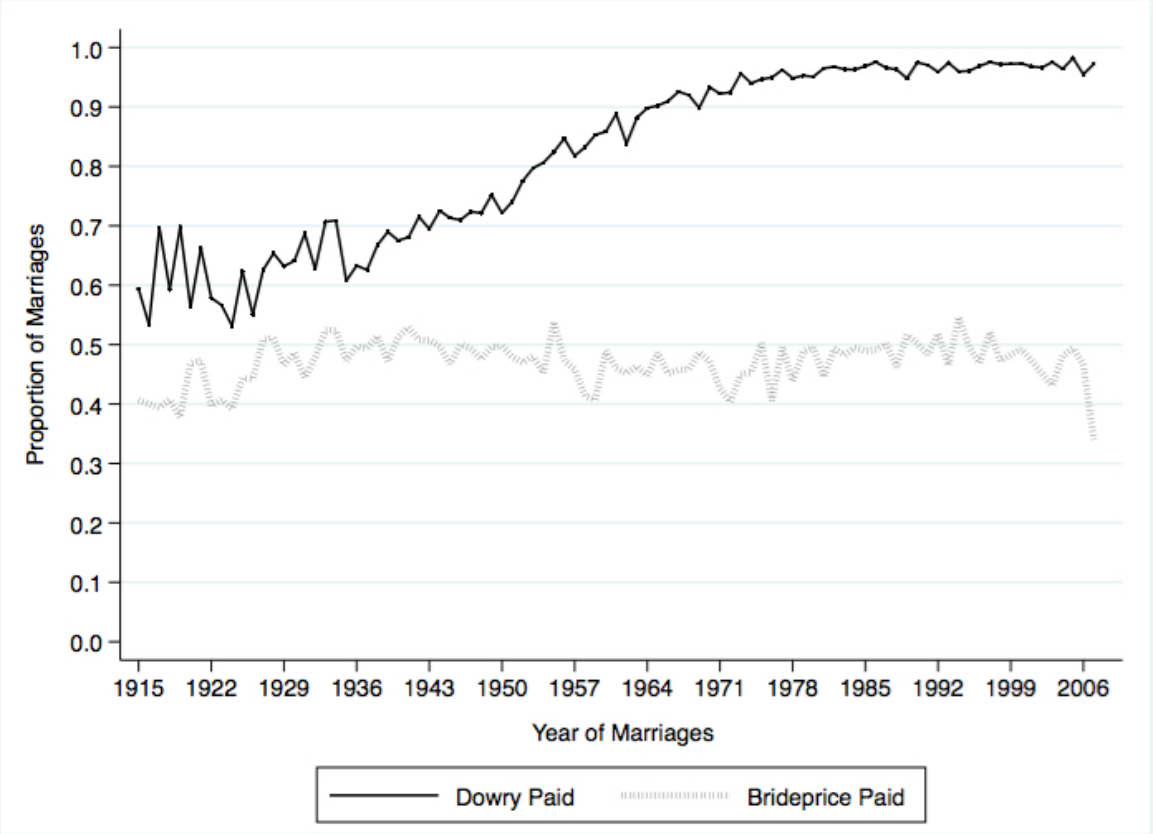
Source: Authors' calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.3 Educational hypergamy in the Indian marriages



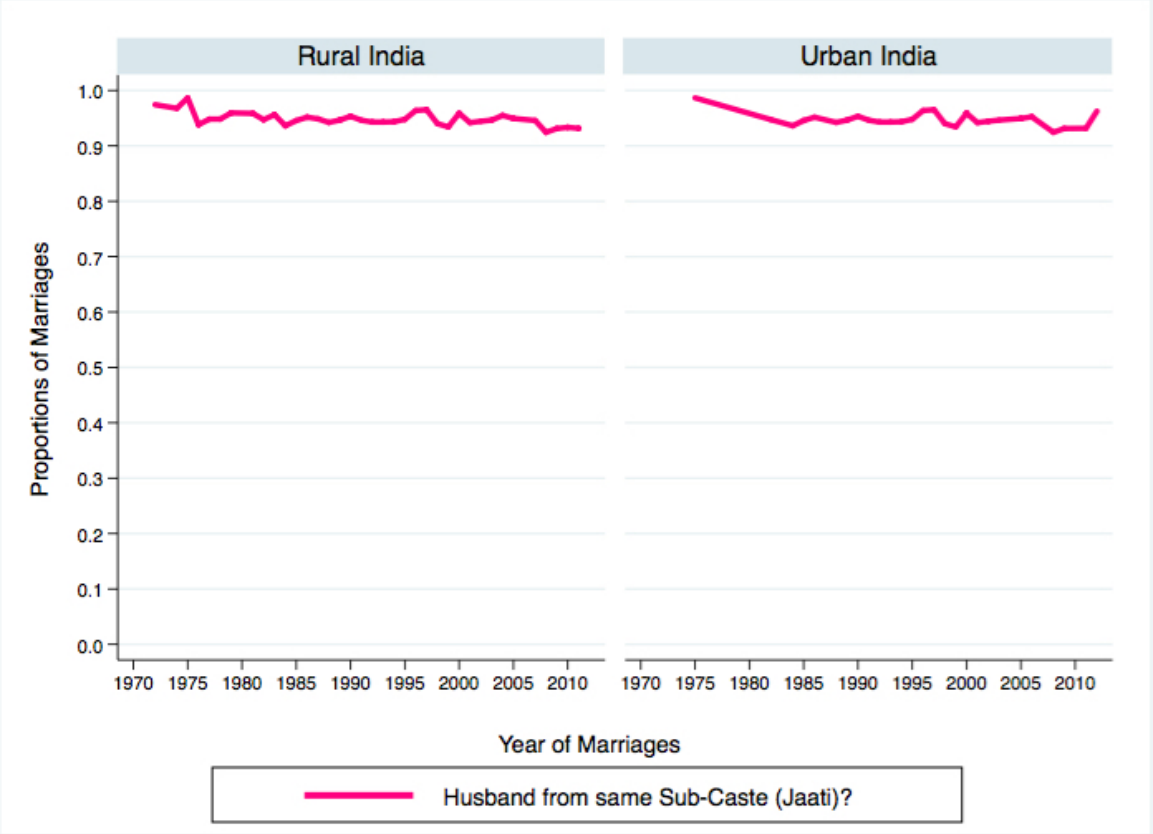
Source: Authors' calculation from the 2006-09 Rural Economic and Demographic Survey (REDS) data

