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Abstract

An earlier study shows that there are no gender preferences among U.S. adoptive parents of international adoption. Yet, every year the U.S. adopts more girls than boys from various countries in the world. Thus, this paper investigates the effect of gender bias in 178 nations on skewed gender composition of U.S. adoptions over the last decades. Using female to male infant mortality rate as a proxy for postnatal discrimination against daughters, we find that the degree of discrimination in sending countries positively affects the excess of female to male adoptions. A one percentage point increase in the relative mortality rate of female to male infants in a sending country leads to U.S. adoptions of two more girls than boys. In addition, we show that the income of the sending country matters for the impact of gender discrimination on the gender difference of U.S. adoption.

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1. Introduction

Into the 21th century, gender bias against females, especially in some parts of the developing world, remains widespread and unshakable. Rampant gendercide (i.e., the intentional extermination of persons due to their sex) and femineglect (i.e., the intentional negligence of female children) begin at conception and persist throughout their lives, resulting in disproportionally high male to female population ratio. In 1990, Sen (1990) estimated that over 100 million women were missing worldwide; a more recent estimate has inflated the number to more than 200 million (Grech, 2015). While excess female mortality due to discrimination and negligence has been the main contributing factor, increasing access to prenatal diagnosis and sex-selective abortion has exacerbated the crisis. In 2010, it was estimated that approximately 1.4 million of pregnancies with female fetuses were aborted globally. 75 percent of them took place in China; together with those in India the percentage stood at a disturbing rate of 95 percent (Bongaarts, 2013). The growing accessibility of prenatal sex selection have further reflected in the elevated sex ratio at birth from the natural level of about 106 males per 100 females to more than 115 males in some Asian and Eastern European countries (Bongaarts, 2013; Guilmoto, 2012; Hudson and den Boer, 2004).

Although sex-selective pregnancy is rather undetectable in the West, specifically the U.S., choosing a son or a daughter to adopt is prevalent. Each year, the U.S. adopts more foreign-born children than any other countries in the world, averaging more than 15,000 children annually over the last two decades. Interestingly, well over 60 percent of those are females.[1] The consistently high ratio of girls to boys adopted each year raises the obvious question of whether American families generally have a preference for a daughter when it comes to international adoption. As inter-country adoption has become less of a humanitarian action but an answer to the parenting needs of Western families, it creates a demand-driven market where adoption agencies work to satisfy their clients with "desired" infants (Graff, 2008). Thus, it is no surprise that dictating a child's characteristics turns out to be a standard practice. In addition, thanks to the availability of numerous sending countries to adopt from, gender and race preference may well be reflected in their selected adoption destination where supply is abundant. However, Khun et al. (2020) finds that there are no gender preferences among U.S. adoptive parents of international adoption when the characteristics of adoptive parents and other characteristics of adopted children are accounted for. This serves to reinforce that the higher ratio of U.S. female to male adoptions may not be driven by parents' preferences, but the supply factors or more specifically the higher ratio of girls to boys put up for adoption in the countries where the gender bias exists. This forms the hypothesis of this paper.

On the supply side, a more intriguing question is what constitutes gender composition of adoptable children at a national level. In China, a combination of one child policy and the entrenched preference for sons over daughters lead to excess female child mortality, rampant

[1] See also Khun et al. (2020) and Why do adoptive parents prefer girls? (slate.com)

abortion of female fetuses, and the abandonment of countless daughters. The crisis is manifested in the overwhelming proportion of Chinese girls adopted. According to the data obtained from the U.S. Department of Homeland Security, in the last two decades the U.S. adopted over 84,000 Chinese children; about 90 percent of them are females. The sheer size of female adoptees from China accounted for more than two fifths of the total U.S. female adoptions from 161 countries. Certainly, China is not the only country notorious for its discrimination against daughters. The discrimination is also widespread in India which sent 5,000 children to the U.S. over the same period, of which girls comprised approximately 72 percent, according to the data from the U.S. Department of Homeland Security. Remarkably, in 1992 and 1995, the entire U.S. adoptions of 492 children from India were girls. Although given a chance for life, this segment of female population has been denied a loving home, simply because they have less earning potential, are less likely to provide old-age economic security, cannot perpetuate patrilineage, or require high dowry cost to be married off (Croll, 2000).

