# Gender and Racial Biases: Evidence from Child Adoption*

Mariagiovanna Baccara (NYU) Allan Collard-Wexler (NYU)
Leonardo Felli (LSE) Leeat Yariv (Caltech)

December 2009

**Abstract**

This paper uses a new data set on domestic child adoption to document the preferences of potential adoptive parents over born and unborn babies relinquished for adoption by their birth mothers. We show that adoptive parents exhibit significant biases in favor of girls and against African-American babies. A non-African-American baby relinquished for adoption attracts the interest of potential adoptive parents with probability $11.5\%$ if it is a girl and $7.9\%$ if it is a boy. As for race, a non-African-American baby has a probability of attracting the interest of an adopting parent at least *seven times* as high as the corresponding probability for an African-American baby. In addition, we show that a child's desirability in the adoption process depends significantly on time to birth (increasing over the pregnancy, but decreasing after birth) and on adoption costs. We also document the attitudes toward babies' characteristics across different categories of adoptive parents – heterosexual and same-sex couples, as well as single women and foreign couples. Finally, we consider several recently discussed policies excluding same-sex and foreign couples from the adoption process. In our data, such policies would reduce the number of adopted babies by $6\%$ and $33\%$, respectively.

**JEL classification:** J13, J15, J16, C78
**Keywords:** Child Adoption, Gender Bias, Racial Bias, Search, Matching.

*We thank Luca Anderlini, Oriana Bandiera, Heski Bar-Isaac, Cristian Bartolucci, Tim Besley, Chantal Collard, Federico Echenique, Ray Fisman, Carola Frege, Maia Güell, Luigi Guiso, Ali Hortacsu, Soohyung Lee, Alessandro Lizzeri, Hong Luo, Nicola Persico, Ronny Razin, Sevi Rodríguez Mora, Jean-Laurent Rosenthal, Bernard Salanié, Gianluca Violante, and Yoram Weiss for helpful conversations and comments. We are especially grateful to Alistair Wilson for outstanding research assistance. Finally, we thank the adoption professionals that offered us invaluable insights into the adoption process.

# 1 Introduction

## 1.1 Overview

Adoption is an important phenomenon in the U.S. According to the Census, about $1.6$ million or $2.5\%$ of all children in the U.S. in 2000 were adopted. Of these, $87\%$ were U.S.-born and adopted through the domestic adoption channel. In terms of revenues, the adoption industry is a substantial one, generating approximately 2-3 billion dollars annually.[1]

In most cases, a successful domestic adoption is the result of a match between a *birth mother* (BMO hereafter) who seeks to relinquish her child, and *prospective adoptive parents* (PAPs hereafter). The underlying matching process involves a bilateral search characterized by several layers of mediation: Typically, adoption agencies represent BMOs, while PAPs work vis-à-vis adoption agencies, lawyers, or facilitators. In this paper, we exploit the unique nature of a new data set documenting the operations of an adoption facilitator. We analyze the preferences of PAPs over the attributes of babies relinquished for adoption, the BMOs' choices, and the factors that determine ultimate outcomes (i.e., a successful adoption, a decision to parent by the BMO, or the child's placement in foster care).

The contribution of this paper is threefold. First, we provide a direct assessment of parents' preferences over children's attributes, in particular gender and race. These results feed into issues of public concern, regarding the differential investment in children, and the impact of the advancements in fertility treatments allowing for embryo selection. Unlike consumers' preferences (that are observable through market behavior) or preferences over marriage partners (that are revealed in dating patterns),[2] very little is known about parents' preferences over children's attributes.[3] For the specific case of adoptive children, our analysis is a step toward filling this gap.

Second, we analyze the determinants of successful adoption outcomes. In fact, children that remain unmatched enter the foster-care system, which is notoriously detrimental to their short- and

[1] See the Census 2000 and Riben (2007).

[2] See the recent papers by Fisman, Iyengar, Kamenica, and Simonson (2006, 2008), Hitch, Hortacsu, and Ariely (2009), and Lee (2009).

[3] Dahl and Moretti (2008) document a preferences for boys using indirect indicators of parents' preferences.

long-term welfare.[4] Despite the social value of a well-functioning matching process that delivers suitable parents to every child, adoption has not received much attention by the economics literature.[5] Our analysis of parents' preferences, combined with the identification of factors facilitating an ultimate match, opens the door to policy interventions aimed at increasing the efficiency of this process.

The third contribution of the paper is, in fact, the evaluation of several recently implemented or suggested regulatory policies. Specifically, we assess the potential effects of a ban on adoption by same-sex parents (implemented in several states) on the volume of successful adoptions. We also illustrate the potential reduction in domestic adoptions due to the recent ratification of the Hague Convention in the U.S., which significantly toughened intercountry adoption, starting in $2008$.

We constructed our data set following the matching process managed online by an adoption facilitator between $2004$ and $2009$. The data set is comprised of approximately $800$ cases of either born or unborn babies that the facilitator collected from multiple agencies and posted on a website designed for client PAPs. On the website, each baby is identified by a code, by an array of attributes, by the estimated adoption finalization costs, and by a set of restrictions imposed by the BMO specifying which categories of PAPs she considers acceptable (such as straight couples, single-sex couples, single women, and foreign PAPs).

Each PAP pays a fixed fee to the facilitator to enter this matching process. PAPs who participate in the matching process observe the babies available for adoption sequentially and can express interest in any baby by submitting an application to the BMO (as long as they meet the BMO's requirements). Our data records all the PAPs that apply for each baby, as well as each BMO's final choice, be it selecting an applicant PAP, matching through channels other than the facilitator, or deciding to parent the child.

Our analysis follows several steps. We start by studying how babies' attributes help explain

[4]Nearly 40% of youth exiting foster-care are homeless within 18 months of discharge (U.S. General Accounting Office, 1999). Entry into foster care is also associated with a much higher rate of incarceration. For instance, in California, 70% of all penitentiary inmates have spent time in the foster-care system (Select Committee Hearing of the California Legislature, 2006).

[5]We discuss several exceptions in Section 1.2.

the variance in the estimated adoption finalization costs that we observe on the website. Adoption finalization costs consist of adoption-agency fees and BMOs' expenses (the former often accounting for over $80\%$ of overall costs). We find that costs respond in a significant way to the race and gender of the child. Indeed, the costs associated with an African-American child are $\$8,000$ lower than the ones associated to a Caucasian or Hispanic child, and the costs associated with girls are $\$2,000$ higher than the ones associated with boys. Moreover, estimated costs exhibit strong time trends, increasing from $\$20,500$, on average, in 2004 to $\$32,000$ on average in 2009, and, for unborn babies, they depend negatively on the time to birth. These observations are suggestive of the limited regulation the adoption industry is subject to: While costs associated with different races could potentially be explained by considering BMOs' expenses (that may be correlated with race through geographical locations entailing different costs of living), the differences in costs associated with gender and time to birth are harder to explain through BMOs' expenses alone.

In order to elicit parents' preferences directly from their behavior, we need to account for the supply of babies of different attributes. To that effect, we utilize a decentralized search and matching model à-la Burdett and Coles (1997) and Eeckhout (1999). We assume PAPs' preferences depend on the observable attributes of the children they are matched with, and BMOs' preferences depend on PAPs' attributes. Participants on both sides of the market effectively solve an option value problem. In equilibrium, a PAP applies for a baby if the utility associated with it exceeds a certain threshold, and a BMO accepts a PAP's application if a match with that PAP yields a utility exceeding her own threshold. We use this characterization to estimate PAPs' preferences over children's attributes (gender, race, and time to birth) and adoption finalization costs.

We show that PAPs exhibit a preference bias in favor of girls and against African-American children. Specifically, if we consider a non-African-American baby, the probability that a given PAP expresses interest in such a baby is $11.5\%$ if the baby is a girl and $7.9\%$ if the baby is a boy. The effect of the estimated adoption cost on child desirability is significant and negative. That is, ceteris paribus, an increase in expected adoption costs lowers the desirability of a child. This allows us to convert the gender bias into dollars. We find that the increase in desirability of a non-African-American girl with respect to a non-African-American boy is equivalent to a $\$16,000$ decrease in

adoption finalization costs. We find the same gender bias to be present for African-American babies. In particular, the probability of eliciting interest from a PAP is $3.4\%$ for an African-American girl and $1.6\%$ for an African-American boy.

With regard to race, most babies in our data are characterized by the composition of varying percentages of three ethnicities: Caucasian, African-American, and Hispanic. If we consider an unborn baby of unknown gender, the probability that a given PAP expresses interest in the baby is about $13\%$ if the baby is non-African-American and $1.7\%$ if the baby is African-American. Again, converting the racial bias into dollars, we find that the increase in desirability of a non-African-American baby with respect to an African-American baby (both of unknown gender) is equivalent to at least a $\$38,000$ decrease in estimated adoption costs. A similar bias (appearing in varying magnitudes) is present for babies of known gender (whether boys or girls). Interestingly, we do not observe *any* bias against Hispanic babies, who represent a substantial fraction of the babies in our data set.

It is interesting to contemplate what underlies these observed biases. Consider, first, the gender bias. The existing literature on parents' preferences for the gender of their biological children has invariably identified a preference for boys. This is believed to be the case both within the U.S. and abroad (e.g., as manifested in the case of the missing women in China). However, our results on gender preferences constitute a reversal of this evidence in the adoption environment. One possible explanation is that PAPs fear dysfunctional social behavior in adopted children and perceive girls as "less risky" than boys in that respect.[6]

Consider, now, the racial bias. *Homophily*, defined as individuals' preference for similarity, is well-established in the sociological literature. In the adoption context, homophily can translate into PAPs preferring adopted children that resemble them in looks, potentially wanting children who can pass as their biological children. Given that the PAPs in our sample are predominantly Caucasian,

[6]The lifetime probabilities of incarceration for men and for women were estimated at $11.3\%$ and $1.8\%$, respectively, by the Department of Justice (see http://www.ojp.usdoj.gov/bjs/crimoff.htm). Also, girls are less likely to develop behavioral problems such as autism spectrum disorders (four times more prevalent in boys than in girls, according to the Autism Society of America) or ADHD (diagnosed two to four times more frequently in boys; see Dulcan, 1997). These facts can be regarded as support for the perceived higher risk boys entail.

the desire for similarity is consistent with a preference for Caucasian babies. While we suspect that this taste for similarity is at the root of some of the racial preferences we observe, it cannot fully explain the preferences we document. Indeed, to the extent that Hispanic babies are more likely to appear different from Caucasian PAPs relative to Caucasian babies, homophily would suggest a (possibly weaker) bias against Hispanic babies as well. However, as highlighted above, we do not observe such a bias.

We also estimate the extent to which PAPs' preferences depend on their own characteristics. We differentiate between PAPs according to whether they participate as a couple or as a single person, their sexual orientation (heterosexual and same-sex couples), and their nationality (U.S. residents and foreigners). The biases mentioned above hold true for all of these categories of PAPs. The racial bias is stronger for same-sex couples and weaker for foreign PAPs. We also find that a big component of the gender bias originates from the preferences of same-sex PAPs.

Next, we quantify the variation of child desirability over the course of the BMO's pregnancy and after birth. The probability that a PAP is interested in an unborn baby monotonically increases the closer the BMO is to delivery, with the probability of an application rising from $3.6\%$ seven months before birth to $8.6\%$ a month before birth. This effect is presumably the outcome of two countervailing forces. On the one hand, the earlier the match between the BMO and the PAP, the closer the adoptive PAPs can monitor the BMO's pre-natal care. On the other hand, BMOs are not allowed to relinquish their parental rights until after birth. This implies that BMOs who are closer to birth have less opportunities to change their minds regarding the adoption and, thus, the match has a higher chance of being successful. Our results suggest that the latter effect dominates the former.

We also find that the probability of a PAP applying for a baby drops substantially immediately after birth. In terms of policy design, this highlights the importance of minimizing bureaucratic obstacles that could disrupt an adoption plan that is in place at the time of birth.

Turning to the outcomes of the adoption process, we find that a doubling in the desirability of a child, as captured by the rate at which the child receives PAPs' applications, raises the child's chances of finding a match from $67\%$ to $71\%$. In addition, raising adoption finalization costs by $\$10,000$ *increases* the match rate from $67\%$ to $79\%$. These observations suggest that investments

made by adoption agencies posting higher costs may have an important effect on the likelihood of generating a successful match.

On the normative side, the question of which parents are legitimate prospective adoptive parents (specifically, for the case of same-sex or single PAPs) is a topic of ongoing debate in the U.S. and abroad. Internationally, The Hague Convention, originally crafted in 1993, regulates intercountry adoption and was ratified in the U.S. on April 1, 2008. The Hague Convention has simultaneously made international adoption far more difficult for U.S. citizens (potentially increasing demand for domestic adoption) and domestic adoption virtually impossible for foreign PAPs. Consequently, its merits are highly debated on both the domestic and international fronts.