Figure 3.4 The dotal (dowry-paying) marriages in India



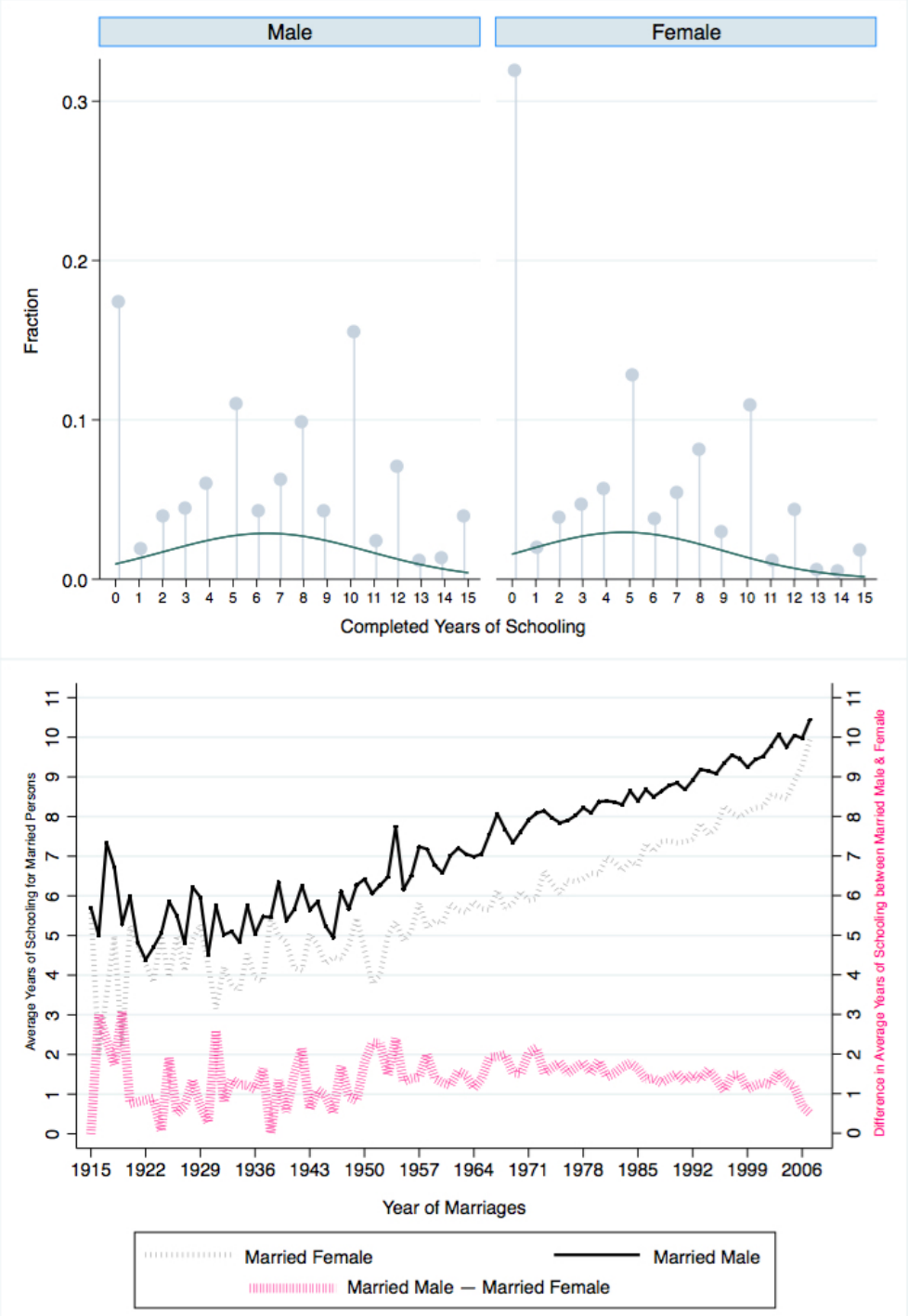
Source: Authors' calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.5 The caste aspect of Indian marriages



