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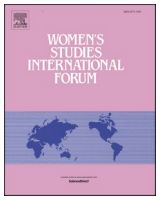

Does women's education improve the sex ratio at birth? Gender, agency and sex-selective abortion in South and East Asia: a critical literature review

Rosie Peppin Vaughan

Centre for Education and International Development, IOE, UCL's Faculty of Education and Society, 20 Bedford Way, London WC1H 0AL, United Kingdom

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ABSTRACT

The increasingly skewed sex ratio at birth, a result of son preference and sex-selective abortions, is a pressing concern in development. It appears that many aspects of development (such as economic growth, technological development, and women's increasing economic independence and voice) are occurring alongside a growing number of 'missing' girls and women, with various adverse social and economic consequences.

A perplexing dimension is that women's education apparently has no clear relationship to the sex ratio at birth, and in some contexts appears to increase the propensity for sex selection. However, so far, studies have tended to use basic measures such as level or years of education, which do not explain whether and how educational experience affects traditional patriarchal norms and the relative value afforded to boys and girls. Drawing on a capabilities perspective on education, this article argues for a more nuanced concept of agency (which incorporates social structures and norms), and the need to integrate critical perspectives on the relationship between education, agency and empowerment. Finally, it makes a case for innovative measures of gender and education, which would allow comprehensive empirical exploration of how different forms of education affect women's capabilities and agency in relation to sex selection.

1. Introduction: the child sex ratio and women's empowerment[1]

An imbalance in the sex ratio at birth (ratio of male to female live births) and the child sex ratio (CSR) has been a persistent issue in many parts of the world as a result of son preference. Since the 1980s these inequalities have sharpened in several Asian countries, including India and China, particularly due to the increasing availability of prenatal sex determination and abortion technology.

Complex economic, social and cultural dynamics underlie sex selection, including changing labour market and marriage patterns, social policy reforms and social and cultural norms. Despite the links between son preference, patriarchal norms and disadvantage for women, interestingly, sex ratios have become more imbalanced at the same time as apparent increases in women's empowerment in most countries, as evidenced by indicators of education and economic participation. In particular, a perplexing dimension is that women's education appears to have no clear relationship to the sex ratio at birth, and in some contexts seems to increase the propensity for sex selection (Boer & Hudson, 2017; Das Gupta, 1987; Ebenstein, 2010; Jha et al., 2011). Some studies even suggest that the more education a women has, the more likely she is to choose sex selection (Jha et al., 2011).

In this article, I examine the key concept of agency in relation to sex-selective behaviour in families, drawing in particular on perspectives from the capability approach. Education is frequently assumed to have a positive effect on women's empowerment and agency (Klasen, 2020), but in some contexts, research suggests that higher levels of women's education appear to be associated with increasing discrimination towards female fetuses and children. However, critical education scholarship calls us to examine not only levels of education but also the gendered nature of educational processes, and as I argue further down, offers new insights into how education may affect agency around sex-selective behaviour. The central aim of this paper, therefore, is to

E-mail address: rosie.peppinvaughan@ucl.ac.uk.

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draw on the body of literature of critical perspectives on gender and education, to give new insights into the trends on sex-selective behaviour. How do gendered aspects of schooling affect women's (and men's) agency later in life, specifically in relation to how sons are valued relative to daughters, and decisions about family composition?

Measures of gender equality in education are central to our understanding of these relationships. So far, studies have tended to use basic measures such as level or years of women's education, which do not give insight into whether and how educational experiences affects individual preferences, traditional patriarchal norms and the relative value afforded to boys and girls. In the final section, I argue that in order to understand the dynamics of the CSR more fully, we need a more comprehensive range of indicators of educational experience, incorporating dimensions of educational processes, content, and men's education.

This article presents an extensive review of literature to reflect on these issues. It begins with a brief overview of recent trends in the child sex ratio in Asia, and existing explanatory theories, focusing on agency, and decision-making around the sex composition of families. Second, it reviews conflicting findings on education, and the child sex ratio. Third, it introduces critical literature on gender, education and agency, and draws on this to argue for examining three key areas of education: agency and women's valued preferences; men's education; and societal values and norms. Finally, it reflects on implications for innovations in measurement, and the significance for future research on the CSR, of improving measures of gender equality in education.

2. Son preference and imbalances in the child sex ratio

2.1. Background

While an imbalanced sex ratio at birth has been identified in a number of different locations and communities, most of the more skewed ratios been observed across Asia (World Bank, 2012: 120–127). A widely accepted 'natural ratio' is around 106 boys born to every 100 girls. However, in India numbers of boys born for every 100 girls rise from 105.7 in 1972, to 109.2 in 1987, 110.1 in 2007 and 109.9 in 2017. In China, the number was 107 in 1972, 117 in 2007 and 113 in 2017, with similar shifts in several other Asian countries (United Nations Population Division, 2020).

Skewed child ratios (aged 0–5) prior to the 1980s are understood to have been a result of preferential treatment of boys, whether conscious or unconscious (for example through girls receiving less nutrition or medical treatment) leading to higher female than male child mortality. In recent decades, there have been improvements in child mortality, and in most Asian countries the male under 5 mortality rate is higher than that of females in the same age group.[2] Therefore, imbalances in child sex ratios since the 1980s and 1990s are understood to be due to a shift in behaviour towards sex selective abortion (Das Gupta, 2019). Some countries which experienced imbalanced ratios have reversed the trend over several decades; and there is also some evidence of shifting preferences (Muñoz Boudet, Petesch, Turk, & Thumala, 2013: 111–113) but overall there is no clear cut picture of progress.

