

Missing Women Found on Historical Tea Plantations: Evidence from British India

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Abstract

It has been previously shown that an increase in the relative value of tea increases female survival rate by enhancing their economic value. By combining contemporary district-level census data with historical data on tea production, in this paper I examine whether contemporary regional variations in gender disparities across India can be traced back to the tea production induced by the British East India Trading Company in the 19th century. I find that more women are born in districts that produced tea in British India compared to districts that did not. These results hold for several robustness tests. To further explore this relationship, I conduct a survey in Idukki district in Kerala. The findings support the hypothesis that an increase in the economic value of women improves the survival rate for girls.

Key words: sex imbalance, tea production, female survival, East India Company.

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1 Introduction

Male-biased sex imbalances are widely recognized in various Asian and Muslim countries. This phenomenon was first acknowledged by Nobel Prize Laureate Amartya Sen (1992), who documented more than 100 million missing women worldwide. Numerous ex post studies confirm this finding, including Bhaskar and Gupta (2007), Duflo (2011), Iyer and Joshi (2013) Franck and Olsson (2014), Lin et al (2014) and Bongaarts and Guilmoto (2015). The implication of these findings is that, even before they are born, women are treated systematically differently compared to men. There is, however, no consensus as of why parents in some parts of the world prefer sons over daughters.

Consequently, the literature is indecisive regarding factors associated with male-biased sex imbalances. One strand of the literature debates whether sex imbalances respond to income (Becker, 1981; Edlund, 1999; Burgess and Zhuang, 2001). Another argues that sex imbalances are in fact independent of economic conditions and can only be explained by genetic factors (Norberg, 2004; Oster, 2005). Finally, there are studies showing that female survival is determined by the relative status of older women (Das Gupta, 1987; Duflo, 2003). To my knowledge, only two papers have identified factors that casually affect the female survival rate. Qian (2008) demonstrates that higher prices of tea had a significant and positive effect on the survival rate for girls and on school enrolment for girls and boys in China, since women possess comparative advantages in producing tea compared to men. Ashraf et al. (2014) show that ethnic groups practicing bride pricing invest more in girls' schooling, since more education implies a higher bride price paid to the parents of the bride at the time of marriage. Also, ethnic groups practising bride pricing are shown to have stronger preferences for additional daughters. These studies emphasize the importance of increasing the economic value of women to ensure their survival and to increase educational investment for all children.

Following this strand of literature, I examine one historical channel through which the economic value of women might have increased in India. Instigated by the British East India Company in the 19th century, Indian tea production commenced as a colonial enterprise. It continued to prosper in the post-independence period, and today India one of the largest producer of tea in the world. One of the most distinct features of tea production is that it uses female labour intensively. According to Chatterjee (2008), women comprise 70 percent of the

labour force at Indian tea plantations. By linking contemporary district-level census data to historical data on tea production generated by the British East India Company, I investigate whether tea production caused regional variation in female survival rate across India. The hypothesis here is that in areas where the British East India Trading Company set up tea plantations in the 19th century, the economic value of women improved, which should have been reflected in higher survival rates for girls.

To test this hypothesis, I combine census data from 2011 with historical data from the Imperial Gazetteer and the Indian Tea Association. My findings suggest that more women are born in districts that produced tea in British India compared to district that did not. An alternative explanation for my findings is that families, in which daughters were valued higher by their parents, chose to work at tea plantation. It might also be that the British developed certain institutions in tea producing regions that are correlated with higher female survival. To solve for this problem, I control for other types of British influence, namely colonial institutions that have been shown to affect current development in India.

Furthermore, I check the robustness of my findings along three dimensions. First, I asses the bias from unobservables by taking advantage of a methodology suggested by Nunn and Wantcheckon (2009) and Altonji et al (2005) to calculate how much larger the impact of unobservable factors would need to be in order to completely absorb the relationship between tea production and sex ratios. I find that selection on unobservables would have to be at least six times greater than selection on observables and on average almost 19 times greater to attribute the entire OLS estimate to selection effects. Second, although tea producing districts are located in regions that differ with respect to economic development and gender equality, I find that the effect of tea production on female survival is in fact homogeneous. Finally, since the timing of colonization might have an impact on a district's development and subsequent female survival, I only include districts that were colonized for the same amount of time. Notwithstanding, the estimated effect of tea production on female survival remains sizeable and significant.

In order to further explore this relationship, I also conduct interviews with women from one historical tea producing district, Idukki, in the southern state of Kerala. It is shown that women working at tea plantations in Idukki district have stronger relative preferences for daughters compared to women not working at tea plantations. At the same time, none of the interviewed women in Idukki district as a whole prefer having more sons than daughters.

Daughters of tea pluckers also attain higher levels of education than sons. These results are in line with the findings at the aggregate level.

My results complement previous studies documenting the importance of increasing the economic value of poor women to fight gender inequality. It also extends previous results by suggesting potential mechanism through which tea production increases female survival. It might be that female survival increased through higher economic value generated by increased labour income from picking tea leaves. Alternatively, it might be that women have gained higher bargaining power over time through generations, as a results of increased income from picking tea leaves and thereby enforced their stronger relative preferences for their daughters. Finally, higher schooling for daughters might be an additional positive factor generated by higher female survival.

The paper unfolds as follows. Section 2 presents the historical avenue of the East India Trading Company and the development of Indian tea plantations. Section 3 describes the empirical strategy and data. Section 4 specifies the empirical model and section 5 presents the results. The robustness of the results is examined in section 6. The survey conducted in Idukki district is presented in section 7. Finally, section 8 discusses and concludes.