Our analysis sheds light on some of these debates. For example, focusing on the effects of participation of same-sex couples, we perform a natural counterfactual experiment. We shut down the possibility for same-sex PAPs to submit applications to BMOs and ask how a baby's chance of being matched with a PAP changes. The answer is a $6\%$ decrease in the probability of being matched. We reach a similar conclusion when looking at whether adoption should be open to foreign PAPs. If we ban foreign PAPs from our sample, we find a sizable reduction of $33\%$ in the chances that a baby will find a match.

## 1.2 Literature Review

Despite the scope of the adoption industry in terms of volume of children and annual revenues, as well as the unique matching mechanisms it employs, adoption has, thus far, received little attention in the economics literature.[7] There are, however, a few important exceptions.

The paper that is closest to ours in terms of questions addressed is Bernal, Hu, Moriguchi, and Nagypal (2007). This paper presents an historical analysis of domestic adoption, uncovering the trends in different types of adoption: domestic and international, related and unrelated, as well as standard adoption and foster care. On the individual level, the paper estimates the propensities of PAPs to adopt and of BMOs to relinquish their child across time. These findings provide an

[7] See Fisher (2003) for an account of how adoption has also been overlooked by sociologists and social scientists more generally.

important springboard for our analysis, which takes PAPs' and BMOs' decisions to participate in the adoption process as given and focuses on their behavior *within* that process.

From a policy perspective, Landes and Posner (1978) propose a strategy for amending the shortage of babies relinquished for domestic adoption and the abundance of babies in foster care. They suggest the opening of a market for babies that would allow for equilibrating monetary transfers between PAPs and BMOs. The envisioned market would entail little governmental regulation and would remove adoption agencies' monopolistic power. Our analysis is useful in assessing this proposal, in that it identifies parents' preferences that would feed into estimating efficiency and the likelihood of entry to foster care in a fully decentralized mechanism as such.

Sacerdote (2002, 2007, 2009) makes use of adoption data to study questions regarding the impacts of nature as opposed to nurture. In particular, he analyzes the long-term performance of Korean-American adoptees who, as infants, were randomly assigned to families in the U.S. While there exists a performance gap between biological and adopted children (favoring biological children) in both education and income, there is no gap in the transmission of other habits (namely, eating, drinking, and smoking). Björklund, Lindahl, and Plug (2006) also focus on the long term effects on both education and income of Swedish adoptees. They show that the adoptive father's income is the most significant determinant of the adoptee's income, while the birth mother's education has the strongest effect on education performance.

The adoption industry has received attention in other disciplines, ranging from legal studies, to sociology, psychology, and history. We provide a summary of the legal background of adoption in Section 2 below. For detailed accounts of child adoption in the U.S., we refer the interested reader to Melosh (2002), Pertman (2000), and references therein.

Other than the literature on adoption per se, our paper is linked to the work on two-sided matching with frictions (e.g., Adachi, 2003; Burdett and Coles, 1997; Eeckhout, 1999; and Smith, 2006). The underlying model in that literature has two sides of a market (e.g., workers and firms, men and women, etc.) encountering each other randomly each period. During an encounter, the two parties observe the utility the match would generate and jointly decide whether to pursue the match and leave the market, or to separate and wait for future periods. Equilibrium behavior is generally

characterized by threshold strategies, where each participant agrees to a match with someone who is "good enough" from the other side of the market.

From a methodological point of view, our paper uses the underlying search and matching model to estimate parents' preferences. We know of very few other empirical estimations of two-sided matching with frictions (see Abramitzky, Delavande, and Vasconcelos, 2009 and Botticini and Siow, 2008, Del Boca and Flinn, 2006, as well as some of the work on online dating discussed below). The existing work focuses mainly on the marriage-market context. We note that the commitment entailed in the successful conclusion of an adoption (that is arguably irreversible) makes our process a particularly good fit for this class of models.

Gender and racial biases are both common and well documented in many realms of modern society.[8] Related to this paper, several recent papers have used matching environments of other types, particularly the online dating market, to estimate racial preferences (e.g., Fisman, Iyengar, Kamenica, and Simonson, 2006, 2008; and Hitch, Hortacsu, and Ariely, 2009). This work identifies a preference for same-race partners, much in the spirit of the racial preferences we observe.[9] Technically, adoption through facilitators and online dating are similar in that both involve a two-sided search. However, unlike most online dating markets, in which an outcome is an agreement for a rather preliminary contact, outcomes in the adoption environment are effectively binary and irreversible: A match means a likely successful adoption. In terms of gender preferences, there is a large body of work suggesting preferences for sons in the U.S. (see Dahl and Moretti, 2008) and abroad (for instance, the case of the missing women in Asia, as noted by Sen, 1990). Most of this work uses indirect indicators (e.g., separation rates of couples as a function of their children's gender) to assess these biases. In this paper, we use the detailed matching data to estimate parents' preferences over children's attributes directly, and we identify a substantial preference for girls in

[8]There exists a large literature that corroborates gender and racial biases in the workplace (e.g., Altonji and Blank, 1999; Bertrand and Mullainathan, 2004; Bertrand, Goldin, and Katz, 2008; and Flabbi, 2009), in the health system (Cooper-Patrick, Gallo, Gonzales, Vu, Powe, Nelson, and Ford, 1999), in the education system (Fryer and Levitt 2006; Skiba, Michael, Nardo and Peterson, 2004), and in the justice system (Mustard, 2001; Iyengar, 2007, 2008). For overviews, see Loury (2002) and Nelson (2009).

[9]See also Banerjee, Duflo, Ghatak and Lafortune (2009) for an empirical analysis of the arranged marriage market in India. They document strong preferences for within-caste marriages, similar to the preferences for same-race partners unearthed by the online dating literature.

the adoption context.

# 2 Institutional Environment

## 2.1 The Adoption Process in the U.S.

Adoption is an ancient institution.[10] The concept of adoption, however, was not legally recognized in the United States until 1851, with the enactment of The Massachusetts Adoption of Children Act, widely considered the first "modern" adoption law. Prior to the 20th century, court adoptions were very rare. During the 20th century, formal adoptions increased dramatically in the U.S., reaching a numerical peak by 1970, when 175,000 adoptions were finalized. This increase went hand in hand with a variety of reforms dedicated to the provision of adopted children with legal safeguards enforced by certified agencies. In 1917, Minnesota passed the first state law that required children and adults to be investigated and adoption records to be shielded from public view. By mid-century, virtually all U.S. states had revised their laws to incorporate such minimum standards as pre-placement investigations, post-placement probation, and sealed records of the adoption process. Since 1950, a number of major shifts have occurred. First, the definition of adoptable children was expanded to include older, disabled, non-Caucasian, and special-needs children. Second, a variety of reforms have been introduced to encourage open adoptions, which allow adoptees and birth parents to remain in contact.

In 1994, the National Conference of Commissioners on Uniform State Laws created The Uniform Adoption Act as an attempt to codify and make current legal practice uniform across states. Nonetheless, very few states altered jurisdiction to incorporate the Uniform Adoption Act and states still differ with respect to an assortment of details regarding the legal formalization of adopted kinship. In what follows, we summarize the main elements of the adoption process in the U.S. (see Jasper, 2008 or Mabrey, 2006 for a full state-by-state survey of adoption jurisdiction).

The supply side of domestic adoption is represented by a population of BMOs who intend to relinquish their children for adoption. The children can be either born or unborn. When not searching

[10] Greeks, Romans, Egyptians, and Babylonians, all had adoption systems.

for adoptive parents on her own, the BMO looks for (or is located by) an adoption agency or some other organization in order to be matched with PAPs.[11] Adoption agencies can be either private or public. While public adoption agencies typically specialize in special-needs children, private agencies match all types of children, and can be either non-profit or for-profit organizations, depending on state law.[12]

The demand side of domestic adoption consists of PAPs. These PAPs can be either (straight or same-sex) couples or singles, and either U.S. or foreign citizens. After undergoing a certification based on a home study, the first choice that PAPs seeking to adopt face is whether to participate in either the international or the domestic adoption process, or in both.[13] The PAPs who decide to search for a child domestically can use adoption agencies, pursue a private (or "independent") adoption with the aid of specialized attorneys, or advertise in local magazines and newsletters.

Each of these channels can be problematic from the PAPs' point of view. Since adoption agencies often operate in geographical areas where they can easily locate BMOs, or where they are subject to less regulation, it can be difficult for PAPs (who usually reside in cities and high-income areas) to locate, screen, and interact with many agencies at the same time. Moreover, in many states, the law does not allow adoption attorneys to act as intermediaries in adoption matches. Finally, independent search through advertising is time-consuming and may entail significant cost uncertainty.

These considerations created a role for intermediaries, usually referred to as "adoption facilitators." Much like adoption agencies, the role of facilitators is regulated by state laws, and in some states their activity is restricted.[14] Often operating online, adoption facilitators connect with BMOs from multiple agencies and coordinate the matching process with PAPs.

Once a PAP is matched with a child, the ensuing process depends on whether the child is born

[11] If the child is already born, the BMO can immediately relinquish her parental rights (legal custody of the child) to the agency, and forego her participation in the selection of the adoptive parents.

[12] Some agencies are faith-based and give priority to families from a particular religious background.

[13] These two adoption routes entail several trade-offs. While costs are comparable, international adoption is subject to the restrictions of the Hague Convention (see Section 2.3 below), as well as to the laws of the child's country of origin. Children adopted internationally are typically older than those adopted domestically, and the wait to adopt them has been reported to be longer (see http://www.americanadoptions.com).

[14] In fact, only in very few states, such as California and Pennsylvania, can adoption facilitators be legally paid (see, e.g., California Family Code Sections 8623-8638, Chapter 1.5).

or not. If the BMO of an already born child has not yet relinquished her parental rights to an agency, then she can relinquish them as soon as the match occurs. The child is then put in the custody of the PAP. If, instead, the baby is unborn, the parties wait until birth, with no commitment to complete the adoption on either side. During this time, the PAP normally pays the living and the medical expenses of the BMO. At birth, with a lag determined by state law, the BMO can, if she still desires, relinquish her parental rights. In this case, the child is placed in the custody of the PAP.

This initiates the post-placement process. The adoption is finalized when a court transfers the parental rights to the PAP. The finalization is conditional on a series of legal requirements determined by the state. The court bases its decision on a post-placement report completed by a registered social worker on the basis of some visits to the adopting family. The court also screens the nature of the financial transfers that have taken place between the PAP and the BMO, as well as the transfers that the PAP has made to the adoption agency. In particular, the court checks that transfers to the BMO constitute allowed reimbursements of either living or medical expenses.[15] Successful PAPs can then file for an adoption tax credit that effectively reduces the cost of adoption by a fixed amount.[16]

## 2.2 Gay, Lesbian, and Single Adoption

Adoption by gay and lesbian couples or individuals is legal in only a few countries around the world.[17] In the U.S., many states have enacted or attempted to enact legislation on gay and lesbian adoption since the early 2000s. However, state laws are still largely silent on the issue. While some states restrict adoption by sexual orientation or marital status, legislation with respect to this issue is still in flux, and gay and lesbian adoption is the subject of a very active and heated policy debate.

At the time of writing of this paper, only Arkansas, Florida, Michigan, Mississippi, New Hampshire, and Utah imposed restrictions on gay and lesbian adoption.[18] Nonetheless, in many states in

[15] Any transfer from the PAP to the BMO that is aimed to obtain consensus of the adoption is illegal. State laws specify the precise categories of BMO expenses (such as medical, legal, and living costs) that can be covered by PAPs, which are classified as charity. If the BMO changes her mind regarding the adoption before finalization, all transfers are generally non-reimbursable.

[16] For 2008, the maximal adoption credit was $11,650; see IRS Form 8839, *Qualified Adoption Expenses*.

[17] Besides the U.S., these are Andorra, Belgium, Canada, Denmark, Guam, Iceland, the Netherlands, Norway, South Africa, Spain, Sweden, the United Kingdom, and two states in Australia.

[18] Arkansas and Utah, while not explicitely banning gay and lesbian adoption, prohibit adoption by a couple that is

which statutes do not prohibit adoption by gay men and lesbians, individual judges or courts have ruled against the practice. In fact, in 40 states, Statute or Appellate Court rulings have banned joint adoption by same-sex couples.[19]

The Census 2000 indicated that $4\%$ of all adopted children in the U.S. live in a gay or lesbian household. Even though in 2000 the adoption rate of same-sex households was reported as $1.6\%$, this rate has the potential to increase dramatically if the current restrictions are lifted.[20]

Since the early 90s, there has been an increase in the number of adoptions by single individuals, the vast majority of whom are women. By 2000, singles accounted for at least $15\%$ of all adoptive parents in the U.S. (see the Census 2000). While allowed in the U.S., adoption by local or foreign single individuals is prohibited in the majority of countries all over the world.