Source: Authors' calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.6 Gender disparity in terms of human capital accumulation



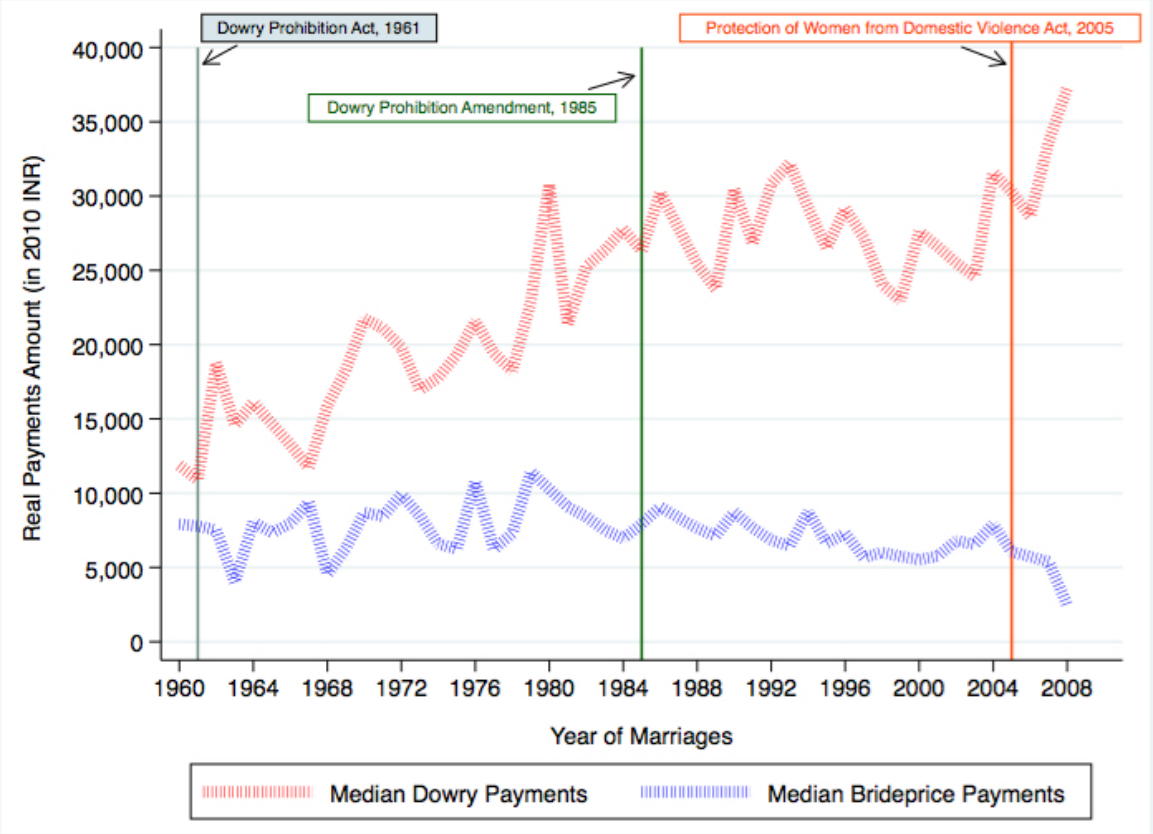
Source: Authors' calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.7 A few possibilities linking dowry and women's educational attainment

Educational attainment of women	Amount of dowry: **High**	Amount of dowry: **Low (≈ Zero)**
High	A "Not So Good" Equilibrium + Dowry ≠ *f* (Women's Education)	A "Good" Equilibrium + Dowry ≠ *f* (Women's Education)
Low (≈ Zero)	A "Bad" Equilibrium + Dowry ≠ *f* (Women's Education)	A "Not So Good" Equilibrium + Dowry ≠ *f* (Women's Education)