2 Historical Context

2.1 British India and The East India Company

A distinguishing feature of the British East India Company was that it ruled nearly the entire country of India. Queen Elizabeth granted the Company a royal charter in 1600, implying monopoly privileges on all trade with the East Indies (John, 2011). In 1608 the first ships of the Company arrived at the port of Surat. Seven years later, the British were given the right to set up a factory at Surat by the Mughal Emperor Jahangir. With time the British trading operations and empire building expanded beyond that of the Portuguese. Along the east and west coast, English communities began to evolve around the key cities of Calcutta, Madras and Bombay. The Mughal Emperor liberated the Company from paying custom duties with a royal dictat in 1717, which is considered to be one of the Company's greatest achievements. After the battle of Plassey in 1757, the rule of the Company was implemented. The rule was characterized by military occupation of Indian states and harsh tax policies, imposing difficult conditions for Indian peasants. This lead to the Mutiny of 1857, when Indian soldiers revolted against their British generals (Banerjee and Iyer, 2005). After suppressing the revolt in 1858,

the British Government took direct control over India and the era of the British Raj commenced. During this era the British attempted to govern India with more caution. The Indian army was reconstructed, disbanding the units of the United Provinces of Agra and Oudh, and forming new regiments like the Baluchis and the Sikhs. For not joining the rebellion, large land owners were rewarded with official recognition in state treaties that were signed with the British Crown. Peasants, on the other hand, were accused of disloyalty since they fought against the British during the mutiny. During the Raj, the British also became submissive with respect to implementing new social reforms and they stopped interfering with the practice of traditional customs, especially religion (John, 2011). With time, the era of the Raj became characterized by Muslim separatism. After World War I communal violence increased, which led up to the mutinies in 1946 and the subsequent announcement to end the British Rule in India in 1947 (Kaul, 2011).

2.2 Indian Tea

The rural economies of south-western and north-eastern India have been dominated by the tea plantation industry for more than 160 years. Plantations were first set up during the Company Rule, but it was not until the era of the British Raj that the tea industry began to flourish. Prior to the British, Indians only used to drink tea for medical purposes and did not involve in any large scale production of tea (Sharma, 2011). After independence however, tea also became consumed by the Indian mass once the Indian Tea Board launched an advertising campaign in order to increase the domestic demand for tea (Sen 2004). To date, India is the world's second largest producer of tea and Indian tea export amounted to 233 million kilos in 2015 (KnowIndia, 2016).

Initially, green tea was produced and exported to England from China in the seventeenth century and it served as a luxury good among the British gentry. However, as the Chinese monopoly on tea eventually became too costly, the British began to look for alternative places to cultivate tea (Sen, 2004). In 1780, a great discussion about the prospect of tea cultivation in India took place within the Company (Chatterjee, 2001). Wild growing tea bushes were first found in north eastern Assam in the late eighteenth century (Sen, 2004). With the profits from selling opium to China, the British purchased tea seeds which they brought to Assam (Brook and Wakabayashi, 2000). According to historical evidence from the Imperial gazetteers, many initial experiments in tea cultivation were made without success due to the very specific geographical requirements of a warm and humid climate combined with inclining elevation

Nevertheless, by taking advantage of Chinese tea cultivation techniques, the first Indian tea plantation was set up in the forest of Assam in the 1820s. Conditional on growing tea for export purposes, the British government offered land to any European wishing to cultivate tea (Sen, 2004). Via the Yandaboo Treaty in 1826, the British overtook the regions of the Ahom Kingdom in the Brahmaputra Valley of Assam, expanding their area of tea cultivation. By using indentured local inhabitants and migrated labour force from the central regions of India, the Assam Tea Company initiated commercial production of tea in 1840 (Sen, 2004; Sharma, 2011). Around the same time, Doctor Archibald Campbell brought seeds of the Chinese tea plant from Kumaon to Darjeeling in West Bengal. In 1874, more than one hundred plantations had been set up in Darjeeling (Kennedy, 1996). The positive results from Assam and Darjeeling inspired the British to cultivate tea across the foothill regions of the Eastern Himalayas and the Brahmaputra Valleys. In line with Darjeeling, large-scale production commenced in Kerala and in the Peermade hills of Travancore in the 1870s, (Tucker, 1988).

2.3 Women on Tea Plantations

The social hierarchy on Indian tea plantations is and have always been patriarchal, rigid and highly centralized where the lowest ranks comprise female workers from scheduled tribes and castes, (Banerjee, 2014). In the words of Chatterjee (2001, p. 6):

“The planter sits astride a pyramid whose base is field work. It is a base constituted by women who dominate the necessary site of the plantation’s political and cultural economy.

Simultaneously fetishized (in the commodity picturesque) and pragmatically devalued (in lower wages) women’s field work -tea plucking- creates the outer perimeter of the plantation field.”

Tea is predominantly picked by women in India, as in many other Asian countries (Lu, 2004). According to Luke and Munshi (2004), 94 percent of tea plantation workers are women in South India, and 70 percent of tea workers, in India as a whole, are women (Chatterjee, 2008). Women’s small and nimble fingers, as well as their height, are considered to be the reason for their absolute comparative advantage in picking tea. The importance of picking whole tea leaves gives women a specific advantage over children, who are considered to be less careful than adults. And since tea bushes are only 2.5 feet tall on average, women also have a comparative advantage over taller adult men. In line with Qian (2008), this paper avoids the potentially confounding factors of agricultural technological change, which may

diminish sex-specific comparative advantages caused by sex-specific bodily characteristics, by focusing on the effect of tea production in British India.¹