## 2.3 The Hague Convention

Intercountry adoptions have played an important role over the years. The percentage of intercountry adoptions (out of all adoptions) fluctuated between $4\%$ and $9\%$ between the 80s and the mid 90s and rose to a documented $15\%$ in 2001 (see Bernal, Hu, Moriguchi, and Nagypal, 2007).

A critical development in international adoption law and practice was the enactment of the 1993 Hague Convention on Protection of Children and Cooperation in Respect of Intercountry Adoption (hereafter, "The Hague Convention").[21] The Hague Convention was ratified in the U.S. on April 1, 2008, at which time $74$ other nations had already signed, ratified, or acceded it. The primary principles of The Hague Convention are targeted at ensuring that each adoption is in the best interests of the child and at preventing the abduction, sale, or trafficking of children between countries. Most notably, the treaty requires that: (i) Agencies involved in intercountry adoption, in both the sending and receiving country, be certified by government agencies; (ii) Agencies provide proof of effort

not legally married. At the same time, in these states it is legal for single individuals to adopt, regardless of sexual orientation, so long as they are not co-habitating in non-marital relationships. Historically, Florida has been the only state that had explicitely banned adoption by a gay or lesbian single individual. This ban was ruled unconstitutional in November 2008.

[19]For details regarding states' jurisdiction on gay and lesbian adoption, see American Civil Liberties Foundation (2006), Human Rights Campaign (2009), and National Conference of State Legislatures (2009).

[20]See Badget, Chambers, Gates, and Macomber (2007).

[21]The Hague Convention is available through http://hcch.e-vision.nl/index_en.php?act=conventions.pdf&cid=69

to place the child for adoption in their country of origin by advertising the case prior to matching the child with foreign PAPs; and (iii) The baby remains in foster care in the country of origin for a minimal amount of time before full custody is granted to the selected PAP. All expenses during the time in foster care are paid for by the PAP.

There are two channels through which The Hague Convention may affect U.S. domestic adoption. First, the high costs associated with agency certification and advertising have reduced the number of agencies, in both the U.S. and abroad, that can legally send foreign children to the U.S. This can potentially increase both the costs and the waiting times to adopt a foreign child. As a result, the demand for domestic babies is expected to increase.

Second, prior to the ratification of The Hague Convention, foreign PAPs could adopt U.S.-born babies in much the same way U.S. residents do. Since the adoption process in European countries and Canada is often slower and more centralized than in the U.S., foreign PAPs constituted a non-trivial portion of the demand for domestic children.[22] The increased regulation due to The Hague Convention is expected to dramatically slow down the adoption of U.S. children by foreign PAPs.[23] Government agencies took notice of these problems and modified some regulatory aspects of the The Hague Convention in March 2009.[24]

# 3 The Data

## 3.1 The Facilitator's Operations

We constructed our data set monitoring an online adoption facilitator who mediates between agencies dealing with BMOs and PAPs, over the period from June 2004 to August 2009.[25] Over a five year period, we collected data on the applications of 675 PAPs to more than 800 BMOs. The facili-

[22]For instance, data from the Canadian immigration bureau indicates that 399 American children aged 0 to 21 were adopted by Canadian citizens between 1994 and 1998.

[23]Private consultations with adoption experts suggested that, as of April 2009 (one full year after the Hague convention was ratified), only one foreign PAP completed an adoption process in the U.S. Unfortunately, there are very limited solid data documenting adoption of U.S. children from abroad as there is no agency tracking issuance of U.S. passports to infants, nor any organization tracking visa applications for U.S. infants moving abroad for adoptive placement.

[24]In particular, if the BMO herself identifies a suitable foreign PAP, the agency's burden to show effort in recruiting a U.S. citizen as PAP was lifted (see http://adoption.state.gov on 22 CFR 96.54(a)).

[25]See the Data Appendix for detailed information on the construction of the data set.

tator placed 115 babies, while 504 were placed through other channels.

New cases of unborn babies or already-born children available for adoption are posted on the facilitator's publicly accessible website regularly.[26] Activity on the website follows this basic timing:

1. *An unborn baby, or already-born child, is posted as a new case on the facilitator's website*. The child is identified by the BMO's code name.[27] For every case, the facilitator publishes the following information: (a) The baby's characteristics: date on which the case is presented, race composition, gender (when available), due date for unborn babies, and age for already-born children;[28] (b) the estimated costs of adopting the child. These include a fixed facilitator fee, adoption agency fees, BMO's expenses (that may include living and medical costs), and legal fees; and (c) the constraints that the BMO or the adoption agency impose on PAPs. Specifically, the BMO can restrict the availability of her baby from same-sex, single, foreign PAPs, etc.[29]

2. After paying the fixed fee to the facilitator, *a PAP can submit one or more applications to adopt any of the available children at no additional cost*.[30] As PAPs submit an application to a BMO, their first name (or initials) are posted on that child's case. The PAPs' application consists of a letter to the BMO sent through the facilitator and the agency. In this letter, the PAPs describe themselves, their life-style, and how they plan to raise the child.[31]

3. *The posted cases can be resolved in several ways*: (a) the BMO chooses the desired PAP

[26] On any given day, there are on average 23 BMOs on the website, all listed on the same page. This makes it straightforward for PAPs to browse the entire list of available BMOs.

[27] The facilitator modifies or changes the BMOs' real first names to maintain their anonymity.

[28] The website also reports fetus anomalies detected by an ultrasound or other documented health problems. However, these medical issues occur for only $0.2\%$ of the children in our data set.

[29] There are some additional restrictions on the PAPs' characteristics dictated by state laws or special adoption regulations that are relevant for some cases. For example, the Indian Child Welfare Act of 1978 gives Native American Indian Nations and Tribes the right to control adoptions that involve their tribal members's children. As a result, the adoption of these children is often restricted to Native American PAPs only. In addition, the BMO can also express her preference toward an open adoption. In our sample, in only $2\%$ of cases did the BMO specify a preference regarding a closed as opposed to an open adoption.

[30] In some cases, before applying, the PAPs receive additional information regarding the BMO and the child based on an interview the agency conducts with the BMO. This interview comprises questions regarding the BMO's health and life-style, her family and the birth-father characteristics. While the information posted on the website is verifiable by the agency and the facilitator, this additional information is not verifiable.

[31] The letter often includes photos of the PAPs, their family, and their environment. No other contact between BMO and PAPs is permitted prior to a match.

among the applicants.[32] This results in a match observable on the website, and both the BMO and the PAP leave the website;[33] (b) the BMO is matched through a different channel, and the child is reported as "matched" on the website; (c) the BMO decides to parent, and the decision is reported on the website; (d) the facilitator reports a lost contact with the BMO; or (e) there are no applications for the case.[34] This final outcome sometimes leads the BMO to parent, but in most cases the child remains unmatched. Unmatched children enter the foster-care system, where they remain adoptable until the age of $18$.

The entire process, from posting of a BMO on the website to finding a match with a PAP, is very fast. Most PAP applications are submitted within the first 10 days of posting a child, and the median child is available on the website for less than a month.

## 3.2 Summary Statistics

### 3.2.1 Birth Mothers' Statistics

Table 1, below, reports the summary statistics pertaining to children's attributes in our data, while the summary statistics conditional on a match and the time trends of some of the children's attributes appear in Tables 6 and 7, respectively, in the Appendix.[35]

The main categories of attributes that prove most useful for our analysis are: gender, race, whether babies have already been born or are unborn, the time period between presentation date and birth for unborn babies, adoption finalization costs, and the restrictions imposed by the BMOs on the acceptable PAPs.

In terms of gender, not conditioning on the achievement of a match, $22.3\%$ of the children in our sample are girls, $30.6\%$ are boys, and the rest are of unknown gender. Conditioning on a match

[32] If the child is born and the BMO has already relinquished her parental rights, the adoption agency that has legal custody of the child selects the PAP.

[33] Any active application of that PAP for other children is dropped. In fact, the facilitator's policy specifies that if the selected PAPs reject a match, they will not be allowed any further applications through the facilitator. Thus, *applications are binding from the PAPs' point of view*. The BMO stops receiving applications from other PAPs upon a match. However, she can still decide to parent until she relinquishes parental rights.

[34] If no application is received after a wait of about one month, the facilitator usually reports the case as "closed."

[35] Summary statistics correspond to different numbers of observations since, in some data points, not all attributes were relevant or specified.

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Already Born | 0.273 | 0.445 | 0 | 1 | 801 |
| Months to Birth for Unborn | 1.925 | 1.62 | 0.033 | 7.8 | 579 |
| Months from Birth for Born | 1.176 | 5.63 | 0.033 | 69.5 | 370 |
| Days from First to Last Application | 33.84 | 31.19 | 1 | 511 | 745 |
| Days from Presentation on Site to Last Day on Site | 51.04 | 42.18 | 1 | 511 | 804 |
| Days on Site if Always Born | 33.84 | 25.50 | 1 | 131 | 125 |
| Days on Site if Always Unborn | 53.67 | 38.25 | 1 | 217 | 477 |
| Days on Site if Switch from Unborn to Born | 85.55 | 53.17 | 3 | 240 | 138 |
| Number of Interested PAPs | 2.218 | 2.216 | 0 | 15 | 804 |
| Applications Per Day | 0.119 | 0.249 | 0 | 4 | 745 |
| Bad Health Words | 0.002 | 0.050 | 0 | 1 | 803 |
| Single PAP Allowed | 0.66 | 0.474 | 0 | 1 | 803 |
| Same-Sex PAP Allowed | 0.313 | 0.464 | 0 | 1 | 803 |
| Foreign PAP Allowed | 0.856 | 0.351 | 0 | 1 | 803 |
| Girl | 0.223 | 0.416 | 0 | 1 | 803 |
| Boy | 0.306 | 0.461 | 0 | 1 | 803 |
| Caucasian | 0.361 | 0.393 | 0 | 1 | 804 |
| Hispanic | 0.128 | 0.27 | 0 | 1 | 804 |
| Asian | 0.022 | 0.112 | 0 | 1 | 804 |
| Non-African-American Boy | 0.175 | 0.35 | 0 | 1 | 803 |
| Non-African-American Girl | 0.12 | 0.302 | 0 | 1 | 803 |
| African-American | 0.389 | 0.415 | 0 | 1 | 804 |
| African-American Girl | 0.102 | 0.279 | 0 | 1 | 803 |
| African-American Boy | 0.13 | 0.301 | 0 | 1 | 803 |
| Domestic Finalization Cost | 26290 | 8176 | 3500 | 52300 | 778 |

**Table 1:** Summary Statistics for BMOs

being created (either through the facilitator or through other channels), girls account for $28.8\%$ of matched children, while boys account for $24.2\%$.

As for race, the unconditional breakdown in our data set is $36.1\%$ Caucasian, $38.9\%$ African-American, and $12.8\%$ Hispanic. The race breakdown conditional on children finding a match is $37.5\%$ Caucasian, $38.7\%$ African-American, and $14.3\%$ Hispanic.[36]

Already-born children constitute $27.3\%$ of our data set, while, conditional on being unborn, the

[36]The sample of children posted on the facilitator's website is potentially biased with respect to the general population of adopted children. However, because states are not legally required to report the number of domestic adoptions, there are limited solid sources documenting characteristics of adopted kinships. The Census 2000 is the most recent source, according to which the race breakdown of children adopted in the U.S., both domestically and internationally (where the latter accounts for $13\%$ of the total adopted children), is $58\%$ Caucasian, $16\%$ African-American, and $13\%$ Hispanic (the remaining portion corresponding to Asian and other races).

average time to birth at which the cases are presented to the facilitator is slightly below two months. The average age of already-born children is just above one month. Conditional on being matched, already-born children constitute only $11.1\%$ of all matched children.

The estimated costs to finalize an adoption range from $\$3,500$ to $\$52,300$, in addition to the $\$4,800$ fixed fee for working with the facilitator.

Finally, in terms of PAPs who are acceptable to BMOs, same-sex PAPs are allowed in $31.3\%$ of the cases, foreign PAPs in $85.6\%$ of the cases, and single women in $66\%$ of the cases.[37]

In terms of the outcomes of the matching process, the average number of PAPs who apply for a given child is $2.2$, varying from $0$ to $15$. BMOs decide to parent their child in $5.3\%$ of the cases, are reported as a lost contact in $5\%$ of the cases, and as a closed case in $25.2\%$ of cases. A match occurs in $70\%$ of the cases ($13.5\%$ through the facilitator). The average number of days a case remains on the facilitator's website is $45$ days, ranging from $1$ to $469$ days. We note that the distributions of time to birth when the child arrives on the facilitator's website and when the child is matched look rather different, as illustrated in Figure 2 in the Appendix.