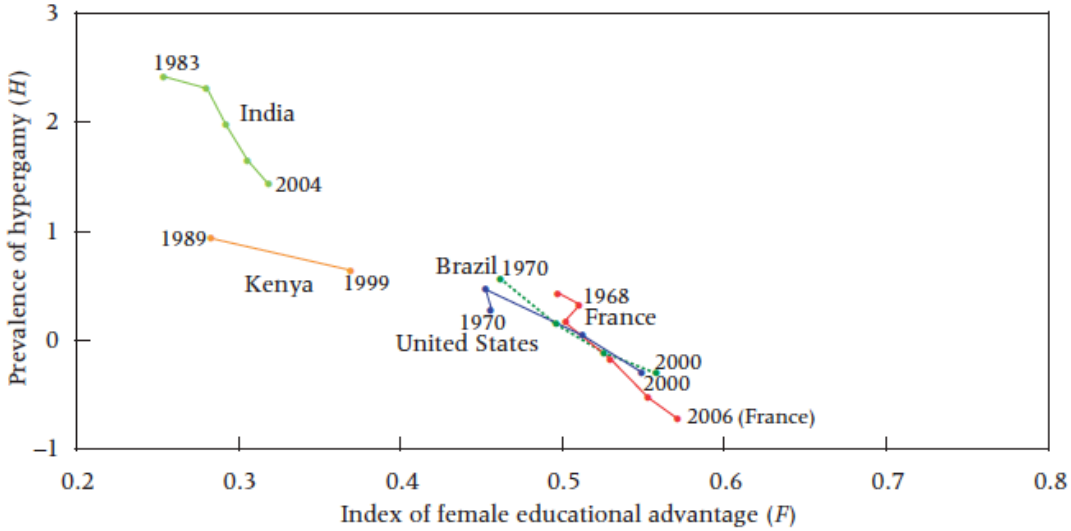
Source: Authors' classification from the literature

Figure 3.8 Median dowry & bride price and Anti-Dowry Laws in India



Source: Authors' calculation from the 2006-09 Rural Economic and Demographic Survey (REDS) data

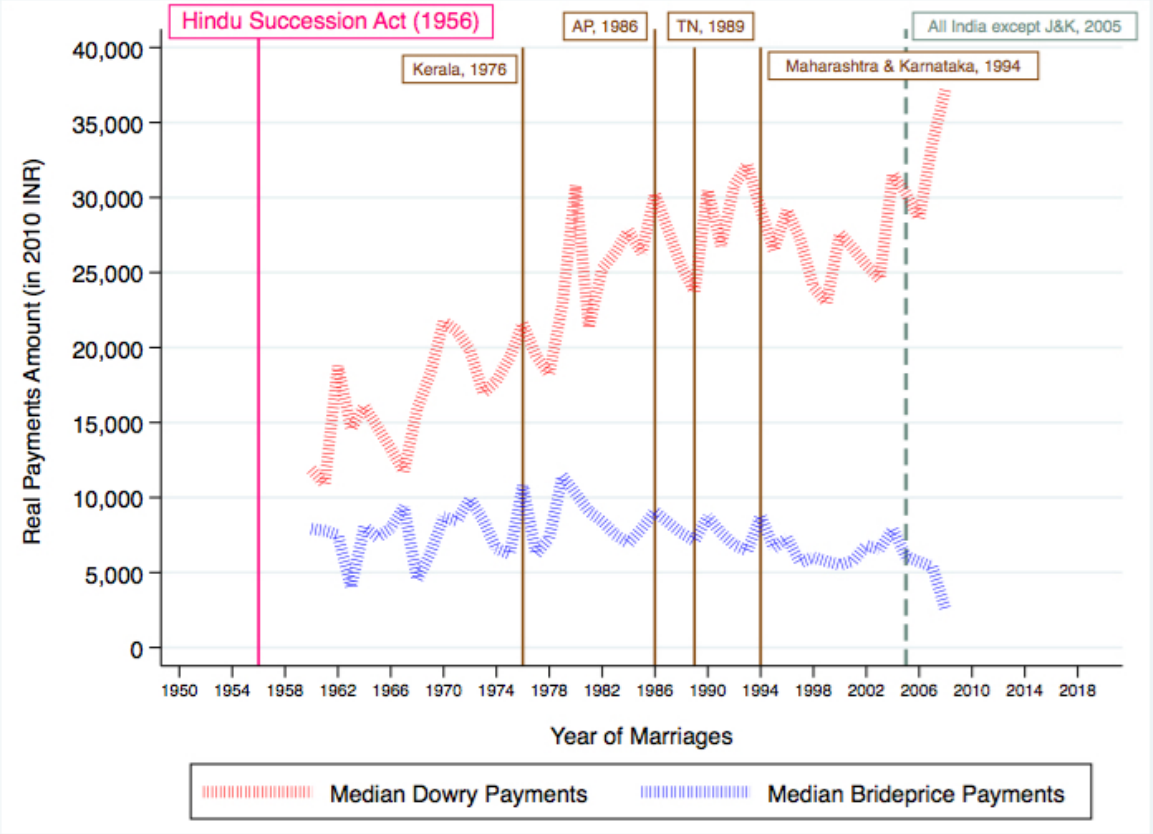
Figure 3.9 Prevalence of hypergamy and female educational advantage



NOTE: See text for definitions of *H* and *F*.
SOURCE: Authors' calculations based on IPUMS international census microdata.