3 Empirical Strategy

3.1 Identification Strategy

In order to identify the effect of tea production on female survival rate, the treatment group comprises districts that produced tea in British India, while districts that did not form the control group. I begin by using a control strategy, more commonly referred to as *selection on observables*. That is, I assume that conditional on a set of colonial and observable factors, tea production in India is as good as random. The reason for using this strategy is that three predominant factors threaten the causality of my findings. First, my results may reflect that the British selected into regions, where the female survival rate was already systematically higher (-or would have been higher in the future) than in other regions, to produce tea. Already at this point, however, history contradicts this concern. As it was previously discussed, tea cultivation required specific environmental conditions, which the British had to obey, in order to produce tea. Since the characteristics of nature ultimately determined where tea could be produced, it is unlikely that the British selected into regions based on how parents in these regions valued daughters relative to sons. Another closely related concern is that the British selected into more developed regions to produce tea. This might be a problem since income and female survival have been shown to correlate. Yet again, we know that the British started to produce tea in previously unexplored regions, implying that development caused by earlier colonization is not an issue. Second, it might be that parents who value daughters higher than sons were more likely to work at tea plantations. However, the British brought migrants belonging to the lowest castes and tribes to work at tea plantations (Sharma, 2011). Since previous evidence suggests that male-biased sex ratios are especially prevalent among the poor, any positive effect of tea plantations on current female-male sex ratios most likely underestimates the true effect.

Thus, so far the historical facets of tea production speak against any potential upward bias due to selection into treatment. The most important concern relates to the problem of omitted variable bias. As mentioned in the previous section, the discovery and subsequent large scale production of tea took place in the midst of the British Empire's colonization of India. If the

¹ To my knowledge, contemporary tea-producing districts also produced tea in British India. That is, the control group does not include districts that started to produce tea after independence.

parts of India that were most impacted by tea production were also most affected by British colonial rule, it might be that tea production is only proxying for factors of colonial rule.

In light of this discussion, I specifically follow Banerjee and Iyer (2005) and Iyer (2010), whom emphasize two main colonial institutions which have had a persistent impact on current development in India. Banerjee and Iyer (2005) show that districts that were characterized by landlord-based property rights systems have lower productivity and less agricultural investments in the post-colonial era than districts that were characterized by individual cultivator-based systems. Iyer (2010) further demonstrates how districts under direct British rule have less access to school, health centres and roads after independence compared to districts under indirect rule. From Banerjee and Iyer (2005) I also control for whether the landlord's revenue commitment to the government was fixed in perpetuity. Finally, I control for whether a colonial district is located by the coast, since this might have an impact on the district's development through trade. The implied attention here is that by controlling for this set of observables, I capture any potential effect of non-tea production British influence on female survival.

3.2 Data

I use a combination of historical and contemporary data for my analysis, where the unit of observation is always one district. The contemporary data is from the 2011 Indian Census. At this time India had 640 districts in 35 states. I choose to conduct my analysis at the district level for three reasons. First, the main difference between old and current Indian districts is that some old districts have been divided into two or more districts over time. This makes it relatively unproblematic to match current districts to old districts. Second, the smallest unit of observation, for which I have information about colonial institutions, is at the district level. Third, by using district rather than state-level data, I attain a relatively large sample size.

From the 2011 Indian census, I collect information about female survival rate, which is measured as the number of females born per 1000 males. I also use data on district-wise population, literacy rates, religion, scheduled castes- and tribes and district shares of people holding below poverty line ration cards.² The above information can only be found for each district, separately, in the 2011 Census and is therefore collected by hand for each of the 640 districts. One major drawback of using data at the district-level is that I do not have measures

² Information about the district share of households holding below poverty ration cards is collected from Knoema in 2008.

of GDP or average income per capita. The above mentioned controls are therefore intended to proxy for income as well as demographic and religious factors that potentially correlate with female survival.

In order to identify tea production in British India, I use information about districts-wise tea production from the Indian Tea Association, which I cross-check with colonial data from the historical reference work of the Imperial gazetteers. The Imperial gazetteers was first published in 1881 and is a geographical lexicon combined with atlases and maps of the British Indian Empire.³ Due to the potential problem of omitted factors, I also need information on district-wise colonial institutions. From Banerjee and Iyer (2005) and Iyer (2010) I collect information about a district's property rights system, type of revenue commitment to the government, information on whether the district is located by the coast and type of colonial rule, respectively. Since information about tea production and colonial institutions are found at the district level from the 19th century, I match them by hand with the existing districts in 2011. Table 1 presents the descriptive statistics. On average, 56 more females per 1000 males are born in tea producing districts compared to non-tea producing districts. At the same time, however, tea producing regions have a higher literacy rate, lower share of scheduled castes and tribes, non-landlord based systems and are more often located by the coast. This suggests that tea districts might be more developed today because of factors not related to tea production, implying an overestimation of the true effect of tea production on female survival. At the same time, tea producing districts have a higher share of Muslims and were less characterized by indirect British rule. Tea and non-tea producing district thus appear to be systematically different. This emphasizes the importance of controlling for both current and historical district-level characteristics in order to obtain an unbiased estimate.

4 Model Specification

I begin by estimating the relationship between districts that produced tea in British India, and the same district's current sex ratio. My benchmark equation is:

$$(1) \quad female_d = \alpha + \beta tea\ production_d + \mathbf{X}'_d \boldsymbol{\Gamma} + \varepsilon_d,$$

where $female_d$ is the current sex ratio, measured as the number of females born per 1000 males divided by 1000 in district d , $tea\ production_d$ is an indicator equal to one if district d produced tea in British India, and $\mathbf{X}'_d \boldsymbol{\Gamma}$ is a vector of district-level covariates, which include

³ Information about tea production in British India is primarily found in volume 1-7, 11, 16, 22 and 24.

the literacy rate, population, the population share of Muslims, the population share of scheduled castes -and tribes and population share that holds below poverty line ration cards.