While China and India represent an extreme case, most societies exhibit some degree of bias against daughters (Williamson, 1976). In countries like South Korea, Taiwan, Pakistan, Bangladesh, Nepal, Sri Lanka, Turkey, Syria, Afghanistan, Iran, Egypt, Algeria, Tunisia, and Sub-Saharan Africa, millions of women were estimated to be "missing" simply due to their gender (Klasen and Wink, 2002). Some of these countries are popular destinations for U.S. adoption, while others occupy a tiny share in the adoption market. South Korea, in particular, has experienced an average U.S. adoption of more than 1,550 children annually over the past quarter century. In the same period, the number of adoptions from Bangladesh and Nepal are negligible, totaling 120 and 550 respectively; however, more than three fourths of the children from these two countries are girls.

Even in countries where discriminatory treatment of daughters prevails, it is not always the case that relatively more girls are being given up for adoption. In this regard, the nature of discrimination–prenatal or postnatal–is playing a crucial role. Given the existence of the bias, developed countries tend to rely more on prenatal sex selection while less developed ones with limited access to the technology resort to postnatal discrimination. For example, China and India, where the majority of the population lack accessible and affordable sex-selective technology, is at the forefront in postnatal sex-selection practices (Das Gupta et al., 2009). Evidently, this has resulted in widespread abandonment of daughters. Chen et al. (2015) estimate that at least four percent of Chinese girls were abandoned in 1990s. In a limited sample of 237 Chinese families who had abandoned children, Johnson et al. (1998) find that girls accounted for 90 percent of the abandoned children. On the other hand, the utilization of the technology is pervasive in South Korea, leading to greatly distorted juvenile sex ratio. Yet, the country has low child mortality after birth and observes no sex differentials in child survival rate (Das Gupta et al., 2009). It is plausible that the extensive prenatal sex selection inevitably reduces the "necessity" of postnatal action such as negligence, infanticide, or abandonment to dispose of unwanted daughters. This possibly results in the shortfall of adoptable Korean girls, which is reflected in relatively more boys being adopted by American parents every year over the last two decades. According to the U.S. Department of

Homeland Security, in 2013, male adoptees markedly accounted for 75 percent of total U.S. adoptions from the country.

If the extent of postnatal sex-selective bias in U.S. sending countries serves to expand the supply of adoptable female children, that may lead to an excess female to male adoptions by U.S. parents. In other words, the observed phenomenon of high female to male ratio in U.S. inter-country adoptions can be partially explained by the degree of postnatal sex-selective discrimination in the sending countries. This brings us to the objective of the paper which seeks to formally establish their causal link between gender bias and U.S. child adoption in a panel of 178 countries over the last three decades.

By examining postnatal discrimination against daughters from the perspective of U.S. inter-country adoption, this paper makes important contributions to the two strands of the empirical literature on gender and family issues. First, studies examining the abandonment of daughters and adoption in less-developed countries are limited, much less cross-country studies on the bias and inter-country adoptions. Chen et al. (2015) and Johnson et al. (1998) investigate the abandonment and adoption of Chinese girls domestically. In addition, a large number of male preference studies have primarily focused on estimating the number of missing women (e.g., Bongaarts and Guilmoto, 2015; Das Gupta et al., 2009; Klasen and Wink, 2002). This paper, on the other hand, explores the distorted sex ratio of U.S. adoption as a result of gender status in 178 countries spanning the last quarter century.