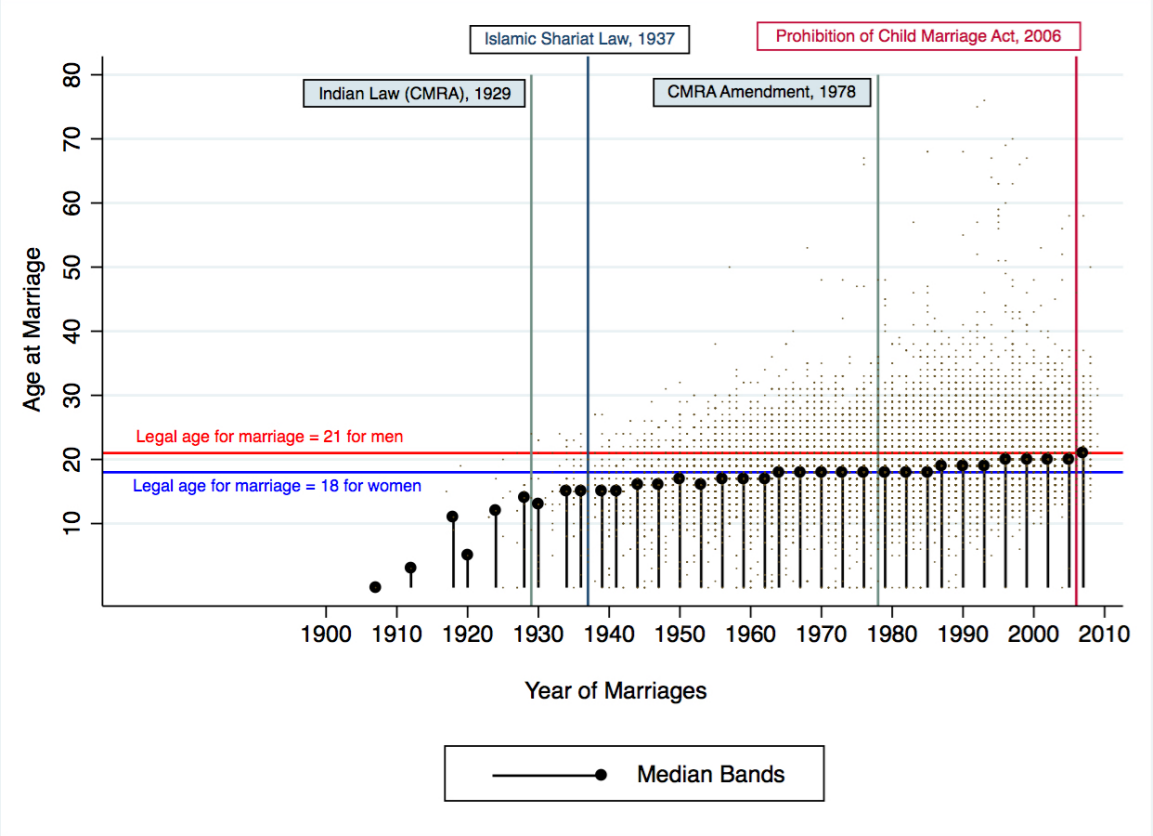
Source: Adopted from Esteve et al., 2012

Figure 3.10 Median dowry & bride price and Inheritance Law Reforms in India



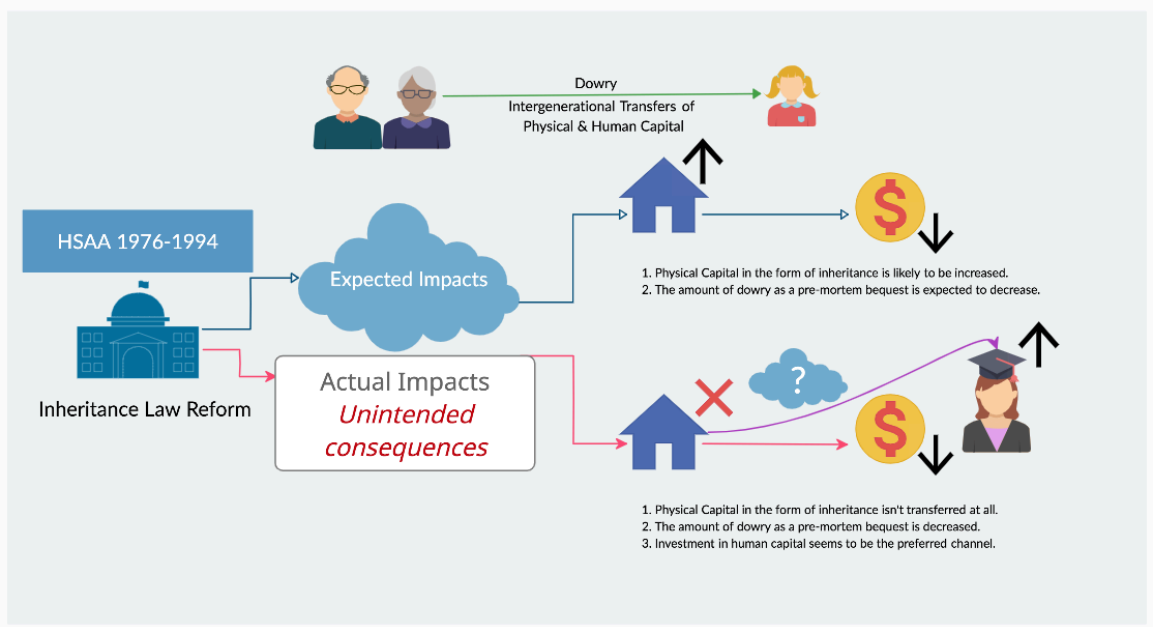
Source: Authors' calculation from the 2006-09 Rural Economic and Demographic Survey (REDS) data
Note: AP stands for Andhra Pradesh and TN stands for Tamil Nadu