Since colonial rule is an important potentially omitted factor, in a set of robustness regressions, I also control for colonial institutions that have been shown to impact long-run development in India.

5 Results

Estimates of equation (1) are reported in columns (1) and (2) of table 2. The coefficient estimate in column (1) suggests that, on average, 55 more females are born per 1000 males in tea producing districts compared to non-tea producing districts. It is also evident that the share of Muslims has a negative effect on female survival. Column (2) further includes region fixed effects. The reason is that India is known for its distinct regional diversity. Time-invariant factors that are unobserved at the regional level might therefore be correlated with districts that produced tea in the 19th century. As depicted in column (2), the effect decreases in magnitude, suggesting that regional fixed effects for tea-producing districts are positively correlated. Yet, the coefficient estimate for tea-producing districts stays statistically significant.

Columns (3) and (4) of table 2 further includes controls for colonial institutions. As hypothesized, all colonial controls were important omitted variables. Although tea districts were characterized by non-landlord based systems to a larger degree than non-tea districts, the institution has a negative impact on female survival. This implies that even though non-landlord based systems led to sustained development according to Banerjee and Iyer (2005), this development is not reflected in higher female survival. The same is true for indirect British rule. Furthermore, temporary revenue commitments and coastal location has a positive impact on female survival. Still, however, the coefficient estimate of tea production remains positive and significant. Including regional fixed effects, the effect is even larger in magnitude in column (4) compared to column (2).

6 Robustness Checks

6.1 Assessing the Bias from Unobservables

Nunn and Wantchekon (2009) argue for why it might be useful to assess the bias from unobservables by using selection on observables. I cannot rule out the fact that selection into

tea plantations, and subsequent higher female survival, might be correlated with unobservable factors that give rise to biased estimates. Therefore, I also try to estimate the probability that my estimates are biased by unobservables. I use the same strategy as Nunn and Wantchekon (2009) and Joseph G. Altonji, Todd E. Elder, and Christopher R. Taber (2005) to calculate how much larger the impact of unobservable factors would need to be in order to completely absorb the relationship between tea production and sex ratios. That is, I run two regressions on my outcome variable of interest. One comprises no control variables, whereas the other comprises a full set of controls. I then calculate a ratio which is meant to illustrate how much larger the impact of unobservable factors would need to be in order to completely absorb the relationship between tea production and sex ratios. The coefficient estimate with the full set of controls is in the numerator. The difference between the coefficient estimate with no controls and the coefficient estimate with a full set of controls is in the denominator.⁴

As illustrated in table 3, all ratios are greater than one and they range from 6.24 to 30.43. The median ratio is 18.48. This means that selection on unobservables would have to be at least six times greater than selection on observables and on average almost 19 times greater to attribute the entire OLS estimate to selection effects. Although we do not know exactly what these numbers translate into in a real world scenario, I argue that they do make it less likely that the estimated effect of the tea plantation is fully driven by unobservables.

6.2 Regional Heterogeneity

Another potential concern is that the estimated effect might be due to regional heterogeneity, which is especially noteworthy within the historical context of India. In terms of gender equality, Kerala stands out due to its high female survival rate, literacy rate, life expectancy and low fertility rate compared to other Indian states. This is often explained by Kerala's unique educational -and cultural history as well as by the "Kerala model of development" (Parayil, 1996). As mentioned in section 2, a substantial part of colonial tea production took place in Kerala. A serious concern is thus that the effect of tea production on female survival might just be found in the districts of Kerala, which happen to be more developed today, as opposed to in all districts that saw colonial tea production. If this is the case, tea production might just be proxying for other unobserved factor of development that are specific for Kerala. However, the results in table 4 suggest that, despite being larger in magnitude in southern tea districts, the effect of tea production is positive and homogeneous.

⁴ For more details of the underlying assumptions, see Altonji, Elder and Tabler (2005).

6.3 Timing of Colonization

As previously mentioned, the key cities in which the British settled during colonial rule were Calcutta, Bombay and Madras. The British settled in these cities long before they discovered tea in India. Furthermore, the cities were not located in the same regions as where tea eventually was discovered and produced. This has two important implications. First, there is no need to control for pre-treatment colonial rule, as it did not exist in tea growing regions prior to the discovery of tea. Second, the timing of colonization might have an impact on a district's development and subsequent female survival rate. In light of Acemoglu et al (2000), the British plausibly set up better institutions in regions where they settled earlier. If this is true the potential outcome, both as treated and untreated, is likely better for regions that were colonized for a longer time than for regions where the British did not settle prior to the discovery of tea. For comparison reasons, I therefore exclude districts that were colonized prior to the discovery of tea.⁵ The results are shown in table 5. As illustrated, the effect remains positive and statistically significant.

7 Anecdotal Elaboration; Survey Conducted in Idukki District

So far I have asked whether districts characterized by tea production, induced by the British East India Trading Company, are associated with higher contemporary female survival. The findings presented so far are consistent with the hypothesis that the economic value of women improved as a result of tea production, which is reflected in higher survival rates for girls. In order to further examine this relationship, I have conducted interviews with women from one historical tea-producing district, Idukki, in the southern state of Kerala.