Empirically, a skewed sex ratio at birth is generally understood to depend on three factors: son preference (demand factor); fertility decline ('squeeze' factor - having fewer children leads to an increased pressure for at least one son); and advances in reproductive technology (supply factor) (Boer & Hudson, 2017; Guilmoto, 2009). Taking these in turn, first, a preference for sons has historically been prevalent in many countries. Reasons for preference vary by context but typically it stems from a higher value of sons for the family, in terms of potential earnings and contribution to the family; expectations around caring for parents in old age (as daughters traditionally will leave the household for their husband's family); inheritance patterns, and status (Klaus & Tipandjan, 2015). Second, declining fertility rates ('squeeze'): if an average family size is smaller, it is more likely that parents will need to take some form of action in order to ensure that at least one of their children is a son. Third, access to sex-selective technology has increased, in the form of ultrasound technology to determine the sex of an unborn child, and legal, safe abortions becoming increasingly available. Most recently, changes in genetic screening earlier in pregnancy have made this easier, by enabling the sex of a foetus to be detected as early as 10 weeks through a simple blood test from the mother (Bowman-Smart, Savulescu, Gyngell, Mand, & Delatycki, 2020).

On top of technological developments and fertility decline, parents must be willing to make the decision to have an abortion as a result of a desire for sons, over and above any ethical or religious considerations (Boer & Hudson, 2017; Guilmoto, 2009). Boer and Hudson argue that government-led fertility programmes (which may support patrilineality), and resultant changes to incentive structures, may provide a catalyst towards this. Several studies have shown that sex selection increases with parity (the number of children a woman has had), which may indicate that families choosing to have fewer children are more likely to practice selection if the first child is not a son (Das Gupta, 1987; Jaitley, 2018; Jha et al., 2006; Jha et al., 2011).

Social class is an important factor in the likelihood of sex selection. Kaur et al., (2016) highlight two contradictory theories about the sex ratio at birth and socio-economic status: the 'optimistic' view which is that as families get wealthier, their perceptions of the value of girls and boys change. Alternately, a 'pessimistic' view is that as families get wealthier, they tend to choose smaller family sizes, and also have greater access to selective technology, and are therefore more likely to act on a preference for sons. In their analysis of trends in India, Kaur et al., (2016) found that the relationship with socio-economic status and prosperity is complex: the ratio depends on the proportion of population in the emerging middle class, and (stable) middle class. They suggest that the stable middle class are more likely to have gender-equal values and for daughters to help with old age care of parents; and also that parents are more likely to invest in daughters' education (2016: 21). They conclude that if the male-female education gap in India continues to close, then the average sex ratio at birth in India will return to 'natural' levels in the mid-2020s, with states with higher son-preference taking longer to adjust.

To address this issue, governments in several Asian countries experiencing particularly skewed child sex ratios in the 1980s and 1990s introduced a number of reforms, including bans and legal reforms relating to sex determination technology and sex selective abortion; as well improved pensions and social security; and targeted measures to promote the value of girl children. In India, for example, key measures have been the Pre-Conception and Pre-Natal Diagnostics Techniques (Prohibition of Sex Selection) Act of 1994 (PNDT) and its amendment the Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act of 2002.[3] However, the continued incidence of sex selective abortion and female child neglect is evident in the skewed child sex ratios that persist in many countries, as seen in Table 1, with a number being above the 'natural ratio' of 106 in 2017 (shown below the black line).

As seen in Figs. 1 and 2 below, in many countries the three factors contributing to sex selection (declining fertility, son preference, and

[2] For almost all countries in Asia, the male mortality rate in the under-5 age group is higher than the female rate (India being the exception). For example, the male to female mortality ratio for under-5 s in China has risen from 1.09 in 1990 to 1.12 in 2018 (calculated from the UN Inter-Agency Group for Child Mortality data). For a more detailed discussion, see Iqbal et al. (2018), who explore how the under-5 female mortality rates, while lower than male mortality rates in the same age group, may nonetheless be higher than expected.

[3] Partly because of these bans, direct evidence for sex selective abortion is almost impossible to gather.

Table 1
Number of boys born to every 100 girls, 1972-present.

	1972	1987	2002	2007	2012	2017
Sri Lanka	103.8	104.6	104.5	104.4	104.0	103.9
Bangladesh	104.9	104.9	104.9	104.9	104.9	104.9
Indonesia	105.0	105.0	105.0	105.0	105.0	105.0
Korea, Rep.	106.2	111.8	109.0	106.7	105.7	105.5
Philippines	106.0	106.0	106.0	106.0	106.0	106.0
Thailand	105.7	105.0	106.2	106.4	106.2	106.2
Nepal	104.5	104.5	107.1	105.4	105.4	106.5
Singapore	107.3	107.3	107.3	107.3	107.3	107.3
Hong Kong SAR, China	106.8	106.9	108.5	112.9	111.7	107.8
Pakistan	106.4	106.4	109.6	108.6	108.7	108.7
India	105.7	109.2	111.2	110.1	109.9	109.9
Vietnam	106.4	106.4	108.1	111.5	112.5	112.3
China	107.0	108.0	116.0	117.0	115.0	113.0

Source: UN Population Division (2020).