### 3.2.2 Prospective Adoptive Parents' Statistics

We now turn to the demand side, represented by the PAPs. The summary statistics on the PAPs' attributes are in Table 2 below, while the summary statistics conditional on a match and the time trends of some of the PAPs' attributes are in Table 7.

Recall that when a PAP applies for a specific baby, *only the PAP's first name(s)* appear on the website next to the baby requested. We therefore infer PAPs' characteristics based on their names and on their behavior on the website. As a first step, when the PAP consists of one person, we identify that PAP as a single woman.[38] Second, when the PAPs' names unequivocally indicate that the PAP is a straight couple, or a same-sex couple, we assign the relevant attribute to the PAP. Of the PAPs that have names with unambiguous gender classification, $63.3\%$ are straight couples, $4.6\%$ are

[37] There are very few cases in which lesbian PAPs are allowed to apply and gay men are not, or vice-versa. The variable 'Same-sex Allowed' identifies a baby for which at least one of these PAP categories is considered acceptable.

[38] According to an interview with the owner of the website, there are no single men among the PAPs.

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Applies for a Baby (on a Specific Day) | 0.053 | 0.047 | 0 | 0.501 | 675 |
| Applies for a Baby (Allowed Choices only) | 0.064 | 0.094 | 0 | 1 | 670 |
| Applies for a Baby (at Some Point in Time) | 0.060 | 0.058 | 0 | 0.504 | 675 |
| Days between First and Last Application | 103 | 171 | 1 | 1559 | 675 |
| Days Since Last Application for a PAP | 1.643 | 4.852 | 0 | 94.149 | 673 |
| Gay PAP (Score) | 0.064 | 0.218 | 0 | 1 | 613 |
| Lesbian PAP (Score) | 0.065 | 0.222 | 0 | 1 | 612 |
| Foreign PAP (Score) | 0.516 | 0.165 | 0.001 | 0.999 | 674 |
| Single PAP (Score) | 0.083 | 0.271 | 0 | 1 | 613 |
| Gay PAP (Unambiguous) | 0.046 | 0.209 | 0 | 1 | 675 |
| Lesbian PAP (Unambiguous) | 0.047 | 0.213 | 0 | 1 | 675 |
| Straight PAP (Unambiguous) | 0.633 | 0.482 | 0 | 1 | 675 |
| Ambiguous PAP Name | 0.201 | 0.401 | 0 | 1 | 675 |

**Table 2:** Summary Statistics for PAPs

gay men, $4.7\%$ are lesbians, and $8.3\%$ are single women.[39] We use these priors to construct straight, gay, and lesbian scores for PAPs with names entailing some gender ambiguity.[40]

As for foreign PAPs, we infer their identities from their behavior on the website. Specifically, assuming a symmetric prior, we compute the probability of a PAP being foreign using Bayesian updating over a multinomial process.[41]

According to this classification criterion, $78.8\%$ of the PAPs in our sample are straight couples, $6.4\%$ are gay couples, $6.5\%$ are lesbian couples, and $8.3\%$ are single women. In addition, $51.6\%$ of the PAPs are foreign.

We consider a PAP *active* from the time at which the PAP submits the first application until the PAP is reported as "matched" or, if never reported as such, until ten days after the last application is submitted.[42] Given these assumptions, active PAPs apply for a child for which they are acceptable with a $6.4\%$ probability.

[39] We use this 'unambiguous' score for some tables in the Appendix.

[40] For instance, 'jack&jamie' could be either a straight or a gay men couple and are coded with the corresponding posterior of $0.92 = \frac{0.633}{0.633+0.046}$ that they are a straight couple as their "Straight PAP" score and with the complementary posterior of $0.08$ as their "Gay PAP" score. Similarly, 'kim&jamie' is coded with a $0.85$ "Straight PAP" score, a $0.07$ "Gay PAP" score, and a $0.08$ "Lesbian PAP" score.

[41] Given a 50-50 division between foreign and domestic PAPs, we assume a $10\%$ error-probability for foreign PAPs applying for children for whom they are not allowed to apply. We compute the posterior probability of the PAP being foreign (see the Data Appendix for more details on the construction of the 'Foreign PAP' score).

[42] We provide robustness checks for our results with respect to the length of this window.

The average time elapsed between the PAPs' first and last application is $103$ days. The (average) application probability of a PAP for an available baby on each day is $5.3\%$, while the probability of applying for that baby at some point is $6\%$.[43]

Finally, the composition of PAPs has been fluctuating somewhat over the years. Most notably, the fraction of foreign PAPs, which varied between $57.5\%$ and $60.3\%$ between $2004$ and $2007$, dropped to $50.3\%$ in $2008$ and to $37.4\%$ in $2009$, possibly reflecting the impact of the Hague Convention.

## 3.3 Adoption Finalization Cost Regressions

The estimated adoption finalization costs include several components. First, they contain the BMO's reimbursable expenses until birth, which can include rent, food, and medical costs. As discussed above, these expenses are restricted by state law. Second, the adoption finalization costs contain agency and legal fees. Typically these fee are less regulated than the BMO's expenses.[44]

As seen in Section Table 2, there is a large variance, with adoption finalization costs ranging from $\$3,500$ to $\$52,300$, with a mean of $\$26,290$. Figure 1 illustrates the density of adoption finalization costs.

Table 3 contains results from a linear regression describing the correlation between adoption finalization costs and different child characteristics, including year dummies for our full sample and for the restricted samples of born and unborn children.[45] Here and throughout the rest of the regression tables, the t-statistics appear in parenthesis.

First, costs are rising over time, increasing by $\$10,000$ from 2004 to 2009. The largest increase occurred in $2008$, coinciding with the ratification of The Hague Convention.

Second, we find that the adoption finalization costs respond in a significant way to the race of the child. Indeed, an African-American child is associated with costs that are $\$8,000$ lower than the

[43] For instance, consider a PAP who is active for $20$ days and a BMO who is available over that entire period. Suppose the PAP applies for the baby on day $11$ (so that the PAP has an open application to the BMO from day $11$ to day $20$) Then, the (average) application probability on each day is $50\%$ while the probability of applying at some point in time is $100\%$.

[44] Some states regulate agencies' and facilitators' fees. Usually, the only restriction is that they do not exceed the customary levels in that state (see Jasper, 2008).

[45] The variables *Single PAPs Allowed, Same-Sex PAPs Allowed*, and *Foreign PAPs Allowed* are dummy variables that attain the value of $1$ when the corresponding PAP cateogory is allowed to apply by the BMO.

| Dependent Variable | Full Sample | | Unborn | | Born | |
|---|---|---|---|---|---|---|
| Finalization Cost in $1,000s | I | II | III | IV | V | VI |
| Already Born | -1.14 | -0.65 | | | | |
| | (-1.41) | (-0.83) | | | | |
| Month to Birth | -0.50** | -0.28 | -0.56** | -0.41* | -0.11 | 0.23 |
| | (-3.14) | (-1.78) | (-3.05) | (-2.32) | (-0.31) | (0.59) |
| African-American Girl | -8.77*** | -7.99*** | -9.55*** | -8.52*** | -5.32 | -5.52 |
| | (-7.38) | (-6.83) | (-7.41) | (-6.69) | (-1.69) | (-1.77) |
| African-American Boy | -7.63*** | -7.41*** | -8.32*** | -8.27*** | -6.05* | -5.21 |
| | (-6.69) | (-6.66) | (-6.50) | (-6.64) | (-2.29) | (-1.98) |
| African-American Unknown Gender | -7.74*** | -7.71*** | -8.59*** | -8.35*** | -3.91 | -4.60 |
| | (-7.38) | (-7.55) | (-7.62) | (-7.60) | (-1.36) | (-1.61) |
| Non-African-American Girl | -0.03 | -0.11 | -0.37 | -0.22 | 1.72 | 0.81 |
| | (-0.03) | (-0.11) | (-0.34) | (-0.21) | (0.60) | (0.28) |
| Non-African-American Boy | -1.93* | -1.90* | -2.13* | -1.95* | -0.63 | -1.31 |
| | (-2.19) | (-2.22) | (-2.26) | (-2.13) | (-0.24) | (-0.51) |
| Hispanic | 0.29 | 0.19 | -0.36 | -0.54 | 2.88 | 2.91 |
| | (0.28) | (0.19) | (-0.30) | (-0.47) | (1.13) | (1.16) |
| Asian | 2.23 | 1.12 | 1.80 | 0.83 | 7.32 | 5.07 |
| | (0.92) | (0.47) | (0.73) | (0.35) | (0.54) | (0.38) |
| Year 2004 | -10.63*** | -10.51*** | -10.90*** | -10.67*** | -5.40 | -4.66 |
| | (-10.76) | (-10.73) | (-10.68) | (-10.58) | (-0.83) | (-0.72) |
| Year 2005 | -9.01*** | -9.55*** | -9.27*** | -9.77*** | -2.95 | -2.70 |
| | (-10.30) | (-10.94) | (-10.46) | (-11.03) | (-0.43) | (-0.40) |
| Year 2006 | -6.05*** | -6.54*** | -6.19*** | -6.74*** | -1.71 | -0.58 |
| | (-6.08) | (-6.66) | (-5.96) | (-6.56) | (-0.26) | (-0.09) |
| Year 2007 | -5.58*** | -4.44*** | -4.90*** | -4.17*** | -1.86 | 0.02 |
| | (-5.42) | (-4.26) | (-4.15) | (-3.60) | (-0.28) | (0.00) |
| Year 2008 | -0.57 | -1.37 | -0.17 | -0.96 | -0.83 | -1.02 |
| | (-0.54) | (-1.32) | (-0.16) | (-0.92) | (-0.12) | (-0.14) |
| Single PAP Allowed | | 0.50 | | 0.44 | | -0.02 |
| | | (0.82) | | (0.67) | | (-0.01) |
| Same-Sex PAP Allowed | | -4.44*** | | -4.51*** | | -4.40* |
| | | (-6.40) | | (-6.03) | | (-2.11) |
| Foreign PAP Allowed | | 0.44 | | 0.10 | | 3.23 |
| | | (0.58) | | (0.12) | | (1.40) |
| Constant | 35.86*** | 36.58*** | 36.42*** | 37.15*** | 29.25*** | 30.56*** |
| | (37.69) | (37.19) | (36.86) | (36.41) | (4.35) | (4.51) |
| $R^2$ | 0.38 | 0.42 | 0.43 | 0.47 | 0.17 | 0.22 |
| Adjusted-$R^2$ | 0.36 | 0.40 | 0.41 | 0.46 | 0.08 | 0.10 |
| F-Stat | 26.4 | 25.8 | 28.2 | 27.1 | 1.8 | 1.9 |
| Babies | 623 | 623 | 500 | 500 | 123 | 123 |

$^{*}p < 0.05,^{**}\ p < 0.01,^{***}\ p < 0.001$. Note that the omitted category is gender unknown non-African-American unborn child in 2009.

**Table 3:** Adoption Finalization Cost Regressions

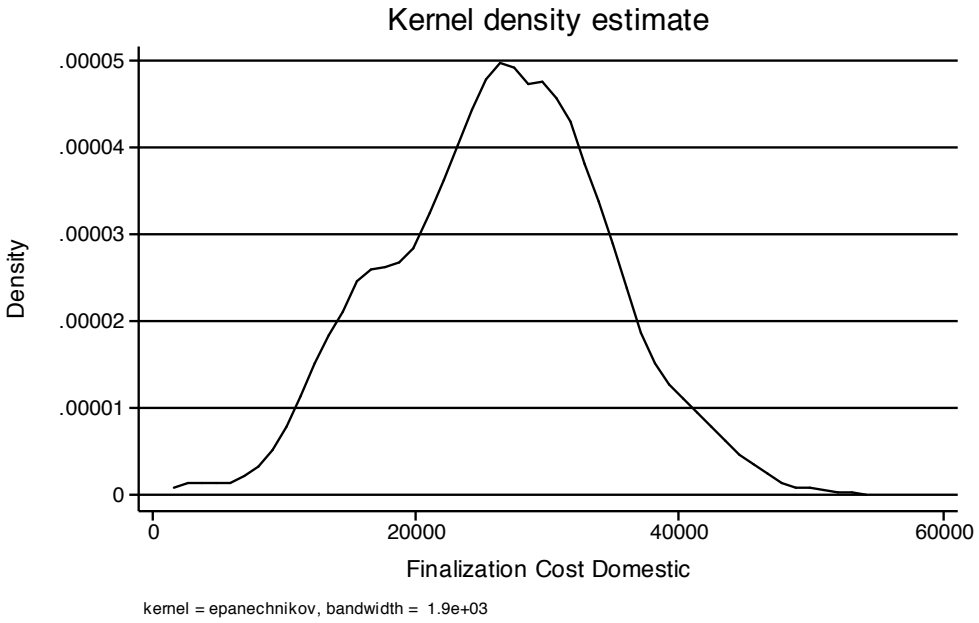


**Figure 1:** Density of Finalization Cost

ones associated with a non-African-American child.