7.1 Idukki District

Idukki district was formed in 1972 when Devikulam, Udumbanchola Peerumade and Thodupuzha Taluks were carved out from erstwhile Kottayam and Ernakulam district.⁶ Idukki is derived from the Malayalam word Idukku, which means narrow gorge. The average altitude in Idukki district is 1022 metres above sea level and more than 90 percent of the total district area is covered by forests and mountains. In the late 1870s, large scale tea production commenced when the Raja of Poonjar sold a vast tract of land to the British planter John Daniel Munroe. The majority of the tract was previously unexplored, covered with dense and

⁵ Information on timing of district-wise colonization is found in the appendix of Banerjee and Iyer (2005).

⁶ According to Hridya Madu (2016), taluk means a group of villages.

uncharted forest. Pioneers attempted to grow numerous spices and coffee before discovering that tea was the most suitable crop to cultivate (Idukki Plantations, 2016). The European company Finlay purchased 33 tea estates in the town of Munnar in 1895. In order to manage Finlay's estates, Kannan Devan Hills Produce Company was formed in 1897. After independence, the Tata-Finlay group was created in 1964 as a joint enterprise between the Indian Tata Group and Finlay. Today, all tea plantations under the Tata Group are assigned to a new company named Kannan Devan Hills Plantation, also known as KDHP, which manages tea plantations spread across 8,600 hectares of land (Tea Growing Regions, 2016).

7.2 Survey Design and Purpose

I conduct interviews on a random basis with women working at tea plantations and other women within Idukki district. It is important to note that female tea-workers and female non-tea workers *within* a tea plantation district are of essence in my treatment group. Tea production is an indicator equal to one if a district was characterized by historical tea production and zero otherwise. At the individual level, however, a treated district comprises both women working at tea plantations and women not working at tea plantations. Thus, only interviewing women working at tea plantations in treated districts would fail to capture the entire treatment group in the empirical analysis.

The main purpose of my survey is to gain knowledge of the means through which families working at tea plantations might have a higher relative preference for having daughters. To the extent that tea production resulted in an increase in the relative amount of jobs available for poor women, it might be that female decision-making power within the household increased as a result of higher income from plucking tea leaves, which subsequently led to higher female survival. Differently put, higher female survival might be derived from a higher bargaining power of the spouse due to increased female labour income. Higher female survival should furthermore imply a change in parental preferences regarding the gender composition of their children. Previous literature emphasizes the impact of labour income on decision-making power within the household (Antman 2014; Anderson and Eswaran 2009; Dharmalingam and Morgan 1996). Furthermore, and in line with the theory of household bargaining, Majlesi (2016) finds that both working and non-working women's bargaining

power increases as a result of higher demand for female labour. In light of these findings, primarily six questions are analyzed in this survey.⁷

3l) If you could choose exactly the number of children to have during your whole life, how many children would that be?

3m) How many of these children would you like to be girls and for how many would it not matter if it's a boy or a girl?

4g) Have women in your family had this occupation for generations?

5a) Who decides how the money you earn will be used: mainly you, mainly your husband, or you and your husband jointly?

5b) Would you say that the money that you earn is more than what your husband earns, less than what he earns, or about the same?

5c) Who decides how your husband's earnings will be used: mainly you, mainly your husband, or you and your husband jointly?

5d) Who usually makes the following decisions: mainly you, mainly your husband, you and your husband jointly, or someone else?

- i. Decisions about the number of children to have?
- ii. Decisions about how many girls and boys to have?
- iii. Decisions about your son(s) schooling?
- iv. Decisions about your daughter(s) schooling?

These questions intend to capture women's preferences of having girls relative to boys, and to examine their bargaining power within the household with respect to the household income, family planning, the gender composition of the children and children's schooling. The reason for including decisions regarding children's schooling is that evidence suggests higher female survival to be associated with higher schooling of both boys and girls (Qian, 2008). Finally, the reason for asking whether women in the family have had the occupation for generations is to examine the possibility that new social norms have developed over time with respect to gender equity.

7.3 Limitations

I am faced with numerous obstacles when conducting the survey. First, time, resource- and geographical constraints prevent me from obtaining a large sample size.⁸ Second, the

⁷ For a full list of questions, see the appendix.

⁸ Being a minor field study funded by SIDA, I only had 8 weeks and limited financial resources for conducting these interviews. The geographical constraints were noteworthy since most tea plantations were located in remote areas only accessible by jeep.

language barrier imposes a natural impediment in terms of information that might get lost in translation. Third, and most importantly, interviewing women at Indian tea plantations today is highly sensitive in a political context. The reason is the ongoing controversy of poor working conditions for female tea workers in India. In September 2015, more than 6,000 women demonstrated for higher wages and better living conditions in Kerala. The protest was organized by the women themselves in a movement called *Pempilai Orumai*, which means women's unity. The discontent was directed not only to KDHP, but to the male trade union leaders who are supposed to represent women, which are said to be in conspiracy with the company management. In light of this debate, I was not allowed to interview women at their place of work. Instead, I could only conduct interviews by visiting women in their home after they have finished working for the day. In light of the above factors, it was beyond the scope of this minor field study to also interview women from a non-tea plantation district, and so unfortunately I cannot depict a picture of the control group.

7.4 Results

The field study resulted in 51 interviews of married women between the ages of 25 to 50, who have at least one school-aged child. 53 percent of these women work as tea leaf pluckers, whereas the remaining have other professions. The tea pluckers are from three different estates; Harrison Tea Plantation in Kolukkumalai, KDHP and Thalayar Tea Plantation in Munnar. Except for the occupational difference, the background characteristics of tea workers and non-tea workers are very similar. According to the local expert Hridya Madu (2016), the daily income of a women plucking tea leaves in Idukki ranges between 250 to 350 rupees, (about 3.7 to 5.2 US dollars). Women employed in other sectors earn the same amount of money typically working as maids, dishwashers, clerks, hotel cleaners and stall holders. Tea workers and non-tea workers at this income level are predominantly either Hindus, belonging to scheduled tribes, or Christians.