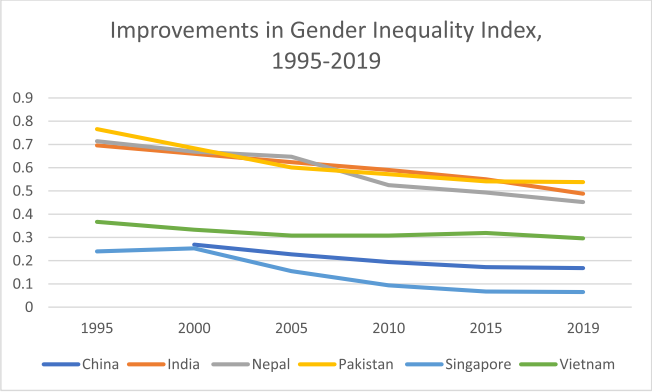

Fig. 1. Gender Inequality Index, selected countries, 1995–2019.[a] (Lower GII value means fewer disparities between females and males)
Source: Human Development Report Office (from Human Development Report Office Statistical Data API, accessed July 2021).
[a]The Gender Inequality Index measures gender inequalities in three important aspects of human development—reproductive health, measured by maternal mortality ratio and adolescent birth rates; empowerment, measured by proportion of parliamentary seats occupied by females and proportion of adult females and males aged 25 years and older with at least some secondary education; and economic status, expressed as labour market participation and measured by labour force participation rate of female and male populations aged 15 years and older (UNDP, 2019).

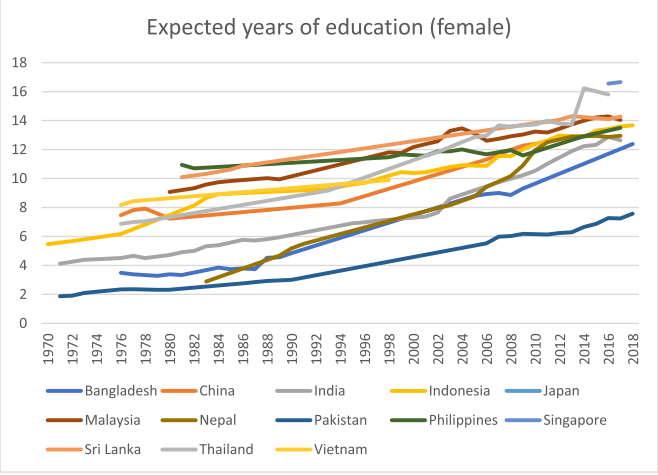

Fig. 2. Expected years of education, selected countries (female)
Source: World Bank DataBank (accessed July 2021).

technological development) have also been present at a time of unprecedented expansion of a range of indicators of gender equality, women's empowerment and rights. This is a puzzle noted by a number of authors (Agrawal, 2012; Chung & Gupta, 2007; Mukherjee, 2013).

Why do measures of women's empowerment appear to be associated with increasing gender discrimination within families? A key issue for understanding the dynamics behind sex selective decisions is women's agency and preferences, and the next section turns to the literature on women's agency and the child sex ratio.

2.2. *Family composition: problematising women's agency*

Agency is broadly understood to be a person's ability to act in accordance with their values and preferences (Crocker, 2008; Gram et al., 2017; Ibrahim & Alkire, 2007; Naila Kabeer, 1999; Koggel, 2019; R. Richardson, Schmitz, Harper, & Nandi, 2019; A. Sen, 1992). Agency is widely regarded as a fundamental component of women's empowerment and, from a human development and capabilities perspective, an integral part of development itself.[4]

Women's control over their bodies and reproductive choice is one of the most well-recognised dimensions of agency. Women with more agency are by definition able to exert more influence in household decisions, including reproductive decisions. Some measures of agency have therefore included decisions over the number of children, and access to and use of abortion (for example, R. Richardson et al., 2019).

However, the relationship between agency and reproductive behaviour is also complex. In many settings women are subject to significant pressure from family members and society about their reproductive choices; including who to marry and when; how many children to have and at what age. This pressure may be explicit; but may also implicitly affect women's preferences about reproductive decisions, as explored in recent comprehensive reviews on links between women's empowerment, fertility, and family planning decisions (Prata et al., 2017; Upadhyay et al., 2014). However, these reviews also reveal that there has been little attention to the relationship between agency, empowerment, son preference and sex-selective abortion.

Yet there is evidence of pressure and lack of power that women feel around the sex of their children as evidenced from research in India. A number of qualitative studies reported women's lack of decision-making power around sex selection (Duggal & Ramachandran, 2004; Visaria, Ramachandran, & Ganatra, 2004). Visaria et al., looking at a series of qualitative studies in India, found that "women expressed helplessness as their status in the family and sometimes the very survival of their marriage depended on the ability to produce sons" (2004: 5046); they also reported that in some study contexts (e.g. Maharashtra) in which the family and community condoned sex-selective abortion (despite its illegality), there was no social stigma for the women. Ganatra, Hirve, and Rao's (2001) study found women in rural Maharashtra describing pressures from wider family to have sex selective abortions. They report that women who had sex-selective abortions (as opposed to abortions for other reasons) had less autonomy and weaker decision-making powers within the household; they were more likely to be living in larger families and more vulnerable to pressure from relatives to produce male heirs.