Figure 3.11 Women's legal age at marriage and prohibition of child marriages



Source: Authors' calculation from the 2011-12 India Human Development Survey (IHDS) data

Figure 3.12 An implied mechanism for intergenerational transfer of capital



Source: Authors

Table 3.1 A summary of contesting theories on dowry

Sl. No.	Theories	Authors
1.	*Sanskritization*	Srinivas, 1956
2.	Clearing price of "marriage market"	Becker, 1973
3.	Marriage squeeze	Caldwell et al., 1983; Rao, 1993
4.	Modernization	Anderson, 2003
5.	Pre-mortem bequests	Botticini and Siow, 2003
6.	Human capital and matching	Anderson and Bidner, 2015
7.	"Keeping up with the Joneses"	Bhalotra et al., 2018
8.	Others (including non-economic)	Chiplunkar and Weaver, 2019

Source: Adopted from Chiplunkar and Weaver, 2019

Table 3.2 Ordinary least squares (OLS) results

Variables	Dependent variable: Educational attainment of women			
	(1)	(2)	(3)	(4)
Expected dowry (in 2010 INR)	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.212***	0.210***	0.214***	0.217***
	(0.007)	(0.007)	(0.007)	(0.007)
Educational attainment of household head	0.121***	0.123***	0.121***	0.119***
	(0.010)	(0.010)	(0.010)	(0.009)
Highest educational attainment of adult woman	0.189***	0.185***	0.179***	0.178***
	(0.009)	(0.009)	(0.009)	(0.009)
Land owned by the household	0.502	0.412	0.560	0.152
	(0.401)	(0.500)	(0.501)	(0.489)
Base: Hindu Brahmins				
Hindu STs	-0.672***	-0.673***	-0.560***	-0.489***
	(0.082)	(0.080)	(0.081)	(0.087)
Hindu SCs	-0.701***	-0.712***	-0.782***	-0.706***
	(0.121)	(0.122)	(0.142)	(0.147)
Hindu OBCs	-0.582***	-0.553***	-0.448***	-0.444***
	(0.091)	(0.090)	(0.092)	(0.090)
Muslims	-0.981***	-0.900***	-0.889***	-0.834***
	(0.101)	(0.112)	(0.103)	(0.121)
Household size	-0.109***	-0.109***	-0.111***	-0.098***
	(0.010)	(0.021)	(0.019)	(0.021)
Number of male siblings	-0.442***	-0.489***	-0.502***	-0.509***
	(0.051)	(0.050)	(0.049)	(0.051)
Number of female siblings	-0.201***	-0.212***	-0.232***	-0.241***
	(0.090)	(0.091)	(0.082)	(0.087)
Controls for:				
Educational infrastructure at the district		X	X	X
Autonomy of women in the household			X	X
Media exposure of women in the household				X
Fixed effects for:				
States		X	X	X
Birth cohorts			X	X
State-specific linear trends				X
Observations	13,523	13,523	13,523	13,523
R^2	0.402	0.429	0.426	0.449

Note: Robust standard errors are in parentheses, two-way clustered at district and household levels.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 IHDS data