The main results of the conducted survey are summarized in table 6. Panel A shows the most important findings concerning female survival. As depicted, tea workers have somewhat stronger relative preferences for having girls compared to non-tea workers. Among both tea workers and non-tea workers, most respondents prefer having an equal gender composition of children, followed by not having any specific preferences regarding the gender composition of their children. None of the respondents preferred having more sons than daughters. All women working at tea plantations answered that decisions are taken jointly regarding their

own income, their husband's income, the schooling of all children and regarding decisions about how many girls and boys to have. This is illustrated in panel B. For non-tea workers, only 2 respondents replied that their husbands possessed all bargaining power within the household and 2 respondents replied that their husband made all decisions regarding his own income. In both cases, the husband earned more income than the wife. Panel C shows that most tea workers earn about the same income as their husband, while most non-tea workers earn less. Furthermore, panel D illustrates that male and female tea pluckers are paid the same wage for the same work performed. This is only true for 62.5 percent of non-tea workers. Panel D also shows that women usually pick tea leaves for generations. Finally, daughters have attended a higher level of education than sons, given the school appropriate age according to the Indian education system. This is true both for tea workers and non-tea workers, as depicted in panel E. The difference is however greater among tea workers, compared non-tea workers.

7 Discussion and Conclusion

First, I take advantage of district-level census data combined with historical data on tea production to examine whether regional variations in male-biased sex ratios across India can be traced back to the tea production induced by the British East India Trading Company in the 19th century. The empirical results demonstrate that more women are born in districts that produced tea in British India compared to districts that did not. This relationship holds conditional on British colonial institutions that have been shown to affect contemporary development in India. Furthermore, it is not likely that the estimated effect is fully driven by unobservables, as shown by assessing the bias from unobservables by using selection on observables. Despite substantial regional differences across tea planting districts, the effect of tea production is in fact homogeneous. Finally, excluding districts that were colonized prior to the discovery of tea does not alter the results.

Second, a survey was conducted in one historical tea-producing district, Idukki, in order to further examine the relationship between tea production and female survival. It is important to note the difference between the empirical and anecdotal analysis. While the former analyses treatment- and control districts across India, the latter examines tea-producing and non-tea-producing individuals in one treated district. That is, whereas the empirical section demonstrates a clear association between tea production and female survival at the district level, the anecdotal section further examines this relationship and potential mechanisms at the

individual level in one treated district. It is shown that women working at tea plantations in Idukki district have somewhat stronger relative preferences for having daughters compared to women not working at tea plantations. At the same time, none of the interviewed women in Idukki district preferred having more sons than daughters. Thus, despite not examining the same thing, the results from Idukki district are in line with the findings at the aggregate level.

Furthermore, the results from the conducted survey hints towards potential channels through which tea production might have increased female survival. It might be that female survival increased through higher economic value generated by increased labour income from picking tea leaves. Alternatively, it might be that women have gained higher bargaining power over time through generations, as a results of the increased income from picking tea leaves and, consequently, enforced their relatively higher preferences for having daughters. More schooling for daughters might also be an additional positive factor generated by higher female survival.

The most noticeable drawback in this paper is that selection on observables does not ensure a causal relationship. And although the results of the conducted survey suggest potential mechanisms through which tea production affects female survival, no general conclusions can be drawn from a sample size this small. It is thus strongly encouraged for future research to take advantage of an experimental approach, or instrumental variable analysis, and to conduct a large scale survey, including women from non-tea producing districts as well.

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Table 1 Summary Statistics

	Tea District	Non-Tea District	Diff.	p-Value
Panel A: Contemporary variables				
Sex ratio	997	941	56	0.00
Literacy rate	0.802	0.716	0.086	0.00
Population	1,724,055	1,905,418	-181,363	0.41
% Muslims	0.202	0.122	0.08	0.00
% SC	0.133	0.163	-0.024	0.02
% ST	0.078	0.192	-0.114	0.00
% BPL	0.309	0.305	0.004	0.32
Obs.	54	586		
Panel B: Colonial variables				
Non Landlord-Based System	0.611	0.352	0.259	0.00
Indirect British Rule	0.167	0.305	-0.138	0.03
Coastal district	0.222	0.094	0.128	0.00
Temporary Settlement	0.778	0.509	0.269	0.00
Obs.	18	249		

Notes: Panel A displays district level summary statistics from the 2011 Indian Census. Sex ratio is the number of females born per 1000 males. Panel B displays district level summary statistics from the Colonial Rule in British India. All colonial variables are indicators equal to one if a 19th century district was characterized by; i) a non-landlord based system; ii) indirect British rule or iii) temporary settlement. p-Value is for a t test of equality of means across tea producing and non-tea producing districts.

Table 2 OLS Estimates of the Relation Between Tea Production and Female Survival

	Dependent Variable: Female Survival Rate			
	(1)	(2)	(3)	(4)
Tea Production	0.055*** (0.014)	0.029** (0.014)	0.055*** (0.0149)	0.031** (0.015)
Population (log)	0.003 (0.006)	-0.003 (0.005)	0.001 (0.006)	-0.004 (0.005)
Literacy rate	-0.010 (0.046)	0.024 (0.042)	-0.008 (0.045)	0.019 (0.044)
% Muslim	-0.059*** (0.024)	-0.034 (0.024)	-0.047** (0.022)	-0.031 (0.022)
% SC	-0.070 (0.045)	-0.050 (0.044)	-0.061 (0.045)	-0.055 (0.045)
% ST	0.044 (0.035)	0.045 (0.038)	0.042 (0.035)	0.046 (0.038)
% BPL	0.032 (0.043)	0.035 (0.045)	0.032 (0.044)	0.035 (0.046)
Coastal district			0.046*** (0.011)	0.023*** (0.008)
Non-Landlord based System			-0.024*** (0.007)	-0.000 (0.007)
Indirect British Rule			-0.016* (0.009)	-0.010 (0.010)
Temporary Settlement			0.016* (0.008)	0.002 (0.009)
Observations	551	551	551	551
Number of Clusters	266	266	266	266
Region Fixed Effects	No	Yes	No	Yes
R ²	0.24	0.42	0.28	0.42