Therefore, access to and use of abortion, coupled with 'fertility squeeze', may not straightforwardly indicate increased agency. Menon's (1995) key work on 'impossibility of justice' takes a legal perspective, and examines how abortion appears differently to feminists in the global

[4] Agency is central to the capability approach; although precise definitions vary (Robeyns, 2017), it is typically understood in terms of an individual's ability to act in accordance with what is valuable to them. Sen contrasts agency to wellbeing, in that it can also encompass values and interests not directly relating to one's quality of life and can be 'other-regarding', incorporating for example, political or religious concerns.

North and South. She argues that while in the North it is typically associated with women's rights and freedom to have autonomy over their bodies, in the South can be a tool with which the reproductive autonomy of women can be controlled. For example, Ravindran and Balasubramanian (2004) explored the role of gender power relations within marriages, in decisions over abortions; and found that non-consensual sex and sexual violence seemed to underlie many of the cases of abortion in the study.

There are complex relationships between preferences, decision-making dynamics and sex selective behaviour. Interestingly, the method of sex selection itself may reflect the gendered differences in control of resources within the household and in the dynamics of decision-making. Using NFHS-3 data, Robitaille and Chatterjee (2018) explore how the method of sex selection (abortion, or postnatal neglect) depends on whether son preference is shared by husband and wife. They found that where wives have son preference but husbands do not, men seem to be able to veto abortions (through control of finances and movement) and instead girl infants had a higher mortality rate; whereas where husbands have son preference but wife does not, men seem to be able to coerce the woman towards having an abortion, thereby highlighting the importance of fathers role in decision making, and bargaining processes within the household (2018: 53–55).

Further, some authors have noted that following pressures around expected reproductive behaviour and especially son preference may give women other privileges or possibly even more autonomy. A number of authors (e.g., Kabeer, 1999; A. Sen, 1999) argue that while reproductive choice can reflect a woman's agency, decisions may represent a trade-off for other sources of power. Having a son, or the approved number of children, can be a way for a woman to increase her rights and privileges within the household, but does not necessarily give her greater autonomy in decision-making (Agrawal, 2012; G. Sen, 1993).

These complexities around agency and whether women have a 'choice' in the context of family and social pressures have been recognised by recent studies of the policies aimed at reducing sex-selective abortions and rebalancing the child sex ratio. Eklund and Purewal (2017) explore what they see as the 'emerging bio-politics' of son preference and sex selective abortion in India and China, and the impact of policy responses that have largely centred around criminalising sex selective abortions. They argue that the psychological dimensions have been ignored in such responses; and that as the family is a site of women's struggle and suppression, the pressures on women mean that sex selection is typically not a 'choice': they either enter a bargain with patriarchy or are subject to coercive and structural forms of violence (2017: 47–49). They also call attention to the role of shame (in response to producing daughters); and that sex selective abortion may be a 'preventative measure' as a means of saving a child from a lifetime of discrimination, or as a pre-empted avoidance of dowry obligations.

Further, Purewal (2018) argues that sex selective abortion should be seen as a manifestation of structural violence; and as it is structurally produced (through neoliberal economic strategies) it cannot be addressed through awareness-raising campaigns in India such as *Beti Bachao Beti Padao*, or financial inclusions. Rahm (2019) argues that many measures may be counter-productive; for example, projects suggesting women and girls need 'protection' may reinforce embedded values around masculinities and female vulnerability.

Wider scholarship on agency has increasingly recognised the complexities of understanding individual agency in relation to social contexts. Dreze and Sen (2013: 233), reflecting on earlier writings, consider that agency needs to be understood not just as 'freedom of action', but also 'freedom of thought and its practice', and that the focus must be on 'informed, critical agency'. Kabeer (2021) states that understanding agency requires a focus on both the conditions and consequences of choice. Koggel (2019), focusing specifically on gender and women's agency, argues that we need a relational account of agency; and examines how certain policies expected to enhance women's agency may actually perpetrate norms that limit agency and choice.

Khader (2018) draws particular attention to how power structures can affect women's agency. She reflects that improvements in women's range of choices can, in certain circumstances, both worsen gender relations and burden her; 'a woman can have increased ability to do what she wants, but, because of external constraints on her options or internalized oppression, engage in activities that do nothing to change, or worsen, the status of women as a group' (2018: 154). Certain factors can mean that expanding women's choices can also be disempowering, such as unjust choice architectures (which force women to choose among unacceptable options), the behaviours of others such as men (which often have the power to set expectations of what women do), and relative inequalities between women and men (that take the form of women being expected to do more) (2018: 150). Rather than simply increasing women's individual agency, Khader argues that we need to attend to these wider concerns, and suggests new pathways to empowerment that recognise power as structural and structuring. These include improving gendered-choice architectures; changes to gendered adaptive preferences; recognising that men also need to be part of the changes.

In sum, studies have shown that rather than being due to a straightforward lack of agency in individual women, sex-selective behaviour must be understood as something rooted in the gendered structures of society, which influence women's (and men's) preferences and decision-making.

One factors frequently cited as fundamental to the development of agency (however it is conceived) is education; and the last few decades have seen an unprecedented rise in girls' and women's education in almost all countries experiencing imbalances in child sex ratios. The next section explores what studies have so far revealed about the relationship between education, son preference, and the child sex ratio; and subsequently draws on critical perspectives on agency and in particular Khader's analysis to explore how theoretical work on gender and education can give new insight into these relationships.