Third, the adoption finalization costs are correlated with the child's gender. The costs associated with non-African-American boys are $\$2,000$ lower than those associated with both non-African-Americans girls and non-African-Americans of unknown gender. The link between gender and costs is suggestive of the limited regulation the adoption industry is subject to. Indeed, costs associated with different races could, in principle, be explained by considering BMOs' expenses (e.g., due to segregation, BMOs' of varying races may live in areas that correspond to different costs of living). However, the gap between costs associated with the two genders is harder to explain through BMOs' expenses alone.

We also find that adoption finalization costs tend to increase over the pregnancy. This is surprising in that the BMOs' expenses are, by nature, decreasing if the match occurs closer to birth. This suggests that either costs are set in response to the child's desirability, and such desirability monotonically increases over the pregnancy, or that particular agencies with differing fixed fees target mothers at different stages of pregnancy.

Last, the BMO's decision to allow applications from same-sex PAPs is associated with a significantly lower estimated cost (by over $\$4,400$). These trends do not depend on whether or not children are born (though significance does decrease for the smaller sample of born children).

It is important to note that the adoption agencies set adoption finalization costs. Consequently, they may be the channel through which the dependence of adoption finalization costs on child attributes is formed. Namely, certain agencies may generally tend to set high costs (due to their operating size, their reputation, etc.) and attract BMOs with children of particular attributes. We return to this point in Section 5.4.

We stress that one needs to exercise caution in interpreting Table 3 as hedonic regressions of prices that are set to clear the market. Indeed, we believe there are heavy institutional barriers that make this difficult. Having said that, learning over the years may have potentially allowed the population of agencies to adjust their fees and baby selection in the direction of a market-clearing price.

In the next sections, we utilize a model of matching with search frictions to directly elicit parents' preferences from our data.

# 4 A Model of Matching with Search

In our environment, PAPs search for a BMO to be matched with, while BMOs search for a PAP to relinquish their baby to. Therefore, we estimate a sequential two-sided matching model. In this section, we present the basic structure of the model (which is closely related to Burdett and Coles, 1997 and Eeckhout, 1999) and characterize its equilibrium structure.

## 4.1 Underlying Framework

In our data set, we observe several types of PAPs: straight couples, gay men, lesbian couples, single women, and foreign couples. These PAPs' types may have dissimilar preferences over children's attributes and may impact the BMOs' utilities differently. Formally, each type is characterized by a vector of attributes and denoted by $\theta = (\theta_1, \ldots, \theta_h) \in \Theta_{PAP}$. BMOs may care about other PAP

attributes that need not affect PAPs' preferences (e.g., wealth and looks). We capture such additional attributes by $a = (a_1, ..., a_m) \in A_{PAP}$. We assume that $(\theta, a)$ is determined independently and identically across PAPs, with a joint cumulative distribution $F_{PAP}$.

We assume that each BMO is characterized by the child's attributes $c = (c_1, ..., c_n) \in C_{BMO}$ (capturing the child's race, gender, time to birth, and so on). Attributes are independently and identically distributed across BMOs with a cumulative distribution $F_{BMO}$. Each BMO is also characterized by the set of types she is willing to consider $\Theta \subseteq \Theta_{PAP}$ (such as straight couples, U.S. residents, etc). These are determined independently of the child's attributes and of the set of types other BMOs are willing to consider according to the cumulative distribution $H_{BMO}$.[46]

### 4.1.1 Prospective Adoptive Parents

A PAP of type $\theta \in \Theta_{PAP}$ gains a match utility $u_{PAP}(\theta; c)$ from adopting a child with attributes $c$. We normalize the utility from remaining unmatched to zero, while we assume that the utility from adopting any child is non-negative: $u_{PAP}(\theta; c) \geq 0$ for all $c$ and strictly positive for some $c$. This amounts to assuming that the outside option (not pursuing adoption or pursuing it through a different channel) is worse than the adoption of any child on the website.

PAPs have an arrival rate of $\lambda$. Each PAP experiences a discount factor of $\delta_{PAP}$. This discount rate can be thought of as capturing PAPs' fatigue or aging.

### 4.1.2 Birth Mothers

Each BMO gains a match utility $u_{BMO}(\theta, a)$ from giving up her child to a PAP with attributes $(\theta, a)$.[47] We normalize the BMO's utility from being unmatched to zero and assume that $u_{BMO}(\theta, a) >$

[46] Acceptable categories of PAPs are arguably due to upbringing and ideological convictions that go beyond strategic forces in the matching process we study. We therefore assume that acceptable categories of PAPs are exogenous and independent of the child's characteristics. Empirically, the most significant restriction imposed by BMOs in our data is whether they allow applications from same-sex couples and from foreign PAPs. However, none of the observable characteristics of children explains these restrictions (see Table 12 in the Appendix). Having said that, the model would extend directly to a situation in which the BMOs' attributes do affect these limitations.

[47] As described above, in certain cases, an adoption agency has physical custody of the child. We assume that adoption agencies perceive the best interest of the child in alignment with the BMO's preferences, and so this does not affect our analysis.

0 for some PAP attributes $(\theta, a)$.[48]

A note on the modeling asymmetry we impose between the BMOs and PAPs is now in order. In principle, some of the BMOs' attributes could play a role in both the BMOs' and the PAPs' preferences. Empirically, however, this does not seem to be the case – BMOs' observable decisions do not seem to differ across child attributes (we return to this point in Section 6 below).

BMOs have an arrival rate of $\gamma$ and experience a discount factor of $\delta_{BMO}$. This discount factor can be interpreted as the forgone monetary flow that birth mothers give up by not committing immediately to a match.[49]

### 4.1.3 The Dynamic Matching Process

Upon arrival in the matching process, a PAP of type $\theta$ may or may not submit an application to each BMO that enters the process and allows applications from PAPs of type $\theta$.

As described above, an application involves a letter from the PAP to the BMO. This letter is effectively comprised of two elements: the type $\theta$ of the PAP submitting the application and a noisy signal $\alpha$ of the PAP's remaining attributes $a$ (the letter could suggest certain characteristics to BMOs, such as affluence, warmth, etc., but may not accurately describe the vector $a$ of attributes the BMO may be interested in). That is, the BMO observes an application of the form $(\theta, \alpha)$, where we assume that the signal $\alpha$ has full support (of $A_{PAP}$) and denote by $G_{PAP}(\alpha|a)$ its conditional distribution. We denote by $U_{BMO}(\theta, \alpha) = \mathbb{E}_{G_{PAP}}\{u_{BMO}(\theta, a)|\alpha\}$ the BMO's expected utility associated with the application $(\theta, \alpha)$. We assume that the parameters of the model are common knowledge among all participants.[50]

A BMO who receives an application immediately decides whether to accept it or reject it.[51]

[48] In general, $u_{BMO}(\theta, a)$ may be negative. This allows some mothers to decide during the matching process to mother the child or use alternative routes for adoption.

[49] We assume that BMOs' discount factor does not depend on the child's attribute, not even on the time to birth, despite it being correlated with the time on the site (see discussion in Section 6). Table 1 implies a case resolution that is very quick (around one month). This short time interval suggests that decisions of BMOs do not change dramatically over their duration on the site, making the uniformity of the discount factor an arguably weak assumption.

[50] In particular, this implies that no learning about the market per se is taking place. This is consistent with our empirical observations – we do not identify differences in PAPs' and BMOs' behavior across time.

[51] The assumption that agents consider potential matches one at a time is standard in the literature on bilateral search (see Rogerson, Shimer, and Wright, 2005). Technically, it dramatically simplifies the equilibrium characterization of our

When an application is accepted, the match gets irreversibly formed and the corresponding PAP and BMO exit the process. Otherwise, both the PAP and the BMO stay in the matching process.

## 4.2 Equilibrium Characterization

In this subsection, we characterize the equilibrium behavior of PAPs and BMOs. Notice, first, that we can restrict attention to stationary reservation utility strategies for both PAPs and BMOs.[52]

In equilibrium, each PAP of type $\theta$ and attributes $a$ has a reservation utility $\bar{u}_{PAP}(\theta, a)$. That is, upon considering a BMO $i$ with a set $\Theta^i$ of acceptable PAPs' types and with child's attributes $c$, a PAP of type $\theta \in \Theta^i$ submits an application if and only if $u_{PAP}(\theta; c) \geq \bar{u}_{PAP}(\theta, a)$.

Similarly, each BMO $i$ with acceptable types $\Theta^i$ and a child of attributes $c$ has a reservation utility $\bar{u}_{BMO}(\Theta^i, c)$. Upon considering an application $(\theta, \alpha)$ from a PAP of type $\theta \in \Theta^i$, the BMO will accept the application if and only if $U_{BMO}(\theta, \alpha) \geq \bar{u}_{BMO}(\Theta^i, c)$.

Given thresholds $\{\bar{u}_{PAP}(\theta, a)\}_{\theta \in \Theta, a \in A_{PAP}}$ and $\{\bar{u}_{BMO}(\Theta, c)\}_{\Theta \subseteq \Theta_{PAP}, c \in C}$, the arrival rates $\lambda, \gamma$, together with the distributions $F_{PAP}, G_{PAP}, F_{BMO}$, and $H_{BMO}$, each PAP of type $\theta$ and attributes $a$ faces an equilibrium arrival rate $r_{\theta,a}$ of BMOs' acceptances, and an equilibrium distribution of these BMOs' attributes $\phi_{\theta,a}$. Similarly, a BMO of type $\Theta$ with a child of attributes $c$ faces an arrival rate of applications $s_{\Theta,c}$ and an equilibrium distribution of these PAPs' attributes $\psi_{\Theta,c}$.[53]

Denote by $V_{PAP}(\theta; c)$ the continuation value of a type $\theta$ PAP considering a BMO whose child has attributes $c$. The following Bellman equation corresponds to the PAP's optimization problem:

$$V_{PAP}(\theta; c) = \max\left\{u_{PAP}(\theta; c), \delta_{PAP}\mathbb{E}_{r_{\theta,a},\phi_{\theta,a}} V_{PAP}(\theta; c')\right\}.$$

model. In particular, it implies that a PAP's decision whether to send an application out does not depend on the number and identity of the other PAPs interested in the same child. The justification for this assumption is in the monetary flow the BMO forgoes by not making an immediate decision paired with the relatively short interval of time that a BMO spends in the matching process.

[52] As highlighted in Burdett and Coles (1997), this model can lead to multiple equilibria. We could impose regularity conditions on $u_{PAP}$ and $u_{BMO}$ that would guarantee uniqueness (mirroring, for example, the structure imposed by Eeckhout, 1999). However, since all equilibria are characterized by reservation strategies, such additional assumptions are not necessary for the purpose of our estimations.

[53] We are essentially characterizing a partial equilibrium of this environment in that the distributions over characteristics are assumed exogenous. As discussed in Burdett and Coles (1999), this can be viewed as a full equilibrium if one assumes the appearance of 'clones' of agents who leave the market. Alternatively, under simple regularity assumptions, one can show that, in fact, there exist distributions constituting part of a full equilibrium. However, we stress that the key insight for our estimations is the equilibrium use of threshold strategies.

The solution to this problem is the reservation utility $\bar{u}_{PAP}(\theta, a)$ such that:

$$\bar{u}_{PAP}(\theta, a) = \delta_{PAP}\, \mathbb{E}_{r_{\theta,a},\phi_{\theta,a}} V_{PAP}\left(\theta; c'\right).$$

or

$$\bar{u}_{PAP}(\theta, a) = \frac{1}{1-\delta_{PAP}} \mathbb{E}_{r_{\theta,a},\phi_{\theta,a}} \left[u_{PAP}\left(\theta; c\right) \mid u_{PAP}\left(\theta; c\right) \geq \bar{u}_{PAP}(\theta, a)\right] \tag{1}$$

A similar analysis applies to the BMOs' behavior. The reservation utility of a BMO is then:

$$\bar{u}_{BMO}(\Theta, c) = \frac{1}{1-\delta_{BMO}} \mathbb{E}_{s_{\Theta,c},\psi_{\Theta,c}} \left[U_{BMO}\left(\theta, \alpha\right) \mid U_{BMO}\left(\theta, \alpha\right) \geq \bar{u}_{BMO}(\Theta, c)\right] \tag{2}$$

Equations (1) and (2) fully characterize an equilibrium of this model.[54]

We conclude with two remarks. First, although we assumed that PAPs get positive utility from adopting any child on the website, in equilibrium, their reservation utility may be above the utility of adopting some of these children. Thus, in equilibrium, some BMOs may not find a suitable PAP.