Second, this paper also focuses on the international aspect of U.S. child adoption, which is severely understudied. Among the existing studies on U.S. child adoption, there are those seeking to determine factors influencing the demand side (e.g., Baccara et al., 2014; Cohen and Chen, 2010; Hansen and Hansen, 2006; Khun et al., 2020), several others investigating the supply side (e.g., Bitler and Zavodny, 2003; Gennetian, 1999; Khun and Lahiri, 2017; Medoff, 1993), and some others examining supply and demand under a unified framework (e.g., Bernal et al., 2009; theoretically see Khun et al., 2020). Additionally, other researchers explore the relationship between adoptions and assisted reproductive technology (ART) (e.g., Cohen and Chen, 2010; Gumus and Lee, 2012; Innes and Murugesan, 2016). While some studies have explored the topic of U.S. international adoption, few have explicitly examined the behavior of international adoptions. Gumus and Lee (2012), for instance, analyze the association between the utilization of ART in the U.S. and foster care adoptions while additionally considering the substitutability between ART and aggregate adoptions from abroad (see also Innes and Murugesan, 2016). Khun and Lahiri (2017), on the other hand, investigate the effect of income and household size in sending countries on the level of U.S. cross-border adoptions.

In this paper, we find that countries with higher degree of discrimination against daughters experience a wider gap between female and male adoptions. A one percentage point increase in the relative mortality rate of female to male infants in a sending country leads to U.S. adoptions of 2 more girls than boys. We also show that the income of the sending country matters for the impact of gender bias on the gender difference of U.S. adoption. Using mean income, the result indicates that a country with an income of $8,586 will experience an increase in the relative adoptions of baby girls by 3.1 cases when gender bias increases by one percentage point. A poorer country would experience a larger increase in the relative adoptions of baby girls. This could possibly due to the differential in resources supporting domestic absorption. In a robustness check, we show that though the magnitude varies quite a bit depending on the specification of the estimations, the impact of gender discrimination on the relative U.S. adoption of girls to boys is significant and has important economic implications.

The paper presents an empirical investigation to ascertain the causal effect of gender status, viz., postnatal bias against daughters on skewed sex ratio in U.S. cross-country adoptions. We carefully take into account the possibility of reversed causality and sampling error due to the very nature of the data used in the study. Subsequently, we highlight the important findings based on rigorous estimation methods and extensive sensitivity analyses. Finally, the concluding section underscores the implications of our findings.

2. Estimation Method

The dependent variable is the number of girls in excess of boys adopted by U.S. parents. To avoid sampling errors, we include both sending and non-sending countries, entailing considerable zero observations in the dataset. Our analysis is carried out using Tobit model, which is designed to deal with corner values of the dependent variable. In particular, we estimate the following equation:

$$Adopt_{it}^{*} = \beta_o Bias_{it} + \beta_1 Income_{it} + \beta_2 Income_{it} * Bias_{it} + \beta_3 X_{it} + \gamma_t + \delta_i + \varepsilon_{ij} \quad (1)$$

where $Adopt_{it}^{*}$ is a latent variable and defined as:

$$Adopt_{it} = \begin{cases} Adopt_{it}^{*}, & if\ Adopt_{it}^{*} > 0 \\ 0, & if\ Adopt_{it}^{*} \leq 0 \end{cases}$$