Notes: This table shows the OLS estimates of the relation between tea production and the contemporary female survival rate. Contemporary districts that could not be matched to colonial districts are dropped from the sample. Column (1) and (2) show the relationship without controlling for colonial institutions with and without region fixed effect, respectively. Column (3) and (4) shows the relationship controlling for colonial institutions. Standard errors are clustered at the 19th century district level. ***p<0.01, **p<0.05, *p<0.1.

Table 3 Using Selection on Observables to Assess the Bias from Unobservables

Controls in the restricted set	Controls in the full set	Female Survival Rate
None	Full set of contemporary controls.	6.91
None	Full set of contemporary and colonial controls.	31.04
Share of Muslim population	Full set of contemporary controls.	6.24
Share of Muslim population	Full set of contemporary and colonial controls.	30.43

Notes: Each cell of the table reports ratios based on the coefficient for tea plantation from two district-level regressions. In one, the covariates include the restricted set of control variables. Call this coefficient β^R . In the other, the covariates include the full set control. Call this coefficient β^F . In both regressions, the sample sizes are the same. The reported ratio is calculated as: $\beta^F / (\beta^R - \beta^F)$.

Table 4 OLS Estimates of the Effect of Tea Production on Female Survival,
Controlling for Regional Heterogeneity

	Dependent Variable: Female Survival Rate			
	(1)	(2)	(3)	(4)
Tea Production	0.018** (0.009)	0.023*** (0.009)		
Tea Production*South	0.063*** (0.021)	0.055*** (0.022)		
Tea Production			0.033*** (0.012)	0.032*** (0.011)
Tea Production*Kerala			0.108*** (0.015)	0.116*** (0.014)
Population (log)	0.006 (0.006)	0.000 (0.006)	0.005 (0.006)	-0.001 (0.006)
Literacy rate	0.022 (0.050)	-0.022 (0.045)	-0.005 (0.048)	-0.052 (0.042)
% Muslim	-0.059** (0.027)	-0.043* (0.023)	-0.071*** (0.023)	-0.052*** (0.019)
% SC	-0.117** (0.047)	-0.067 (0.045)	-0.101** (0.049)	-0.056 (0.047)
% ST	0.039 (0.035)	0.045 (0.035)	0.034 (0.034)	0.039 (0.034)
% BPL	0.030 (0.042)	0.033 (0.043)	0.029 (0.041)	0.030 (0.042)
Coastal district		0.043*** (0.011)		0.037*** (0.011)
Non-Landlord-based System		-0.021*** (0.008)		-0.024*** (0.007)
Indirect British Rule		0.020** (0.009)		-0.023*** (0.009)
Temporary Settlement		0.015* (0.008)		0.020** (0.008)
Observations	551	551	551	551
Number of Clusters	266	266	266	266
R ²	0.21	0.30	0.24	0.34

Notes: This table shows the OLS estimates of tea production on the contemporary female survival rate for all tea districts and separately for southern tea districts. Column (1) and (2) show the relationship for tea districts located in the southern region. Column (3) and (4) shows the relationship for tea districts located in the state of Kerala. Standard errors are clustered at the 19th century district level. ***p<0.01, **p<0.05, *p<0.1.

Table 5 OLS Estimates of the Effect of Tea Production on Female Survival,
Controlling for Timing of Colonization

	Dependent Variable: Female Survival Rate			
	(1)	(2)	(3)	(4)
Tea Production	0.055*** (0.016)	0.027* (0.015)	0.055*** (0.015)	0.029** (0.015)
Population (log)	0.003 (0.006)	-0.004 (0.006)	-0.001 (0.006)	-0.005 (0.006)
Literacy rate	0.024 (0.055)	0.039 (0.046)	-0.026 (0.050)	0.009 (0.049)
% Muslim	-0.079*** (0.027)	-0.044 (0.027)	-0.060** (0.025)	-0.041 (0.025)
% SC	-0.161*** (0.055)	-0.101* (0.053)	-0.100* (0.057)	-0.091 (0.056)
% ST	0.018 (0.037)	0.029 (0.040)	0.026 (0.039)	0.032 (0.042)
% BPL	0.021 (0.039)	0.032 (0.041)	0.030 (0.39)	0.034 (0.043)
Coastal district			0.048*** (0.013)	0.026*** (0.010)
Non-Landlord-based System			-0.027*** (0.008)	-0.003 (0.007)
Indirect British Rule			-0.011 (0.012)	-0.005 (0.012)
Temporary Settlement			0.025 (0.013)	0.009 (0.012)
Observations	499	499	499	499
Number of Clusters	244	244	244	244
Region Fixed Effects	No	Yes	No	Yes
R ²	0.19	0.41	0.29	0.43

Notes: This table shows the OLS estimates of the relation between tea production and the contemporary female survival rate where districts that were conquered prior to the discovery of tea are dropped from the analysis. Column (1) and (2) show the relationship without controlling for colonial institutions with and without region fixed effect, respectively. Column (3) and (4) shows the relationship controlling for colonial institutions. Standard errors are clustered at the 19th century district level. ***p<0.01, **p<0.05, *p<0.1.