Second, note that our data describe the operation of one adoption facilitator, while the PAPs and BMOs whom we observe participating may take part in parallel matching processes through other channels (e.g., religious organizations, private attorneys, etc.). Thus, it is inherently difficult for us to identify the arrival and departure rates of PAPs and BMOs together with utilities corresponding to all types of participants. We use the information on whether PAPs and BMOs fall above or below each other's reservation utility mainly to make inferences on the relative importance of different babies' and PAPs' characteristics.

# 5 Estimating Adoptive Parents' Preferences

This section presents our estimations regarding PAPs' preferences. We are interested in studying PAPs' preferences over gender, race, time to birth, and costs. Since many adoption-policy debates revolve around the participation of special categories of PAPs (such as same-sex couples, singles, and foreign PAPs), we analyze how the preferences with respect to children's attributes vary across

[54] Note that the particular structure of the noise in our model assures that PAPs who submit an application are never indifferent between applying and not applying.

these categories. This will allow us to examine how a participation ban on specific categories of PAPs would affect outcomes.

An observation in our sample corresponds to a triplet $(t, b, p)$ , where $t$ identifies a date, $b$ a baby who is unmatched on the website at date $t$, and $p$ a PAP that is active on the website at time $t$ *and for whom* $b$ *is an available choice* – that is, $b$'s BMO did not exclude the type of PAP $p$ upon entering the matching process. Recall that we consider a PAP *active* from the time at which the PAP submits the first application until the PAP is reported as "matched" or, if it is never reported as such, until ten days after the last application is submitted.[55]

The model of Section 4 implies that a baby receives an application from a PAP if and only if the PAP's utility from being matched with that baby exceeds the PAP's reservation utility. For the sake of estimation, we consider a stochastic version of the model above and assume that each PAP of type $\theta$ assesses the utility from a child of characteristics $c$ as

$$u_{PAP}(\theta; c) = \beta_\theta \cdot c + \beta_{\theta,0} + \varepsilon_{tbp} \geq u_{PAP}(\theta), \tag{3}$$

where $\beta_{\theta,0}$ is a constant term that varies with PAP's type and year, and $\varepsilon_{tbp}$ is an idiosyncratic unobservable distributed according to the standard normal distribution (corresponding to each triplet $(t, b, p)$).[56]

The specification allows us to estimate discrete choice models in which the probability of applying for a match with a specific child depends on the child's observable attributes. Note that this method enables us to evaluate the weights that different types of PAPs put on different attributes. However, it does not allow us to identify the absolute level of the reservation utility corresponding to (1), as it is confounded with the constant term in the utility specification.

The model is useful in two respects. First, it provides a justification for these estimations. In

[55]In principle, the window of activity is important for our estimations as we assume that active PAPs who do not apply for available babies value them below their threshold. In the Appendix, we discuss the robustness of our results to a window of *90 days* (Table 8). Also, Table 9 illustrates results obtained looking at the decision of a PAP to apply to a BMO without including the time variation $t$. These alternative definitions of PAP activity do not have a large impact on our results.

[56]Formally, PAPs' threshold $\bar{u}_{PAP}(\theta, a)$ depends on the PAPs' unobserved attributes $a$. Since we assume that these attributes do not enter directly into the PAPs' utility assessments, our estimations are not affected by the inherent aggregation over these unobserved characteristics.

particular, it validates the separate estimation of PAPs' and BMOs' preferences (rather than the estimation of a simultaneous set of equations capturing the demand and supply of children, which would have emerged from a static model). Second, it links the estimated constant term with an endogenous reservation utility (in addition to a constant associated with the parents' utility function), affecting its interpretation.

Table 4 below presents the results of probit estimations targeted at assessing PAPs' preferences over different attributes and their dependence on PAPs' categories. We cluster standard errors by child-PAP pair to account for serial correlation, since a PAP's application is kept on the website until the baby is matched.

The first column of Table 4 refers to the behavior of the entire PAP population. It corresponds to a model in which the different categories of PAPs in our sample—straight couples, gay men, single women, lesbian couples, and foreign PAPs—are characterized by the same utility function—namely, the coefficients $\beta_\theta$ in (3) are restricted to be identical across PAPs—but may have different thresholds (captured by the dummy variables corresponding to PAPs' categories) due to the different streams of children for whom they can be considered. The PAPs-category dummy variables in the first column are significantly different from one another, highlighting the response of PAPs to the matching dynamics. The remaining columns of Table 4 correspond to estimated models in which different categories of PAPs are allowed to have different preferences. In what follows, we first discuss the aggregate preferences over children's attributes and then compare estimated preferences across different categories of PAPs.

The omitted category corresponding to all estimations reported in Table 4 is a 2009 baby, a month before birth, whose gender is still unknown, whose race composition is zero percent African-American, and whose adoption finalization costs are $\$26,000$. This omitted category of babies has a $7.3\%$ probability of receiving an application, while a child whose attributes correspond to the population means (as reported in Table 1) receives an application with a probability of $8.6\%$.

According to the third and fourth columns of Table 4, gay and lesbian couples have a significantly higher probability of submitting an application than straight couples. Indeed, the probability of submitting an application for the child whose attributes correspond to the population mean is $7.2\%$

| Dependent Variable: | All | Straight PAP | Gay PAP | Lesbian PAP | Single PAP | Foreign PAP |
|---|---|---|---|---|---|---|
| PAP Applies for Baby | | (Score) | (Score†) | (Score†) | | (Score†) |
| **♠ Activity Window: 10 Days** | | | | | | |
| Already Born (d) | -0.016* | -0.021** | -0.074 | -0.064 | 0.026 | -0.025** |
| | (-2.35) | (-3.15) | (-1.48) | (-0.84) | (0.84) | (-2.66) |
| Months to Birth | -0.001** | -0.001** | -0.002 | -0.001 | -0.001 | -0.001* |
| | (-3.26) | (-3.29) | (-0.77) | (-0.54) | (-1.13) | (-2.50) |
| Finalization Cost in $10,000s | -0.018*** | -0.016*** | -0.013 | -0.091* | -0.020* | -0.024*** |
| | (-5.69) | (-4.93) | (-0.58) | (-2.57) | (-2.16) | (-5.89) |
| African-American Girl | -0.052*** | -0.045*** | -0.181** | -0.189** | -0.052* | -0.039*** |
| | (-6.22) | (-4.98) | (-2.80) | (-2.66) | (-2.18) | (-3.51) |
| African-American Boy | -0.070*** | -0.067*** | -0.047 | -0.093 | -0.077** | -0.062*** |
| | (-7.70) | (-6.89) | (-0.76) | (-1.07) | (-2.74) | (-5.19) |
| African-American Unknown Gender | -0.069*** | -0.067*** | -0.091 | -0.089 | -0.073*** | -0.061*** |
| | (-8.15) | (-7.19) | (-1.31) | (-1.32) | (-3.59) | (-5.50) |
| Non-African-American Girl | 0.029*** | 0.025*** | 0.121 | 0.229* | 0.032 | 0.025* |
| | (4.26) | (3.49) | (1.50) | (2.57) | (1.38) | (2.49) |
| Non-African-American Boy | -0.007 | -0.010 | 0.014 | 0.115 | 0.001 | 0.003 |
| | (-1.06) | (-1.43) | (0.25) | (1.90) | (0.07) | (0.34) |
| Hispanic | 0.002 | 0.004 | 0.117 | -0.023 | -0.024 | 0.005 |
| | (0.27) | (0.49) | (1.47) | (-0.21) | (-0.95) | (0.48) |
| Year 2004 (d) | -0.043*** | -0.036*** | -0.035 | -0.088 | 0.014 | -0.052*** |
| | (-7.79) | (-6.15) | (-0.59) | (-1.52) | (0.56) | (-6.37) |
| Year 2005 (d) | -0.036*** | -0.020** | -0.056 | -0.076 | -0.003 | -0.043*** |
| | (-5.68) | (-2.90) | (-1.07) | (-1.40) | (-0.14) | (-4.36) |
| Year 2006 (d) | -0.009 | 0.009 | 0.119 | -0.060 | 0.012 | -0.006 |
| | (-1.24) | (1.03) | (1.30) | (-0.93) | (0.36) | (-0.57) |
| Year 2007 (d) | -0.024*** | -0.005 | 0.025 | -0.190*** | 0.034 | -0.022* |
| | (-3.65) | (-0.59) | (0.44) | (-6.11) | (0.74) | (-2.27) |
| Year 2008 (d) | 0.014* | 0.029** | 0.012 | 0.067 | 0.042 | 0.026* |
| | (2.00) | (3.19) | (0.31) | (1.55) | (1.82) | (2.32) |
| Gay PAP (Score) | 0.061*** | | | | | |
| | (4.78) | | | | | |
| Lesbian PAP (Score) | 0.093*** | | | | | |
| | (7.71) | | | | | |
| Single PAP (Score) | 0.003 | | | | | |
| | (0.45) | | | | | |
| Foreign PAP (Score) | 0.077*** | | | | | |
| | (7.21) | | | | | |
| Probability for Mean Attributes | 0.086 | 0.072 | 0.165 | 0.193 | 0.079 | 0.091 |
| Probability for Base Case ♡ | 0.073 | 0.115 | 0.172 | 0.263 | 0.094 | 0.151 |
| $\chi^2$ | 407.23 | 203.14 | 37.39 | 55.51 | 42.27 | 148.01 |
| Log-Likelihood | -205182.0 | -170467.6 | -27102.0 | -29930.5 | -25409.0 | -208980.9 |
| Observations | 818413 | 708443 | 66190 | 60804 | 96665 | 734659 |
| PAP-Babies | 29053 | 25459 | 2382 | 2134 | 3134 | 27128 |

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05$,$^{**}$ $p < 0.01$,$^{***}$ $p < 0.001$. Standard Errors Clustered by PAP-Baby Pair. ♡ Note that the omitted category is an unknown-gender, non-African-American, unborn child who is less than one month to birth, with finalization costs of $26,000 in 2009. †: Gay, lesbian, and foreign estimated using weighted probit.

**Table 4:** Determinants of PAPs' Applications (Activity Window of 10 Days) – Marginal Effects for Probit

for straight couples, $16.5\%$ for gay PAPs, $19.3\%$ for lesbian PAPs, $7.9\%$ for single women, and $9.1\%$ for foreign PAPs. These can be partly explained by the constraints that gay and lesbian couples face when adopting a baby: Since many of the children on this website are not available to them, gay and lesbian couples conceivably compensate by applying more frequently when they can.[57]

## 5.1 Preferences over Gender

In our data, the gender of each baby is "boy," "girl," or "unknown." A baby of unknown gender is either a baby at an earlier stage of gestation or a baby who is less likely to have received medical attention than a baby whose gender is known. In order not to confound gender and health effects, we measure the PAPs' gender bias by comparing the probabilities of receiving an application between girls and boys.

Non-African-American girls have a probability of receiving an application that is $3.6\%$ higher than non-African-American boys, a large effect given that the child with mean attributes has a probability of $8.6\%$ of receiving an application. In other words, PAPs have a positive and sizable bias in favor of (non-African-American) girls. We can quantify the gender bias in dollar terms by comparing the effect of gender to the effect of adoption finalization costs. The increase in desirability of a non-African-American girl with respect to a non-African-American boy is equivalent to a decrease of $\$16,000$ in finalization costs.[58] This higher desirability of girls is consistent with anecdotal evidence reported by adoption agencies and the popular press covering the adoption process.[59] It is also consistent with adoption *outcomes* in the U.S. Indeed, the Census 2000 reported $47\%$ male adopted children as compared with $51\%$ male biological children (see Kreider, 2003). A preference for girls has also been documented for biological mothers by Gallup polls, though, interestingly, biological fathers tend to report a preference for boys.

[57] As mentioned before, these baseline probabilities confound the differing reservation utilities and the constant terms in the utility functions corresponding to different categories of PAPs and, therefore, should be interpreted with caution. In particular, the differences between these probabilities do not fully mirror the differences between the coefficients of the dummy variables corresponding to PAP categories in the first column of the table.

[58] Note that if the finalization costs are positively correlated with some unobservable but desirable child attributes, $\$16,000$ becomes an upper bound of the willingness to pay for a non-African-American girl with respect to a non-African-American boy.

[59] See, for instance, Slate (1/16/2004).

In our data, the preference for girls is apparent, though somewhat different, across all categories of PAPs. Lesbian couples exhibit, by far, the most intense preference for non-African-American girls. Indeed, for non-African-American children, the estimated difference in application probabilities between girls and boys is $3.5\%$ for straight couples, $10.7\%$ for gay couples, $11.4\%$ for lesbian couples, $3.1\%$ for single women, and $2.2\%$ for foreign PAPs. The large gender biases pertaining to gay and straight PAPs suggest that women's preference for girls is not the sole driving force behind this bias.[60] We note that there is a strand of literature based on hypothetical surveys of different classes of PAPs regarding preferences over children's gender (see Goldberg, 2009, and references therein). Our results are the first to report a stronger preference over children's gender for same-sex than for straight PAPs.