Table 3.3 Instrumental variable (IV) Two stage least squares (2SLS) results

Variables	Dependent variable: Educational attainment of women							
	(1st-stage 1)	(IV 1)	(1st-stage 2)	(IV 2)	(1st-stage 3)	(IV 3)	(1st-stage 4)	(IV 4)
Expected dowry (in 2010 INR)		-0.009**		-0.011**		-0.012**		-0.012**
		(0.005)		(0.006)		(0.006)		(0.006)
Age	-0.098	0.214***	-0.092	0.212***	-0.108	0.219***	-0.252	0.221***
	(0.122)	(0.007)	(0.141)	(0.007)	(0.192)	(0.007)	(0.202)	(0.007)
Educational attainment of household head	1.981***	0.142***	1.831***	0.143***	2.002***	0.136***	1.109***	0.142***
	(0.410)	(0.011)	(0.501)	(0.012)	(0.498)	(0.011)	(0.408)	(0.010)
Highest educational attainment of adult woman	1.109***	0.210***	1.105***	0.209***	1.108***	0.207***	1.142***	0.187***
	(0.412)	(0.014)	(0.444)	(0.014)	(0.455)	(0.011)	(0.426)	(0.009)
Land owned by the household	71.007**	1.002	78.082**	1.303	83.010**	1.261	89.727**	0.982
	(33.672)	(1.132)	(35.701)	(1.524)	(39.590)	(1.520)	(40.001)	(1.000)
Household size	0.719	-0.118***	1.210	-0.143***	2.062	-0.142***	2.719	-0.112***
	(0.516)	(0.012)	(0.982)	(0.031)	(1.957)	(0.029)	(1.823)	(0.032)
Number of male siblings	-3.390	-0.482***	-3.271	-0.501***	-4.001	-0.515***	-4.018	-0.591***
	(3.001)	(0.062)	(3.122)	(0.060)	(4.000)	(0.059)	(4.001)	(0.080)
Number of female siblings	-1.940	-0.178***	-2.782	-0.201***	-2.775	-0.192*	-3.982	-0.202*
	(2.290)	(0.078)	(2.870)	(0.092)	(3.011)	(0.108)	(4.001)	(0.100)
IV 01: "Suitable boys in the neighborhood"	-0.671***		-0.672***		-0.671***		-0.669***	
	(0.212)		(0.212)		(0.220)		(0.231)	
IV 02: "Expected dowry (- *i*)"	0.367**		0.352**		0.395**		0.349**	
	(0.031)		(0.031)		(0.052)		(0.050)	
Effective F-statistics	38.816		38.022		36.001		32.157	
Controls for:								
Castes & religions	X	X	X	X	X	X	X	X
Educational infrastructure at the district			X	X	X	X	X	X
Autonomy of women in the household					X	X	X	X
Media exposure of women in the household							X	X
Fixed effects for:								
States			X	X	X	X	X	X
Birth cohorts					X	X	X	X
State-specific linear trends							X	X
Observations	10,212	10,212	10,212	10,212	10,212	10,212	10,212	10,212

Note: Robust standard errors are in parentheses, two-way clustered at district and household levels.
Olea & Pflueger (Effective) F-statistics are reported for the first stage.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 IHDS data

Table 3.4 Instrumental variable (IV) Tobit results

Variables	Dependent variable: Educational attainment of women			
	(1)	(2)	(3)	(4)
Expected dowry (in 2010 INR)	-0.011**	-0.012**	-0.016**	-0.018**
	(0.005)	(0.006)	(0.008)	(0.009)
Controls for:				
Age	X	X	X	X
Educational attainment of household head	X	X	X	X
Highest educational attainment of adult woman	X	X	X	X
Land owned by the household	X	X	X	X
Household size	X	X	X	X
Number of male siblings	X	X	X	X
Number of female siblings	X	X	X	X
Castes & religions	X	X	X	X
Educational infrastructure at the district		X	X	X
Autonomy of women in the household			X	X
Media exposure of women in the household				X
Fixed effects for:				
States		X	X	X
Birth cohorts			X	X
State-specific linear trends				X
Observations	10,212	10,212	10,212	10,212

Note: Robust standard errors are in parentheses, two-way clustered at district and household levels.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 IHDS data

Table 3.5 Logarithm (Expected Dowry) results

Variables	Dependent variable: Educational attainment of women			
	(1)	(2)	(3)	(4)
Log (Expected dowry)	-2.712**	-2.520**	-2.498**	-2.331**
	(0.665)	(0.634)	(0.701)	(0.672)
Controls for:				
Age	X	X	X	X
Educational attainment of household head	X	X	X	X
Highest educational attainment of adult woman	X	X	X	X
Land owned by the household	X	X	X	X
Household size	X	X	X	X
Number of male siblings	X	X	X	X
Number of female siblings	X	X	X	X
Castes & religions	X	X	X	X
Educational infrastructure at the district		X	X	X
Autonomy of women in the household			X	X
Media exposure of women in the household				X
Fixed effects for:				
States		X	X	X
Birth cohorts			X	X
State-specific linear trends				X
Observations	10,102	10,102	10,102	10,102

Note: Robust standard errors are in parentheses, two-way clustered at district and household levels.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 IHDS data

Table 3.6 Practice of hypergamy (Logit) results

Variables	Dependent variable: Practice of hypergamy (Yes/No)			
	(1)	(2)	(3)	(4)
Expected Dowry (in 2010 INR)	0.006***	0.005***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Controls for:				
Year of marriage	X	X	X	X
Natal & virilocal household controls		X	X	X
Educational infrastructure at the natal district			X	X
Educational infrastructure at the virilocal district				X
Fixed effects for:				
States		X	X	X
Birth cohorts			X	X
State-specific linear trends				X
Observations	16,098	16,098	16,098	16,098