where γ_t, δ_i, and ε_{ij} are year fixed effects, country fixed effects, and error term, respectively. $Adopt_{it}$ is the observable difference in female and male children adopted by U.S. parents from country *i* in period *t*. This allows us to interpret the results in a more intuitive way. Alternative calculations of the dependent variable, viz., the ratio of female to male adoptions are not desirable as it would restrict our sample to only sending countries eliminating the non-sending countries, the sampling errors we try to avoid. However, we will provide the result for the alternative dependent variable in a robustness check. $Bias_{it}$ is the indicator for post-natal bias against daughters proxied by the ratio of female to male infant mortality rate in sending countries. Female/male infant mortality rate is the number of female/male infants dying before reaching one year of age, per 1,000 female/male live births in a given year. Because the number of female/male live births could be affected by the extent of prenatal discrimination existing in the sending countries, by calculating the variable as the percentage of female mortality rate to that of male, we effectively address the measurement error problem.[2] $Income_{it}$ represents household income proxied by real GDP per capita. It is reasonable to expect that the effect of $Bias_{it}$ on adoption may vary depending on the level of economic development. For instance, given the extent of discrimination against daughters, high income countries, possibly due to smaller household size and/or better social safety net, are relatively prepared to absorb the children domestically. We include the interaction term between $Bias_{it}$ and $Income_{it}$ to account for the effect. The specification also incorporates country fixed effects to address the possibility of correlation between $Bias_{it}$ and time-invariant unobservables, such as culture and religion, which might link to adoption. Year dummies are to capture any common factors affecting adoption from all sources such as U.S. demography or adoption policy. X_{it} represents other controls including the percentage of female to male aged zero to nine in the U.S. and sending countries – $FMPOP9\_US_t$ and $FMPOP9_{it}$. The former is the proxy for the supply of adoptable girls relative to boys in the states while the latter is that of the sending countries.

The above specification may be subject to endogeneity issue. The fact that adoption raises income or reduce infant mortality rate in sending countries introduces biased estimates. Because international adoption entails approximately one to two years of waiting time, we address this issue by letting all explanatory variables enter the regression with a two-period lag. Since reverse causality is the main concern here, this strategy could ameliorate to some extent the problem of endogeneity issue. In addition, we incorporate the three-period lag of $Adopt_{it}$ as an explanatory variable. This approach could also address the endogeneity while allowing the estimation of $Bias_{it}$ to be conditioned on previous adoption levels (see Baccini and Urpelainen, 2014; Steinberg and Malhotra, 2014).

The regressions are estimated based on a panel of U.S. adoptions from 178 countries. These observations are constrained by the data on mortality rates by gender. While the data on adoption are available on an annual basis, those on mortality rates are only available for periods 1990, 2000, and 2010. Because gender bias is a social, cultural issue that does not tend to change quickly over time, the 10-year variation is appropriate. We provide a list of the sample countries in Table 1. Table 2 presents the descriptive statistics of the variables based on the actual data points used in the regressions. It is important to note that the mean and standard deviation for the difference between female and male adoptions are 14.22 and 252.8, respectively. Without China and India, they are just 0.16 and 21.7, respectively.

We obtain the data of U.S. adoptions of foreign-born children from U.S. Department of Homeland Security. Others are from the World Bank's World Development Indicators and Gender Statistics. Several important points should be noted about our dataset. First, data on U.S. international adoption are based on the U.S. fiscal year, which begins on Oct. 1 and ends on Sept. 30 and is designated by the calendar year in which it ends. Second, absence of data points for

[2] That is, we may observe a lower number of female live births in a country with an extensive prenatal discrimination against daughters. However, if the country also has postnatal discrimination, we may not observe a large number of female mortalities. Thus, the percentage rather than an absolute number effectively reduces the error caused by prenatal discrimination.

adoptions means there were not any adoptions from that country for that year, so we assign a value zero for those missing observations.