Table 4 also highlights a positive and sizable (although not statistically significant) bias for African-American girls with respect to African-American boys. In particular, the difference between the application probabilities for an African-American boy and an African-American girl is $1.8\%$. This difference results in an overall application probability of $3.4\%$ for African-American girls and $1.6\%$ for African-American boys. In other words, the probability of an African-American girl receiving an application is more than double that of an African-American boy. In relative terms, the gender bias for African-American babies is larger than the bias for non-African-American babies.

This observation is compatible with the idea that girls are viewed as "safer" in terms of dysfunctional behavior and are, therefore, more appealing candidates for adoption.[61] Furthermore, this conjecture would suggest that the gender gap should be stronger for African-American children, for whom the gap in terms of negative outcomes is greater between the genders.[62]

[60] We mention that the gender biases we observe in gay men and single women, despite being large in sizes, are not significant due to the scarcity of observations.

[61] There are some data backing such perceptions. For instance, the U.S. Department of Justice reports that lifetime chances of a person going to prison are significantly higher for men (11.3%) than for women (1.8%). Also, girls are less likely to develop behavioral problems such as autism spectrum disorders (four times more prevalent in boys than in girls, according to the Autism Society of America), or ADHD (diagnosed two to four times as frequently in boys as in girls, see Dulcan, 1997). This conjecture has been mentioned repeatedly in the popular press, see, e.g., Slate (10/14/2003 and 1/16/2004).

[62] In terms of incarceration, the U.S. Department of Justice reports that the imprisonment statistics in 2001 were: 16.6% for African-American males, 7.7% for Hispanic males, 2.6% for Caucasian males, 1.7% for African-American

We note that the substantial preference for girls we document constitutes a reversal, in the adoption environment, of the preference for sons identified by the literature studying the preferences over gender of biological children by looking at indirect indicators such as divorce, likelihood of the mother's remarriage, etc. For instance, Dahl and Moretti (2008) find that first-born daughters are associated with a range of negative predicaments for the survival of couples.[63] Since the Census 2000 suggests that approximately $50\%$ of households containing adopted children do not include any biological child, it is difficult to explain this inconsistency by the mere ordering of children in the family.[64]

## 5.2 Preferences over Race

To our knowledge, racial preferences over offspring have not yet been documented. Anecdotal evidence from adoption agencies and facilitators suggest that there are greater difficulties in matching African-American children with respect to other ethnicities. However, to this date, the only evidence to support this claim had been the gap between the proportion of African-American children awaiting adoption in the U.S. foster-care system ($32\%$ in 2006, according to the U.S. Department of Health and Human Services Report) and the proportion of African-American children in the total (domestic and international) population of adoptees ($16\%$ in $2000$, according to the Census). Although suggestive, these statistics cannot be directly related to PAPs' preferences. In that respect, our data set provides a direct channel to estimate parents' racial biases in the adoption environment.[65]

Our results show that a baby's aggregate probability of receiving an application is considerably affected by his or her race. In particular, this probability dramatically decreases if the baby is, at least partially, African-American.

---

females, 0.7% for Hispanic females, and 0.3% for Caucasian females.

[63] Specifically, Dahl and Moretti (2008) report that (i) women are less likely to remarry if they have a first-born daughter than if they have a first-born son; (ii) couples tend to divorce less often if they have first-born sons rather first-born daughters; and (iii) the number of children is significantly higher in families with first-born girls.

[64] Indeed, such an explanation would require parents to have dramatically different gender preferences between first and later children.

[65] Estimating preferences over physical characteristics of biological children is inherently difficult due to the limited choice parents have over offsprings' appearance. Furthermore, according to the Census 2000, only $4\%$ of marriages in the U.S. are interracial, so variation in the race of biological children may be challenging to assess.

Projecting the marginal effect linearly, the probability that a $100\%$ African-American baby (of unknown gender) receives an application is $1.7\%$ in contrast to a probability of $13\%$ for a $0\%$ African-American baby.[66] Similarly, application probabilities decrease dramatically for both African-American girls and boys. In other words, PAPs in our sample exhibit a large and negative bias against African-American babies.

Again, the estimated effect of finalization costs in Table 4 allows us to convert the racial bias into dollars. The increase in desirability of a non-African-American baby with respect to one with mean attributes is equivalent to $\$38,000$ decrease in finalization costs. In fact, using the linear interpolation described above, as well as the incidence of the African-American attribute in our sample, we obtain a willingness to pay for a $100\%$ African-American baby with respect to a $0\%$ African-American baby as high as $\$62,000$.[67]

Physical similarity may be underlying these preferences. In fact, preference for similarity, or *homophily*, is a well-known and documented phenomenon in the sociology literature (see McPherson, M., L. Smith-Lovin, and J. Cook (2001) and references therein).[68] In the context of adoption, homophily may manifest itself in the desire of PAPs to adopt children who are similar to them and could, therefore, appear as their biological offspring. Since the large majority of PAPs in our data set are Caucasian, homophily would be consistent with a negative attitude toward African-American children.[69]

Hispanic children account for $12.8\%$ of babies on the website. However, we do not find a racial bias for or against Hispanics. The estimated desirability of Caucasian and Hispanic children is roughly identical, with a non-significant increase of the application probability of $0.2\%$ if the baby

[66] The $13\%$ probability is derived through a linear interpolation of the $1.7\%$ probability of application for a $100\%$ African-American baby (of unknown gender) and the $8.6\%$ probability of application for the baby with mean attributes (according to Table 1, such a baby is $38.9\%$ African-American).

[67] On the other hand, as before, if the finalization costs are positively correlated with some unobservable but desirable child attributes, our estimate for the willingness to pay for a non-African-American baby with respect to an African-American one should be revised downward.

[68] This desire for similarity would be in line with racial preferences over romantic partners documented by Fisman, Iyengar, Kamenica, and Simonson (2006, 2008).

[69] Indeed, according to the Census 2000, only $12\%$ of adoptive parents in the U.S. are African-American. In addition, according to an informal assessment of the facilitator, the vast majority of the participating PAPs is Caucasian. African-Americans and Hispanics constitute only an approximate $1\%$ of the PAPs. African-American and Hispanic PAPs are known to favor other adoption channels (local religious communities, extended families, etc.).

is Hispanic. To the extent that Hispanic children may look different than Caucasian children, this suggests that a preference for physical similarity alone cannot account for the racial biases we observe.

In terms of different PAP categories, we find that the bias against African-American children is similar across straight, gay men, lesbian couples. The negative effect on the application probability for an African-American child of a straight couple is $-4.5\%$ for a girl, $-6.7\%$ for a boy, and $-6.7\%$ for a child of unknown gender, off an application probability of $7.2\%$ for a child with mean attributes. This same effect on the application probability of gay men is $-18.1\%$ for a girl, $-4.7\%$ for a boy and $-9.1\%$ for a child of unknown gender, off an application probability of $16.5\%$ for a child with mean attributes. Likewise, this effect for lesbian couples is $-18.9\%$ for a girl, $-9.3\%$ for a boy, and $-8.9\%$ for a child of unknown gender, off an application probability of $19.3\%$ for a child with mean attributes. These observations suggest that the racial bias against African-American children is somewhat stronger (although in some cases not significantly so) for gay men and lesbian couples than for straight couples.

Moreover, we find significant racial biases for single women, for whom we find an effect on the application probability for an African-American child of $-5.2\%$ for a girl, $-7.7\%$ for a boy, and $-7.3\%$ for a baby of unknown gender, off application probability of $7.9\%$ for a child with mean attributes.

Finally, the foreign PAPs' racial bias is somewhat lower than that identified for straight couples. Indeed, the overall probabilities of submitting an application for African-American girls, African-American boys, and African-American babies of unknown gender are consistently higher for foreign PAPs ($5.2\%$, $2.9\%$, and $3\%$, respectively) than for straight couples ($2.7\%$, $0.5\%$, and $0.5\%$, respectively).

## 5.3 Preferences over Time to Birth and Child Age

Understanding how the desirability of a baby changes during the pregnancy and after birth is relevant for evaluating how a disruption of an adoption plan at different stages of the BMO's pregnancy and child growth can affect adoption outcomes.

Tables 4 and 10 show estimates regarding the desirability of unborn children over the pregnancy and of already-born children. Table 4 reports a probability of $7\%$ for an already-born child to receive an application, while the same probability for an unborn child is $8.6\%$. Note that this significant decrease occurs despite the fact that the average age of already-born babies in our sample is *just over* $1$ *month*.

Table 4 suggests a significant negative effect of time to birth for unborn babies. In Table 10, we allow for nonlinearities over the months to birth. We find that, while in the first $6$ months of pregnancy application probabilities increase rapidly, going monotonically from $3.6\%$ to $7\%$, they are fairly constant over the three months preceding birth.[70]

In principle, there are two opposing effects at work that influence babies' desirability over time. On the one hand, a match occurring early in the pregnancy offers PAPs the possibility of monitoring the BMO's health habits and medical conditions for a longer portion of the pregnancy.[71] On the other hand, several forces make BMOs early in their pregnancy potentially less appealing. First, since the law does not allow the BMO to relinquish parental rights until after the birth, a BMO who is in early pregnancy might be more tentative about relinquishing her baby for adoption and has more time to reconsider her decision. Thus, BMOs that are in late pregnancy can be perceived as more committed to the adoption plan. Second, since PAPs typically cover the BMO's living and medical expenses from the time of the match until the delivery, an early match could entail more risk with respect to the ultimate costs. Indeed, if the BMO eventually reconsiders the adoption plan, all the costs incurred up to that point are non-recoverable for the PAPs. Our results show that the effects that make a BMO that is closer to delivery more appealing to PAPs are dominant.

[70] This is somewhat surprising in view of the documented importance of pre-natal care in early stages of pregnancy (see, e.g., http://www.expectantmothersguide.com).

[71] It is often the case that, after the match takes place, the matched PAPs monitor the BMO's medical condition and lifestyle. Depending on PAPs' state of residence, this can be done, for example, by offering the BMO to move temporarily to the PAPs' geographical area or home until the delivery.

### 5.4 Preferences over Adoption Finalization Costs

Our analysis reveals that PAPs' application behavior is significantly affected by the cost of finalizing the adoption. However, the effects we find are not very large in aggregate terms. Indeed, Table 4 shows that an increase in adoption finalization costs of $\$10,000$ decreases the probability of receiving an application from $8.6\%$ to $6.8\%$.

Recall that our hedonic regressions suggested a strong dependence of adoption finalization costs on attributes. Those observations, together with the identified relative price inelasticity, suggest that variance in costs may be driven largely by the adoption agencies that select particular BMOs to work with. Namely, our observations indicate that some, possibly more established and reputable, agencies may set higher fees and be more effective at finding a match for their BMOs. The results in Table 4 also suggest that such agencies may be less likely to target African-American babies and BMOs at an early stage of their pregnancies.

Finally, we find that alternative PAP categories respond quite differently to changes in adoption finalization costs. Indeed, lesbian couples seem to respond to changes in adoption finalization costs more than straight and gay couples, single women and foreign PAPs. Thus a $\$10,000$ increase in adoption finalization costs reduces the desirability of a child by $1.6\%$ for straight couples, $1.3\%$ for gay men, $9.1\%$ for lesbian couples, $2\%$ for single women, and $2.4\%$ for foreigners. The sensitivity of these categories is consistent with the Census 2000, which reports that adoptive straight couples and gay men are, on average, wealthier than single women and lesbian couples.

## 6 Birth Mothers' Choices and Matching Outcomes

Conditional on putting up their children for adoption through an agency and the facilitator, BMOs make two distinct choices that we observe in our data: Ex-ante, they decide which categories of PAPs are acceptable, and, ex-post, they resolve the case by selecting one of the PAP applications received, deciding to parent, or losing contact with the facilitator.

As discussed in Section 4, the ex-ante choice of acceptable categories of PAPs cannot be explained by baby attributes, as can be seen in Table 12 in the Appendix. In fact, the only significant

predictors of the choice of acceptable categories are the year in which the cases were presented and the adoption finalization costs. Specifically, both gay men and lesbian PAPs were significantly less likely to be acceptable prior to 2007 (by $18\% - 30\%$ between 2004 and 2006, relative to 2009). According to the time trends reported in Table 7 in the Appendix, the fraction of gay, lesbian, and foreign PAPs was fairly stable through time. In that respect, the increase in BMOs' propensity to allow same-sex PAPS may reflect a shift in BMOs' preferences (mirroring important ideological and political changes, e.g., legalization of gay marriages in several states). In addition, a BMO's decision to allow applications from same-sex PAPs is significantly correlated with adoption finalization costs, with higher costs corresponding to a substantially lower probability of same-sex PAPs being declared acceptable.[72]

The propensity to consider foreign PAPs was consistently and significantly higher prior to 2008, echoing the difficulties of adoption by foreign parents imposed by the ratification of the Hague Convention in early 2008.