3. Education, agency and the child sex ratio: evidence from research

Broadly speaking, within research on the child sex ratio, education is typically regarded as a driver of empowerment, that increases women's autonomy and agency within the household. Mukherjee (2013), exploring the relationship between education and the child sex ratio in India through Census data, begins by summarising the different mechanisms presented so far through which education theoretically would improve the child sex ratio, which accord with increasing agency, or changing preferences:

i) Women who are more informed about health and childcare make better decisions on child wellbeing. (Many studies have shown that improvements in women's education raise investments in child health and survival (Currie & Moretti, 2003; Glewwe, 1999).

ii) Education gives women increased skills for paid work, leading to an increase in parental income, and less future dependence on sons – therefore reducing son preference.

iii) Paid work, facilitated by education, leads to the increased self-worth of mothers, who then have greater decision-making power to allocate resources to girls.

iv) Women with access to income may choose to bear and rear more girls (Agarwal, 1994; Basu & Basu, 1991).

These theories are supported by some empirical studies which show that increasing levels of education can be associated with the child sex ratio becoming more balanced (for example, Klaus & Tipandjan, 2015; Pande & Malhotra, 2006). However, theories that education might reduce the child sex ratio rest on a number of assumptions: first, that education would change women's preferences and lead to valuing a girl child more; or also that sex-selective abortion is a result of woman's lack of agency within the household and that women do not desire sex selective abortion.

However, Mukherjee's analysis of 2001 Census notes that the child

sex ratio becomes more skewed with rising education level. This finding is also in line with numerous other studies in India. Ebenstein (2010), using DHS survey data, found that mothers with more education were more likely to have smaller families, and more likely to have sons. Portner (2015), drawing on several decades of NFHS data since the 1970s, also found that higher education levels for women are associated with increased use of sex selective abortion, particularly as family sizes have become smaller. Higher educated women are more likely to have fewer children, and a number of authors have hypothesised that if a smaller family is anticipated then this can lead to a greater desire (or pressure) for sons. Further, higher education tends to be associated with greater affluence, which gives more access to ultrasound technology. Some of the studies using Census or survey data, however, have given some insight into how education intersects with other determinants of sex selection.

First, we can consider the effects of education on women's preferences about the sex of their children. There is no consensus from empirical studies about how and whether son preference varies according to women's level of education. Some studies offer evidence that more educated mothers express less son preference (Bhat & Zavier, 2003; Pande & Malhotra, 2006). Interestingly, Kaur et al. (2016) found that male and female education affect the sex ratio at birth in different ways: male education makes son preference more prevalent; whereas female education makes the ratio more balanced.

Second, it is not clear whether education affords increased agency and bargaining power within the household specifically in relation to the sex composition of children. Research suggests that increased education is associated with a number of factors likely to lead to stronger external direct pressures on women (and households) to practice sex selection. For example, educated women are more likely to have smaller families, which in a context of society placing more value on boys than girls, increasing the need to intervene to ensure having a son. As discussed earlier, studies have revealed that the sex ratio by birth order is significant (Das Gupta, 1987; Jaitley, 2018; Jha et al., 2006; Jha et al., 2011), and these have also shown that education can intensify this effect. Das Gupta's seminal study (1987) of the sex ratio in the Punjab revealed that while higher levels of women's education were associated with lower child mortality overall, higher birth order girls experienced much higher mortality than their male siblings. More recently, Jha et al. (2011, 2006) looked at the conditional sex ratio for second order births following a first born girl in India. They found that if the first child was a daughter, educated mothers are much more likely to have a second child that is a son, which they attribute to cultural preferences and greater access to prenatal ultrasound among women with more education.

A related point is that the significance of education can be affected by class and socio-economic status. Arokiasamy and Goli (2012) examined the significance of landholdings, and found that within a given level of mother's education, the larger the landholding, the more skewed the child sex ratio. Kaur et al. (2016) found sex selection to be more strongly linked to the 'emerging middle class' in comparison to what they termed the 'stable middle class', with greater family pressures around status, son preference and wealth.

Moreover, greater levels of education may both increase a woman's understanding of and ability to access sex selective technology, particularly if her education has also afforded her an income and greater status within the household. Bhalotra and Cochrane (2010) suggest that better educated women may be more receptive to new technologies, and better access to ultrasound and safe abortion facilities. Moreover, in addition to understanding sex-selective screening and technology and how to access it; education could also further parental understanding about the implications of forms of child neglect or infanticide.

Overall, therefore, empirical studies so far on education and the child sex ratio indicate a complex relationship between education, son preference, and women's agency around family composition. The significance of education is mediated by a range of factors (Guilmoto, 2009): class; family structures; norms and behaviours (influenced by labour market, inheritance, laws etc); birth order and decreasing fertility; policies around social security and old age; and the relative value placed on sons and daughters.