Table 1: The list of 178 countries in the sample

Afghanistan	Congo, Dem. Rep.	India	Mongolia	South Africa
Albania	Congo, Rep.	Indonesia	Montenegro	Spain
Algeria	Costa Rica	Iran, Islamic Rep.	Morocco	Sri Lanka
Antigua and Barbuda	Cote d'Ivoire	Iraq	Mozambique	St. Lucia
Argentina	Croatia	Ireland	Namibia	St. Vincent and the Grenadines
Armenia	Cuba	Israel	Nepal	Sudan
Australia	Cyprus	Italy	Netherlands	Suriname
Austria	Czech Republic	Jamaica	New Zealand	Swaziland
Azerbaijan	Denmark	Japan	Nicaragua	Sweden
Bahamas, The	Djibouti	Jordan	Niger	Switzerland
Bahrain	Dominican Republic	Kazakhstan	Nigeria	Syrian Arab Republic
Bangladesh	Ecuador	Kenya	Norway	Tajikistan
Barbados	Egypt, Arab Rep.	Kiribati	Oman	Tanzania
Belarus	El Salvador	Korea, Rep.	Pakistan	Thailand
Belgium	Equatorial Guinea	Kuwait	Panama	Timor-Leste
Belize	Eritrea	Kyrgyz Republic	Papua New Guinea	Togo
Benin	Estonia	Lao PDR	Paraguay	Tonga
Bhutan	Ethiopia	Latvia	Peru	Trinidad and Tobago
Bolivia	Fiji	Lebanon	Philippines	Tunisia
Bosnia and Herzegovina	Finland	Lesotho	Poland	Turkey
Botswana	France	Liberia	Portugal	Turkmenistan
Brazil	Gabon	Libya	Qatar	Uganda
Brunei Darussalam	Gambia, The	Lithuania	Romania	Ukraine
Bulgaria	Georgia	Luxembourg	Russian Federation	United Arab Emirates
Burkina Faso	Germany	Macedonia, FYR	Rwanda	United Kingdom
Burundi	Ghana	Madagascar	Samoa	Uruguay
Cabo Verde	Greece	Malawi	Sao Tome and Principe	Uzbekistan
Cambodia	Grenada	Malaysia	Saudi Arabia	Vanuatu
Cameroon	Guatemala	Maldives	Senegal	Venezuela, RB
Canada	Guinea	Mali	Serbia	Vietnam
Central African Republic	Guinea-Bissau	Malta	Seychelles	West Bank and Gaza
Chad	Guyana	Mauritania	Sierra Leone	Yemen, Rep.
Chile	Haiti	Mauritius	Singapore	Zambia
China	Honduras	Mexico	Slovak Republic	Zimbabwe
Colombia	Hungary	Micronesia, Fed. Sts.	Slovenia	
Comoros	Iceland	Moldova	Solomon Islands	

Table 2: Summary Statistics

	Mean	Median	Std. Dev.	Min	Max
Adopt	14.22	0	252.8	-271.0	5590
Adopt (excluding China and India)	0.16	0	21.74	-271.0	116.0
Bias-infant mortality	82.97	82.60	5.690	66.56	133.3
Bias-mortality under 5	84.81	84.31	5.935	67.98	123.6
Income (in thousand dollars)	8.586	2.582	13.511	0.137	82.4
FMPOP9	96.14	95.90	2.504	73.45	105.3
FMPOP9_US	95.53	95.38	0.206	95.37	95.81

Note: The statistics are based on 508 observations used in the main regressions. All explanatory variables are presented in a two-year lag.

3. Empirical Findings

Table 3 presents our results. We report the results from maximum likelihood estimations of Tobit model with the corresponding marginal effects for the convenient interpretation of the magnitude of the relationship. Robust standard errors are provided in parentheses.[3] In column 1, we examine the association between biases against daughters (ratio of female to male infant mortality rate) and the difference in female-male adoptions without any control variables except for the lagged adoptions. The result shows a significant, positive association indicating that gender bias in the sending countries results in the U.S. adoption of more girls than boys. The estimated coefficient is 4.228 and its corresponding marginal effect of 2.141 that is statistically significant at the 95 percent confidence interval. The result suggests that a one percentage point increase in the relative mortality rate leads to U.S. adoptions of 2 more girls than boys. In other words, an increase in the bias against daughters by one standard deviation raises the U.S. adoptions of 12.2 more girls than boys, which is almost the size of the mean difference between female and male adoptions by U.S. parents.