Table 6 Summary of Interviews Conducted in Idukki District

	Tea workers	Non-Tea workers
<i>A. Preferred gender composition of children</i>		
Prefer more daughters than sons	18.6	16.6
Prefer equal composition of daughters and sons	44.0	54.2
No specific preferences	37.4	29.2
<i>B. Decision-making power within household</i>		
All decisions are taken jointly	100	83.3
<i>C. Income</i>		
Earn more income than husband	25.9	8.3
Earn about the same income as husband	51.8	16.7
Earn less income than husband	22.3	75.0
<i>D. Employment</i>		
Paid same wage as men	100	62.5
Have had same occupation for generations	74.0	20.8
<i>E. Children's schooling</i>		
Daughters attain higher level of schooling	22.2	12.5

Notes: This table presents a summary of the main results from the conducted survey in Idukki district. All numbers are in percentages.

A. Questionnaire

Name of household head:

Household number:

District:

State:

Date:

Language of questionnaire:

Name of supervisor:

Introduction and Consent

Hello. My name is Victoria Towliat and I am studying at Lund University in Sweden in collaboration with the Swedish International Development Cooperation Agency (SIDA). I am conducting a survey about women working at tea plantations. I would very much appreciate your participation in this survey. The interview takes between 10 to 15 minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.

As part of the survey I would first like to ask some questions about your household.

All of the answers you give will be confidential. Participation in the survey is completely voluntary. If we should come to any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. However, we hope you will participate in the survey since your views are important.

At this time, do you want to ask me anything about the survey?

May I begin the interview now?

Signature of interviewer:

Date:

1 Household Characteristics

1a) What is your relationship to the head of the household?

1b) Do you usually live in this household?

1c) Did you stay here last night?

1d) How old are you?

1e) What is your current marital status?

1f) What is your religion?

1g) What is the name of your caste?

2 Educational Background

2a) Have you ever attended school?

2b) How many years of schooling have you attended?

2c) What is the highest level of schooling you have attended?

3 Fertility and Family Planning

3a) Now I would like to ask about all the births you have had during your life.
Have you ever given birth? Yes =1, No=0

3b) Do you have any sons or daughters to whom you have given birth who are now living with you? Yes=1, No=0

3b i) How many sons live with you?

3b ii) And how many daughters live with you?

3c) Do you have any sons or daughters to whom you have given birth who are alive but do not live with you? Yes=1, No =0

3c i) How many sons are alive but do not live with you?

3c ii) And how many daughters are alive but do not live with you?

3d) How old are your daughters?

3d i) Age of daughter 1:

3d ii) Age of daughter 2:

3d iii) Age of daughter 3:

3e) How old are your sons?

3e i) Age of son 1:

3e ii) Age of son 2:

3e iii) Age of son 3:

3 f) Are your daughter(s) currently in school? Yes=1, No =0

3f i) Daughter 1 currently in school:

3f ii) Daughter 2 currently in school:

3f iii) Daughter 3 currently in school:

3 g) Are your son(s) currently in school? Yes=1, No =0

3g i) Son 1 currently in school:

3g ii) Son 2 currently in school:

3g iii) Son 3 currently in school:

3h) How many years of schooling have your daughter(s) attended?

3h i) Daughter 1 years of schooling:

3h ii) Daughter 2 years of schooling:

3h iii) Daughter 3 years of schooling:

3i) How many years of schooling have your son(s) attended?

3i i) Son 1 years of schooling:

3i ii) Son 2 years of schooling:

3i iii) Son 3 years of schooling:

3j) What is the highest level of schooling your daughters(s) have attended?

3j i) Daughter 1 highest level of schooling:

3j ii) Daughter 2 highest level of schooling:

3j iii) Daughter 3 highest level of schooling:

3k) What is the highest level of schooling your son(s) have attended?

3j i) Son 1 highest level of schooling:

3j ii) Son 2 highest level of schooling:

3j iii) Son 3 highest level of schooling:

3l) If you could choose exactly the number of children to have your whole life, how many children would that be?

3m) How many of these children would you like to be girls and for how many would it not matter if it's a boy or a girl? 10= does not matter

4 Employment

4a) What is your occupation, that is, what kind of work do you mainly do?

4b) Do you usually work throughout the year, or do you work seasonally, or only once in a while? Permanently=1, Seasonally=2, Once in a while=3.

4c) Are you paid in cash or kind for this work, or are you not paid at all? Cash=1, Kind=2, Not at all=3.

4d) Are men performing the same kind of work as you? Yes=1, No=0

4e) Are men paid the same amount of money as women? Yes=1, No=0

4f) Do women in your family have the same occupation? Yes=1, No=0

4g) Have women in your family had this occupation for generations? Yes=1, No=0

4h) For how many generations have the women in your family had this occupation?

5 Household Decision-Making Power

5a) Who decides how the money you earn will be used: mainly you, mainly your husband, or you and your husband jointly? You=1, Your husband=2, Jointly=3

5b) Would you say that the money that you earn is more than what your husband earns, less than what he earns, or about the same? More=1, Less=2, About the same=3

5c) Who decides how your husband's earnings will be used: mainly you, mainly your husband, or you and your husband jointly? You=1, Your husband=2, Jointly=3

5d) Who usually makes the following decisions: mainly you, mainly your husband, you and your husband jointly, or someone else? You=1, Your husband=2, Jointly=3, Someone else=4

- i. Decisions about the number of children to have?
- ii. Decisions about how many girls and boys to have?
- iii. Decisions about your son(s) schooling?
- iv. Decisions about your daughter(s) schooling?