One factor complicating our understanding of the role of education is the fact that empirical studies so far have relied on basic measures such as enrolment, years of education, and/or literacy. Yet Mukherjee (2013) raises the important question about the values about gender imparted or reinforced through education, especially in relation to dowry and marriage. A separate body of scholarship has explored how women's agency depends not just on the presence, or 'quantity' of education, but also the gendered nature of those educational experiences. This literature has not yet been brought to the discussion of sex selective behaviour, but has the potential to give insight into whether and how education can support both Khader's concept of 'critical, informed agency', and new pathways to empowerment that recognise power as both structural and structuring (Khader, 2016, 2018). The next section therefore turns to this body of literature, to theorise in more depth the relationship between education and sex selective behaviour.

4. Women's education and the child sex ratio: critical perspectives

Critical feminist scholars have questioned the assumption that education straightforwardly increases gender equality and girls' and women's agency, and have examined the gendered nature of the content and processes of education, and in particular the idea that these processes may at times reinforce gendered norms, behaviour and structural inequalities. However, so far, there has been little dialogue between academic studies of the child sex ratio, and the body of critical scholarship on gender and education. We therefore need to ask, taking a more critical perspective on education, how do gendered experiences of boys and girls in school relate to agency later in life; specifically agency around family sex composition decisions? Scholars working in the field of gender, agency and capabilities have discussed the complexities around adaptive preferences and 'reason to value' (Khader & Kosko, 2019). In this section I bring together literature on gender, agency and the CSR with critical education scholarship to explore how education can relate to three dimensions of agency and empowerment raised by Khader (2018): i) women's adaptive preferences and agency around the sex of her children; ii) men's preferences; and iii) improved gendered-choice architecture and the relative values of boys and girls in wider society.

4.1. Son preference, women's agency and adaptive preference

First, one reading of the imbalanced child sex ratio might be that increased levels of education are helping women to understand what is valuable to them, and also to act effectively as an agent to achieve her preferred family composition. However, a more granular definition of agency could include the conditions in which preferences are formed and the role of gender values and attitudes (R. Richardson et al., 2019). Currently it is clear that the wider context presents a strong pressure through a system in which boys are valued over girls. A number of authors have seen a fundamental component of women's agency as the ability to critically question prevailing gender norms despite being in a system; and to include critical examination of your own preferences and preference formation (Gupta & Yesudian, 2006; Kabeer, 1999; Mosedale, 2005; R. Richardson et al., 2019: 27).

It is here that critical perspectives on gender and education can give deeper insight. Education undoubtedly has a strong role both in an individual forming their own preferences, and also in their ability to critically reflect on them in the light of dominant norms and societal pressures (Peppin Vaughan & Walker, 2012). Scholarly work on gender and education argues that it is important not to look only at the levels of boys and girls education; but also to consider curriculum and pedagogy, and the gendered messages that may be imparted through the

experiences of attending school (Unterhalter, 2007; Walker, 2014). Walker (2014: 326-327). Indeed, a number of studies have indicated how increasing levels of girls' education may reinforce gendered value systems, including through reinforcing gendered preferences within girls. Education may therefore not increase agency in some respects, if it reinforces restrictive gender norms (Unterhalter, 2003).

Alternately, education which has gender-transformative curriculum content and pedagogic methods can foster critical thinking around gender roles, values and personal preferences, with the potential for formation of preferences that involves more autonomy and independent choice over individual goals. Unterhalter (2007) calls for an expansive (re)framing of gender equality in education, challenging unjust forms of power, the denial of rights and capabilities, the inequitable distribution of resources, and restrictions on participation in and empowerment through education.

In practice, the picture can be complex. Some aspects of schooling may foster some aspects of agency while constraining others (Dejaeghere, 2018). Cin (2017), explores gender, agency and education in Turkey, explores and also examines the role of female teachers in women's emancipation as social actors. One of her findings is that schooling can both increase and constrain agency for girls (2017: 37–39; 174–180). DeJaeghere's (2018) study of girls' schooling and agency in Tanzania, drawing on Bourdieu, argues that young women's agency is relational and socially situated, as social relations can not only constrain but also foster agency and aspirations, and girls are able to imagine alternate futures. Similarly, DeJaeghere and Lee (2011), working with marginalised girls in Bangladesh, discussed the complexities around agency and education; and that agency must be understood as relational.

If this is applied to the child sex ratio, then this could help to explain why in some circumstances, increased levels of women's education are associated with a more skewed child sex ratio. If schools are (explicitly or implicitly) reinforcing traditional gender norms and male preference, this might both improve new skills and opportunities, and increase pressures around son preference according to class. In this way, education might be feeding into the 'demand' of son preference, in conjunction with the 'squeeze' of declining fertility, and the supply of improved sex determination technology.

Even if women are able to critically reflect on their own values, many will still be subject to external pressures around son preference, relating both to status, and to the economic reality of relative benefits of sons and daughters. Yet it is still important to acknowledge the critical thinking dimension of agency, and the role of education in fostering this. Education which takes a transformative approach to gender may offer a chance to contribute to improving the child sex ratio; we therefore need to understand more about the content and processes of education.

4.2. *Men's preferences and household decision-making*

As discussed, seeing the skewed sex ratio at birth as a matter of women's agency alone is problematic, given the wider context of strong pressure from family and society (both in terms of values and in terms of economic pressures) to choose to have sons.

Within a household unit, men's preferences and power are a crucial part of the picture. Ibrahim and Alkire argue that institutional as well as non-institutional structures are instrumental in people's abilities to act (Ibrahim & Alkire, 2007). Koggel (2019) discusses Fraser's third model of the 'universal caregiver', which acknowledges that men need to change too, for women's agency to increase. For looking at the broader concept of indicators of women's empowerment, some authors have noted the importance of gathering information relating to men, and their role in empowerment (Pereznieto & Taylor, 2014; R. A. Richardson, 2018: 551).