Table 3: Gender Bias and U.S. Child Adoption

	Dependent variable: *Adopt*					
	(1)	Marginal effects	(2)	Marginal effects	(3)	Marginal effects
Lagged Adopt	1.444***	0.731***	1.444***	0.732***	1.450***	0.735***
	(0.180)	(0.091)	(0.179)	(0.091)	(0.176)	(0.089)
Bias-infant mortality	4.228**	2.141**	7.738**	3.923**	7.993**	4.054**
	(1.902)	(0.959)	(3.451)	(1.741)	(3.551)	(1.794)
Income			14.818**	7.513**	17.401**	8.825**
			(6.788)	(3.426)	(8.390)	(4.240)
Income x Bias			-0.185**	-0.094**	-0.218**	-0.110**
			(0.086)	(0.043)	(0.106)	(0.054)
FMPOP9					5.975	3.031
					(4.746)	(2.402)
FMPOP9_US					-1.791	-0.908
					(7.609)	(3.859)
Time dummies	yes		yes		yes	
Country dummies	yes		yes		yes	
Observations	571		529		508	

Notes: (i) Lagged Adopt is in a three-year lag and all other explanatory variables are lagged by two years. (ii) The figures in parentheses are robust standard errors, (iii) *** indicate significance at 99% confidence level, ** at 95%, and * at 90%.

[3] According to Abadie et al. (2017), there is no need to adjust the standard errors for clustering when the sample, which is in our case, is randomly selected from the population. Clustering at the region level is applicable when the sample is randomly drawn by selecting a sample of regions, and then sampling countries from within each region. Similarly, clustering at the country level is needed when the sample is randomly drawn by selecting a sample of countries, and then sampling cities, towns or people from within each country.

Column 2 includes income and its interaction with the bias variable. Both variables are statistically significant at the 95 percent confidence interval, suggesting that economic development in the sending countries matters for the difference between female and male adoptions and the effect of gender bias on U.S. relative adoptions of girls to boys depends on the income of sending countries. Using mean income, the result from the marginal effects indicates that a country with an income of $8,586 will experience an increase in the relative adoptions of baby girls by 3.1 cases when gender bias increases by one percentage point [3.923 – (8.586 x 0.094)].[4] A poorer country would experience a larger increase in the relative adoptions of baby girls. For instance, while South Korea with an income of $23,000 would experience an increase of 1.8 cases, India with an income of $1,100 would experience an increase of 3.8 cases when bias against daughters rises by one percentage point.

In column 3, we include two additional control variables, the percentage of female to male aged zero to nine in the sending countries and the U.S., both of which turn out to be statistically insignificant and the results for gender bias and income are still robust. Thus, this specification is used in the following robustness check.

Table 4 reports the results of the robustness check. As noted earlier, China and India exemplify a society with entrenched discriminatory treatment of their daughters. Due to the extensive discriminatory practices and the large share they occupy in U.S. adoption of female children (i.e., the mean of the dependent variable for China and India is 2,246 and 134, respectively), including them in the estimated sample might lead to biased estimates. Thus, we re-estimate the specification based on the full sample of countries excluding the two outliers. The result in column 1 of Table 4 shows that leaving out China and India relieves the upward bias of the estimated effect of gender discrimination on adoptions. The coefficient for *Bias* is now 2.475 with a corresponding marginal effect of 1.279 which suggests that for a country with an income of $8,586, an increase in bias against daughters result in an increase in the relative adoption of girls by one case [1.279 – (8.586 x 0.025)].

Next, the variable, *Bias*, has been defined as the percentage of female to male infant mortality. To check the sensitivity of the results with respect to the choice of its definition, in column 2 of Table 4, we present the estimation using the percentage of female to male under-5 mortality rate. As the variable is rather inclusive in its calculation, it on average exhibits a relatively higher level of discrimination (i.e. the mean of its sample points used in the study is 84.81 as compared to 82.97 of the relative mortality rate for infants). Hence, we expect relatively lower impact of gender bias on adoptions. Its estimated coefficient is 6.027 with a corresponding marginal effect of 3.055, which is lower than that in column 3 of Table 3. The coefficient for the interaction term between income and *Bias* remains unchanged from that in column 3 of Table 3. Thus, as expected, the impact of gender bias measured by relative under-5 child mortality rate is less pronounced. For a country with an income of $8,586, a one-percentage-point increase in discrimination against girls leads to an increase in adoption of 2.2 more girls than boys by U.S. parents.