Note: Robust standard errors are in parentheses, two-way clustered at district and household levels. These results are from all married samples. It does not fit the sample selection criteria of $5-21$ *years girl children. One must not draw a causal inference here as it is a suggestive evidence only.*
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2011-12 IHDS data

Table 3.7 Impact of HSAA on women's inheritance: DDD results

Variables	Dependent variable: Inherited any land? (Yes/No)			
	(1)	(2)	(3)	(4)
Age ≤ 18 at HSAA	-0.091***	-0.089***	-0.084***	
	(0.007)	(0.008)	(0.007)	
Father's death after HSAA	0.021	0.020	0.041	0.040
	(0.030)	(0.030)	(0.030)	(0.025)
Age ≤ 18 at HSAA * Father's death after HSAA	0.000	0.000	-0.000	-0.000
	(0.030)	(0.030)	(0.029)	(0.021)
Controls for:				
Natal household controls	X	X	X	X
Fixed effects for:				
States		X	X	X
Birth cohorts		X	X	X
State-specific linear trends			X	
States * Birth cohorts				X
Observations	5,005	5,005	5,005	5,005
Adjusted R^2	0.080	0.089	0.090	0.110

Note: Robust standard errors are in parentheses, clustered at the state level. Natal household controls include educational attainment of the household head, the highest educational attainment of adult woman in the household, land owned by the household, household size, number of male and female siblings, castes & religions, and household income.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2006-09 REDS data

Table 3.8 Impact of HSAA on actual dowry: DDD results

Variables	Dependent variable: Log (Actual dowry paid), in 2010 INR			
	(1)	(2)	(3)	(4)
Age ≤ 18 at HSAA	-0.070	-0.068	-0.069	
	(0.150)	(0.256)	(0.190)	
Father's death after HSAA	0.131	0.142	0.149	0.128
	(0.110)	(0.109)	(0.109)	(0.111)
Age ≤ 18 at HSAA * Father's death after HSAA	-0.482***	-0.423***	-0.410***	-0.473***
	(0. 103)	(0.090)	(0.089)	(0.091)
Controls for:				
Natal household controls	X	X	X	X
Fixed effects for:				
States		X	X	X
Birth cohorts		X	X	X
State-specific linear trends			X	
States * Birth cohorts				X
Observations	3,876	3,876	3,876	3,876
Adjusted R^2	0.272	0.281	0.280	0.313

Note: Robust standard errors are in parentheses, clustered at the state level. Natal household controls include educational attainment of the household head, the highest educational attainment of adult woman in the household, land owned by the household, household size, number of male and female siblings, castes & religions, and household income.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2006-09 REDS data

Table 3.9 Impact of HSAA on women's education: DDD results

Variables	Dependent variable: Educational attainment of women			
	(1)	(2)	(3)	(4)
Age ≤ 18 at HSAA	0.001*	0.000*	0.001	
	(0.000)	(0.000)	(0.010)	
Father's death after HSAA	-0.408	-0.446	-0.501	-0.329
	(0.510)	(0.435)	(0.400)	(0.533)
Age ≤ 18 at HSAA * Father's death after HSAA	1.891***	1.724***	1.701***	1.903***
	(0.410)	(0.410)	(0.400)	(0.324)
Controls for:				
Natal household controls	X	X	X	X
Fixed effects for:				
States		X	X	X
Birth cohorts		X	X	X
State-specific linear trends			X	
States * Birth cohorts				X
Observations	5,005	5,005	5,005	5,005
Adjusted R^2	0.209	0.208	0.319	0.400

Note: Robust standard errors are in parentheses, clustered at the state level. Natal household controls include educational attainment of the household head, the highest educational attainment of adult woman in the household, land owned by the household, household size, number of male and female siblings, castes & religions, and household income.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2006-09 REDS data

Table 3.10 Impact of HSAA on women's age at marriage: DDD results

Variables	Dependent variable: Age at marriage			
	(1)	(2)	(3)	(4)
Age ≤ 18 at HSAA	0.250	0.290	0.282	
	(0.180)	(0.221)	(0.234)	
Father's death after HSAA	0.149	0.103	0.103	0.220
	(0.237)	(0.241)	(0.239)	(0.315)
Age ≤ 18 at HSAA * Father's death after HSAA	1.048***	1.023***	1.110***	1.091***
	(0.102)	(0.100)	(0.124)	(0.098)
Controls for:				
Natal household controls	X	X	X	X
Fixed effects for:				
States		X	X	X
Birth cohorts		X	X	X
State-specific linear trends			X	
States * Birth cohorts				X
Observations	4,087	4,087	4,087	4,087
Adjusted R^2	0.110	0.109	0.121	0.198

Note: Robust standard errors are in parentheses, clustered at the state level. Natal household controls include educational attainment of the household head, the highest educational attainment of adult woman in the household, land owned by the household, household size, number of male and female siblings, castes & religions, and household income.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculation from the 2006-09 REDS data

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