Specifically in relation to sex-selection, few studies include a close focus on the characteristics and education of fathers. However some studies have explored the significance of male preferences in sex selective abortion decisions (Robitaille & Chatterjee, 2018). It is therefore important to consider the role of fathers' education, both in terms of literacy and/or level of education; and the effect of the content and educational experiences on gender values. However, so far, few studies on the child sex ratio reflect on the role of men and men's education.[5] We therefore need more exploration of how men's education affects their preferences towards sons, and willingness to act; and more broadly how men's education affects the dynamics of household decision-making and women's agency.

Bringing this together with critical work on gender and education, men's education is potentially significant for both women's agency at the household level, and changing gender norms in wider society. As DeJaeghere notes, agency is relational; and therefore there needs to be more research on the effect of men's education on the child sex ratio.

Therefore, if agency needs to include value formation and norms, we need to consider both women's value formation processes, and also men's value formation, and wider family norms.

4.3. *Gendered-choice architecture, agency and sex-selective abortion*

Women's and men's preferences over family sex composition both sit within the relative value society places on boys and girls, men and women.

Feminist scholars working on bio-politics note that it can be problematic to think of individual agency around such decisions under structures of inequality and gendered norms. From this perspective, the only effective strategy is a longer-term one, involving deeper economic structural and value changes, as opposed to 'awareness-raising' campaigns. For example, this could be through:

- concerted education on ideas about *gender* (as opposed to media messages on the girl child) (Rahm, 2020).

- changes in economic value: not only social security reforms and laws, but education for gender equality in the labour market (Boer & Hudson, 2017; Purewal & Eklund, 2018; Rosenblum, 2017).

More broadly, a number of studies have argued that more is needed than aiming to raise the status of daughters by addressing the typical indicators of gender equality, such as education, employment, and political representation. Such measures can actually result in validating the idea that daughters are not worth the same as sons, as extra measures are needed to prove their worth.

In line with this, a number of authors argue that changing son preference and the status of women is more important than regulations or bans. Kalsi (2017: 13) argues that prenatal and postnatal discriminations are substitutes for each other; and that therefore bans on prenatal treatments may lead to an increase in postnatal discrimination. Instead, measures that improve the status of women, such as the *Panchayati Raj* reservations, are a better way to address the issue.

Rather than aiming for equal numbers of boys and girls in school, or equal literacy, or narrowly conceived initiatives to include 'gender sensitivity' in the classroom, from this perspective education needs to support and spearhead these deeper transformations. As covered earlier, other aspects of gendered-choice architecture around sex selection rest with other forms of social policy; but looking specifically at education and to understand better its effects on women's preferences and agency, men's preferences, and societal norms in relation to the child sex ratio, we need to look beyond levels or years of education (particularly women's). However, empirical studies on sex-selective abortion have not yet engaged with critical literature on the gendered nature of education. One obstacle has been that only basic measures of education are available for quantitative comparative studies; what has been lacking so far has been more substantive measures that capture the gendered nature of schooling. In the final section, I theorise about possible future directions for gathering data that might capture a more substantive

[5] An important but under researched field is how boys and men's education relates to gender equality. See, for example, Walton (2013).

picture of the gendered nature of education.

5. Measuring gender equality in education

A key challenge for exploring the relationship between education and the child sex ratio has been measurement; specifically, obtaining data which captures information about the gendered aspects of schooling for comparative analysis across time and contexts. Until recently, the most readily available reliable and comparable education data has been literacy rates and years of education, with the majority of studies drawing on Census and DHS data. Such measures, which capture information on access to and length of time in school, and reading ability, have also been widely drawn on in global and national development targets and measures of progress in education. These dominant definitions of 'gender equality' in education typically rely heavily on parity of enrolment or completion data; and most current measures focus on wellbeing and agency to participate in education as opposed to wellbeing and agency through education (Vaughan, 2007).

However, very little can be inferred about any gendered pedagogic and institutional practices, or values relating to gender that may have been imparted through attending school (Unterhalter, 2015, 2016). As sex selective behaviour is inherently gendered, we will struggle to understand more about the role education plays in the child sex ratio without better measures relating to the gendered experiences and values within education systems (for both men and women), which could give better insight into how education affects agency around sex selection.

Critical analyses of education have underscored the crucial role of qualitative data for understanding how gendered processes in schools relate to agency. Yet there is a powerful argument for also developing carefully theorised quantitative measures, which allow large scale correlational analyses, and comparison over time and contexts. Technological advances have significantly broadened the range of data available relating to gender; and in recent years there has been a growth in the number of international quantitative indicators and indices relating to gender and women's empowerment.[6]

Research in the field of capabilities and education pushes for a more nuanced understanding of how education relates to freedoms and opportunities, requiring a more in depth examination of the processes and experiences within learning contexts and how these affect well-being and agency. Some research in this field so far has involved quantitative exploration of these relationships (Anand, Saxena, Gonzales Martinez, & Dang, 2020; Biggeri & Cuesta, 2021; Comim, 2018; Trani, Biggeri, & Mauro, 2013). However, little quantitative work has so far focused on gender equality and capabilities through education. The AGEE project is approaching this at a system-wide level, gathering data in 6 key domains to give a picture of gender equality in education (E. Unterhalter, Longlands, & Peppin Vaughan, 2023).