[4] Using the median income of $2,582, a one-percentage-point increase in discrimination against girls will increase the relative adoption of girls by 3.7 cases.

Table 4: Robustness Check

	Excluding China and India	Marginal effects	Bias-mortality under 5	Marginal effects	Alternative lag length	Marginal effects	Adopt measured as ratio of female to male adoptions	Marginal effects	Including additional controls	Marginal effects
	(1)		(2)		(3)		(4)		(5)	
Lagged Adopt	0.681***	0.352***	1.450***	0.735***	1.129***	0.586***	0.301**	0.237**	1.453***	0.736***
	(0.182)	(0.096)	(0.177)	(0.089)	(0.075)	(0.039)	(0.144)	(0.113)	(0.171)	(0.086)
Bias	2.475**	1.279**	6.027**	3.055**	3.956**	2.052**	29.537*	23.224*	11.667**	5.912**
	(1.128)	(0.579)	(2.729)	(1.378)	(1.772)	(0.912)	(17.484)	(11.962)	(5.724)	(2.890)
Income	3.639	1.880	15.590**	7.901*	7.097*	3.682*	232.98	183.19	46.705	23.667
	(2.284)	(1.174)	(7.495)	(3.785)	(4.143)	(2.136)	(159.5)	(113.8)	(31.537)	(15.945)
Income x Bias	-0.048*	-0.025*	-0.195**	-0.099**	-0.089*	-0.046*	-2.807	-2.207	-0.588	-0.298
	(0.029)	(0.015)	(0.095)	(0.048)	(0.052)	(0.027)	(1.898)	(1.353)	(0.394)	(0.199)
FMPOP9	0.175	0.091	5.665	2.871	2.432	1.262	22.775	17.907	8.250	4.180
	(0.303)	(0.156)	(4.597)	(2.325)	(2.095)	(1.082)	(18.718)	(13.74)	(6.073)	(3.072)
FMPOP9_US	-0.725	-0.375	6.994	3.544	-4.733	-2.456	-108.144	-85.032	113.27*	57.396*
	(3.729)	(1.927)	(8.268)	(4.190)	(6.194)	(3.213)	(97.130)	(71.90)	(68.52)	(34.637)
BiAid									-5.740**	-2.909**
									(2.817)	(1.422)
Hague									-34.11*	-17.285*
									(19.23)	(9.714)
Time dummies	yes		yes		yes		yes		yes	
Country dummies	yes		yes		yes		yes		yes	
Observations	502		508		507		129		409	

Notes: (i) The figures in parentheses are robust standard errors, (ii) *Bias* is *Bias-infant mortality*, except for column 2. (iii) Hague variable is zero for the year when the country pair are not members of the Hague convention, one for the year when either one of the pair is a member of the convention, and two for the year when both countries are members of the convention. (iv) *** indicate significance at 99% confidence level, ** at 95%, and * at 90%.

One way to deal with reverse causality is to introduce lagged dependent and independent variables, the approach we have applied so far. To test the sensitivity of the chosen lag lengths, in column 3 of Table 4, we use a two-period lag of the dependent and a one-period lag of the independent variables. The alternative lag length is based on the fact that international adoption takes approximately one to two years to complete. The result shows that our variables of interest remain robust. In comparison to column 3 of Table 3, the magnitude of *Bias* coefficient decreases to 3.956 with the corresponding marginal effect of 2.052. The interaction effect, similarly, shrinks to 0.089 with a corresponding marginal effect of 0.046. These coefficients are consistently significant at the conventional level. Intuitively, shorter lag length leads to smaller estimated effects possibly because of the delayed impact and thus some adoptions has not been accounted for.

We want to address the measurement of the dependent variable which is calculated as an absolute difference between U.S. of adoption of girls and boys. The reason is that the sample includes zero adoptions of either or both genders for some countries as well as in some periods. Taking a ratio of one over the other would result in a huge loss of observations. To demonstrate that, column 4 of Table 4 provides the result with the dependent variable measured as a ratio of female to male adoptions. Noticeably, we lose about three quarters of the observations. The *Bias* variable remains positive and statistically significant at the conventional level; however, the magnitude of the impact is rather large. This may be because of the loss of the many observations, thus eliminating useful information about countries where discrimination exists, but there are no U.S. adoptions. The coefficient for the interaction term between income and gender bias is not statistically significant.

Finally, one may argue that there might be some other factors that affect the demand and supply of child adoptions. We address the issue by including two additional variables in the control – U.S. bilateral aid as a percentage of total aid and membership of the Hague Convention. The bilateral aid variable, *BiAid*, is to capture the political relationship between the sending countries and the U.S. and *Hague* is an international agreement on the protection of children and co-operation in respect of inter-country adoption. The result reported in column 5 of Table 4 show that both control variables are statically significant. However, *BiAid* carries a negative coefficient which is intuitively puzzled while *Hague* has a negative coefficient as expected. The *Bias* variable remains positive and statistically significant at the 95 percent confidence interval though the interaction term with income turns insignificant. This is possibly due to the correlation between aid and income. Interestingly, the coefficient for *Bias* is large and its marginal effect suggests that a one-percentage-point increase in the discrimination against girls can lead to an adoption of nearly 6 more girls than boys.

4. Conclusion

In this paper, we examine whether the extent of discrimination against daughters in 178 sending countries contributes to elevating the number of female relative to male adoptions among U.S. parents. Our cross-country evidence spanning the last few decades shows that a country with higher gender discrimination against girls/daughters observes relatively more girls than boys being adopted. A one percentage point increase in the relative mortality rate leads to U.S. adoptions of 2 more girls than boys. We also show that the higher degree of economic development measured by real income per capita in sending countries works to relegate this effect. A country like South Korea would experience an increase of only 1.8 cases while India would experience an increase of 3.8 cases when bias against daughters rises by one percentage point. Our findings are well-established under rigorous sensitivity analyses. The impact of gender bias on the difference between female and male adoptions is robust to the exclusion of China and India from the sample, an alternative measure of bias variable, a different lag length, and an alternative measure of female-male adoptions.

The findings have important implications. For humanitarian reasons, the fact that the degree of bias in sending countries has a direct impact on the number of girls relative to boys being adopted by American parents suggests that while preference is at the heart of their adoption choices, American parents have provided homes to the abandoned or relinquished children who are difficult to be placed locally. From a different perspective, the phenomenon might hurt the sending countries demographically. Considering countries where the discrimination is widespread and the birth ratio could be as high as 115 males per 100 females, the outflow of girls into the U.S. may exacerbate sex imbalance in the countries. However, relatively high income countries, whose populations might have better access to sex-selective technology and are more engaged in pre-natal sex selection practices (i.e., thus, experiencing elevated sex ratio at birth), tend to observe smaller impact of post-natal discrimination on the number of female adoption while less developed ones experience relatively more outflow for the same degree of discrimination. This could possibly be due to the differential in resources supporting domestic absorption.

Encouraging domestic adoption has always been advocated for the best interest of the child. On the one hand, it helps preserve a child’s cultural and national identity. On the other, it addresses the concern of abusive practices in international adoption. Additionally, this study advocates for domestic adoption especially of girls, for the best interest of many sending nations: balancing the imbalance sex ratio due to deep-rooted preferences for sons. However, in countries where bias against daughters is prevalent, it can be a challenge to find a loving home for the unwanted. Thus, to effectively promote domestic absorption of girls, more resources need to be allocated for the purpose.

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