Looking in a more granular fashion at education, agency, and ideas about gender (including CSR), what data might be used to give more insight into how agency relating to family composition is affected by education? We can contrast two dimensions of agency through education (Vaughan, 2007): how education can increase an individual's skills (which may be cognitive, physical or emotional) to increase their capabilities to achieve what is valuable to them; and how education can improve reasoning and autonomous thought, thereby strengthening what Sen and Khader have referred to as 'critical, informed agency'. These dimensions would require different areas of measurement: the first more around participation, achievements and general quality in education; the second would require gathering information around the presence of critical reasoning and reflection in the curriculum, and related pedagogical methods. Applying these ideas specifically to the issue of gender equality in and through education, we might look for gender equality in participation, outcomes and educational quality in the first, and the presence of gender transformative curricular materials and pedagogy in the second, which would support and encourage critical and autonomous reflection on gender in society. Measures in both dimensions would be important for a substantive understanding of how education affects agency in relation to gender. Table 2 sets out these potential areas of measurement.

More substantive measures of capability and agency in and through education would mean that we are better equipped to explore the complex relationship between education, decision-making in the household, and the child sex ratio in specific contexts – including the questions raised earlier in the article about who makes decisions and why. Where the types of data as detailed in Table 2 are not available at a macro level, for example, collating the AGEE dashboard for different states and districts could be used in correlational analyses to explore the strength of relationship between particular gendered aspects of education and the child sex ratio.[7]

6. Conclusion

We currently have no clear picture over the role of education in the child sex ratio, with empirical studies providing conflicting evidence that increasing women's education may be associated with either increases or decreases in the ratio. To some degree this is understandable; we know that education does not operate in a vacuum but is mediated by gendered norms and processes in families, social institutions and the media; so its significance can be seen as dependent on the wider gender context in which it is delivered. Moreover we know that sex selective behaviour can also vary according to non-education policy reforms, such as social security and pensions, as individual and family male preference may be reasoned and rationalised due to social and economic pressures relating to having daughters. Studies have also demonstrated the importance of an intersectional approach, distinguishing how selection

Table 2
Measuring agency through education.

Concept	Dimensions within education	Potential areas of measurement
1) Basic agency: having an equal range of skills between males and females	- gender equal development of agency within school - gender equal demonstration of agency	- equal participation (attendance; engagement in learning; completion) - equal quality of education - equal outcomes (labour market participation; presence of pooling in HE and sectors of economy)
2) Critical, informed agency Reasoning and autonomous thought; choice and preference formation. How does education affect choice and preference formation along the lines of gender? "gender-related educational capabilities"	- critical discussion around gender in schools; understanding of social constructions and constraints around gender - exploration of values around gender - formation of agency goals relating to gender (e.g. valuing of men / women; boys / girls in society; family composition)	- gender in the curriculum (including transformative content) - gender in teacher training - gender in textbooks - gender in school policies, - SRGV

Adapted from Vaughan (2007).

[6] For example, OECD's Social Institutions and Gender Index (SIGI); UNDP's Gender Inequality Index and the Gender Adjusted Human Development Index; and the Women's Empowerment in Agriculture Index (WEAI).

[7] This might potentially incorporate a 5 or 10 year time lag to allow for the effects of education to be measured once the school level education cycle is completed.

varies for example by socio-economic status, ethnicity and religion.

Nonetheless, critical education scholarship argues that education can be a key influencing factor on gender norms in society, particularly through factors such as the gendered nature of the curriculum, pedagogy, school regulations, and teacher training. Any effect of education on the child sex ratio is therefore likely to depend on the gendered nature and content of that education. This is nuanced and may work in several directions at once (for example, girls may gain some agency through learning to read but lose some through school-related gender-based violence). But a school which effectively builds in critical reflection on societal gender norms into curriculum and school processes is likely to be one which helps to contribute to (re)balancing the child sex ratio; and a school which actively promotes valuing boys and girls differently is unlikely to help. Having more substantive quantitative measures of gender equality in education is one important means through which we would be able to explore these relationships further.[8]

This paper has provided a comprehensive review of literature relating to gender, education and agency in relation to the sex ratio at birth, and uses this to propose a new approach to exploring the relationship between education and the use of prenatal sex selection technology. This is a relationship that currently is not clearly understood, and varies considerably across different contexts. However, the viability of realising such an approach depends on a number of factors, including the availability of comparable data; and the degree of political will to improve existing data on gender and education. While at this point in time, the lack of comparable data means it is not yet possible to directly test this method, it is possible that further improvements, for example due to the drive to improve education data under the SDGs, would make this possible in the not too distant future.

The sex selective abortion debate sits in the context of wider questions about the trajectory of gender equality and development in the last few decades. Recent studies have thrown into question the idea of a straightforward relationship between economic development and gender equality (Kabeer, 2020; Klasen, 2020). Creating improved indicators on the gendered nature of education will allow us to explore and understand these complex dynamics in a much more focused and insightful way.

CRediT authorship contribution statement

Rosie Peppin Vaughan: Investigation, Formal analysis, Conceptualization, Writing – review & editing, Writing – original draft.

Declaration of competing interest

None.

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