Regarding the BMOs' selection of PAPs among those who apply, we cannot reject BMOs' selecting one of the applications randomly. Indeed, a model in which the chosen PAP is allowed to depend on all observable characteristics (namely, the volume of applicants and the categories to which they belong, in addition to the relevant baby's attributes) generates no significant proxies of choice (see Table 13 in the Appendix).

BMOs can also decide to match through channels other than the facilitator, or to forgo committing to an adoption agreement altogether (thereby deciding to parent or to relinquish their children to foster care).[73] In our sample, $13.4\%$ of cases result in a match through the facilitator, and, overall, $70\%$ of cases become matched through the facilitator or in other ways.[74] Table 5 contains estimation

[72]We suspect that the correlation between banning same-sex couples and finalization costs is due to the fact that adoption agencies that ban same-sex couples also make greater investments in legal and medical services, rather than because of BMOs' decisions per se.

[73]Foster care is notoriously harmful in terms of outcomes. It is associated with a far higher rate of post-care homelessness (40% are homeless within 18 months of discharge, according to the U.S. General Accounting Office, 1999). Foster care is also associated with a much higher rate of incarceration. In California, 70% of all penitentiary inmates have spent time in foster care (Select Committee Hearing of the California Legislature, 2006).

[74]Reported decisions to parent occurred in only $5\%$ of cases, whereas cases were determined closed, without a specified resolution, in $4.8\%$ of the cases (which may entail some unreported matches and some decisions to parent).

results regarding the determinants of a successful match, through the facilitator or through other channels, controlling for all observable baby characteristics.

Several insights come out of these estimations. First, the successful match of a baby is weakly associated with some constraints imposed by BMOs. Specifically, the establishment of a match is *negatively* linked with allowing applications from same-sex PAPs. We interpret this result as consistent with the presence of some adoption agencies being particularly effective in finding matches and, at the same time, more restrictive in their attitudes toward same-sex PAPs. Also, Table 5 suggests that the matches through the facilitator are *positively* associated with allowing applications from foreign PAPs.

Second, the application arrival rate significantly affects the likelihood of a match. In order to get a sense of the magnitudes, and bearing in mind the fact that the average time from first to last application for a baby on the website is $33$ days, our estimations suggest that an increase of three applications corresponds to the overall probability of a successful match increasing by approximately $6\%$.

Third, the knowledge of a baby's gender (be it a boy or a girl) is associated with a significantly higher probability of a match. This is particularly intuitive in view of the distribution of the time to birth. Recall that the average time to birth of an unborn baby in our sample is about two months. At that stage, not knowing the gender of the child is a strong signal of very limited medical attention (an ultrasound exam would reveal a child's gender starting from approximately the 20th week of gestation). In that respect, the knowledge of the child's gender serves as a proxy for medical care (and our results are consistent with the preference for girls identified through PAPs' choices in Section 5).

Last, on average, higher adoption finalization costs are linked with higher probabilities of a match. Ceteris paribus, an increase of $\$10,000$ corresponds to an increase of $7\%$ in the probability of a match through the facilitator, and an increase of $12\%$ in the probability of a reported match through any channel. This result is consistent with adoption agencies playing an important role in setting prices, and generating matches. Specifically, a link between costs and the probabilities of a match may be the result of two effects: (i) more expensive agencies being more effective in

| Dependant Variable | Matched | Matched through Facilitator |
|---|---|---|
| Already Born (d) | 0.04 | -0.10*** |
| | (0.29) | (-4.08) |
| Months from Presentation to Birth | 0.01 | 0.00 |
| | (1.59) | (0.56) |
| African-American | 0.05 | 0.08 |
| | (0.69) | (1.66) |
| Girl (d) | 0.19** | -0.03 |
| | (2.88) | (-0.69) |
| Boy (d) | 0.18** | 0.04 |
| | (2.72) | (0.92) |
| PAP Arrival Rate Per Day | 0.61** | 0.16** |
| | (3.22) | (2.75) |
| Finalization Cost (in 10 000s of dollars) | 0.12* | 0.07* |
| | (2.41) | (2.55) |
| Same-Sex PAP Allowed (d) | -0.24** | 0.04 |
| | (-2.74) | (0.70) |
| Single PAP Allowed (d) | -0.00 | 0.00 |
| | (-0.05) | (0.04) |
| Foreign PAP Allowed (d) | 0.02 | 0.07* |
| | (0.24) | (2.00) |
| Year 2005 (d) | 0.14 | -0.01 |
| | (1.26) | (-0.21) |
| Year 2006 (d) | 0.10 | -0.01 |
| | (0.87) | (-0.23) |
| Year 2007 (d) | 0.03 | 0.03 |
| | (0.27) | (0.37) |
| Year 2008 (d) | -0.01 | 0.10 |
| | (-0.07) | (1.08) |
| Probability for Mean Attributes | 0.666 | 0.089 |
| $\chi^2$ | 46.77 | 29.17 |
| Log-Likelihood | -162.9 | -91.7 |
| Babies | 286 | 286 |

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. Note that the omitted category is an unknown-gender, non-African-American, unborn child who is less than one month to birth, with finalization costs of $26,000 in 2009.

**Table 5:** Matching Regression – Marginal Effect from Probit of a Child Finding a Match.

generating matches, and, as discussed in Section 3.3, (ii) more expensive agencies targeting babies that are desirable in terms of unobserved characteristics, resulting in more successful matches.

# 7 Policy Implications

## 7.1 Gay and Lesbian Adoption

When considering the debate on whether to ban or allow gay and lesbian adoption, it is important to note two facets of adoption outcomes.[75] First, studies tracking adopted children identify some positive effects and no negative effects of adoption by gay or lesbian parents as opposed to heterosexual parents.[76] Second, there are monetary costs states incur when restricting adoption. Barth, Lee, Wildfire, and Guo (2006), as well as Hansen and Hansen (2006), show that state and federal governments save between $\$65,422$ and $\$126,825$ on the average child who enters care at age three if he or she is adopted rather than remaining in state care throughout childhood. Furthermore, Hansen (2006) calculated that the human service costs of adoption are about one-half the costs of long-term foster care.[77]

In order to estimate the impact of the participation of same-sex couples in the adoption process, we assess the number of matches of children and adoptive parents that would be lost in our matching process should gay and lesbian PAPs be restricted from participating.[78] As a conservative hypothesis, we assume that whenever we observe a match, the BMO views all applicants as acceptable. In that case, banning same-sex applicants would reduce the number of matches by the number of cases in which the child was ultimately adopted *and* no application by heterosexual parents was

[75] For an overview of state jurisdictions regarding same-sex adoption, as well as their implications on outcomes, see Howard and Freundlich (2008).

[76] See Brewaeys, Ponjaert, Van Hall, and Golombok (1997); Golombok, Perry, Burston, Murray, Mooney-Sommer, Stevens, and Golding (2003); Golombok, Spencer, and Rutter (1983); and Wainwright, Russell, and Patterson, (2004).

[77] She also found that when examining other social costs, such as reduced incarceration or increased education attainment, each dollar spent on the adoption of children from foster care results in $\$2.45$ to $\$3.26$ in tangible benefits to society.

[78] In this counterfactual exercise, and in the one in Section 7.2, we study the comparative statics within one equilibrium of the model presented in Section 4.

submitted.[79,80] This amounts to $6\%$ of matched cases in our data. This is clearly a large effect given that, according to Table 6, only $18.6\%$ of matched cases allow gay and lesbian PAPs to apply. This method is an underestimate of the loss of matched children, in that it ignores two important elements of our environment. First, it ignores the fact that certain heterosexual parents may not appear acceptable to some birth mothers. Second, it ignores the endogenous effects on PAPs' threshold attributes. Indeed, consider our underlying model. Reducing the pool of potential parents would reduce the competition on the parents' side and would lead to an increase in the threshold utility $\bar{u}_{PAP}$. Consequently, fewer applications would be placed, and potentially fewer matches would be created.

Obviously, this result depends on the participation rate of gay and lesbian PAPs in our matching process, which is not necessarily representative of the overall gay and lesbian participation in adoption overall. It would be interesting to convert our counterfactual exercise into an estimate of the number of matches that would have been lost due to a gay and lesbian adoption ban, relative to a world in which gays and lesbians are universally allowed to adopt (except for restrictions imposed by the BMOs' preferences). In order to do that, one would need recent estimates of the gay and lesbian population and their propensity to adopt. The Census 2000 reported about $600,000$ households headed by a same-sex couple harboring $4\%$ of all adopted children (under the age of $18$).[81]

In our data, same-sex couples are chosen by the BMOs in $12\%$ of all cases of matched babies for whom we know the identity of the chosen PAP. This serves as an upper bound on the percentage of matches that would have been lost had same-sex couples been prohibited from participating in the adoption process.

[79] The significant variance observed in the number of applications BMOs receive by the time of a match suggests that they are not determining their duration on the website based on the number of applications received.

[80] Since the same-sex classifications are probabilistic, if a child receives an application from $n$ PAPs with probabilities of being same-sex $p_1, ..., p_n$, the probability of *all* applicants being same-sex couples is $\prod_{i=1}^{n} p_i$, which is the probability at the root of our counterfactual estimation.

[81] See Badget, Chambers, Gates, and Macomber (2007).

## 7.2 Foreign Adoptive Parents and the Hague Convention

As discussed in Section 2.3, the ratification of the Hague Convention in 2008 has made it difficult for foreign PAPs to adopt domestically. In our sample, classification of PAPs as foreign is only approximate in that our deductions are based on application behavior alone. Nonetheless, even with this coarse classification, we observe sharp declines in the probability of PAPs being foreign: While between 2004 and 2009 these probabilities varied between $56.3\%$ and $60.3\%$, they are estimated at $50.3\%$ in 2008 and at $37.4\%$ in 2009. The concern regarding the reduction of foreign PAPs is similar to that discussed with respect to gay and lesbian adoption bans. That is, a reduction of foreign PAPs would potentially lead to a reduction in the volume of children that find an adoptive home.

We perform a similar counterfactual to the one done above. We calculate the expected number of children that would have remained unmatched in our data had foreign PAPs been prohibited.[82] We find that, in expectation, $33\%$ of matches would have been severed had foreign PAPs not participated in the process.

While the precise value of $33\%$ is derived from the way we classify PAPs as foreign, we note that the qualitative impact is consistent with the preferences we estimate for foreign PAPs. Indeed, foreign PAPs appear to exhibit more flexibility with respect to baby attributes since they apply for more children than straight couples do. Therefore, removing them from the matching process would clearly have a negative effect on matching probabilities. Given that the reduction in foreign participation may be underestimated in our sample and that the outcomes of such bans are crucial for policy decisions, a deeper investigation of the consequences of restrictions on international adoption is an important avenue for future research.

# 8 Conclusion

We collected a novel data set to track the matching of potential adoptive parents to birth mothers looking to relinquish their child for adoption. The detailed data on over $800$ children allow us to

[82] As before, since the foreign classification is probabilistic, if a child receives an application from $n$ PAPs with corresponding probability of being foreign of $p_1, ..., p_n$, the probability of *all* applicants being foreign is $\prod_{i=1}^{n} p_i$.

estimate parents' preferences over child attributes, most notably over gender, race, time to birth, and adoption finalization costs.

We find clear patterns in parents' preferences. First, girls are consistently preferred to boys, and Caucasians and Hispanics are consistently preferred to African-Americans. In monetary terms, the increase in desirability of a girl relative to a boy can be compensated by a decrease of approximately $\$16,000$ in adoption finalization costs. Similarly, the increase in desirability of a non-African-American baby with respect to an African-American baby (both of unknown gender) is equivalent to a decrease of at least $\$38,000$ in adoption finalization cost. Second, adoption outcomes are somewhat fragile to the timing at which birth mothers enter the process, with adoptive parents preferring children who are unborn, but relatively close to birth. Third, adoption finalization costs impact demand significantly. An increase in adoption finalization costs of $\$10,000$ decreases the aggregate probability of receiving an application from $8.6\%$ to $6.8\%$.

Different categories of adoptive parents—straight, gay, lesbian, single, or foreign—have different behaviors in the matching process. We find that gays men and lesbian couples submit applications to $16.5\%$ and $19.3\%$ of children, respectively, while straight couples submit applications to only $7.2\%$ of babies. However, we do not find evidence that same-sex couples or single women are less biased than straight couples. If anything, they seem to have stronger biases in favor of girls and against African-American babies. On the other hand, foreign adoptive parents exhibit weaker gender and racial biases with respect to other parents categories.

The chances that a child put up for adoption will be successfully matched to adoptive parents depend on several crucial characteristics—namely, how selective the birth mother is about the categories of parents she is willing to consider; the rate at which potential adoptive parents express interest in adopting the child; and whether the child's gender is known (presumably, proxying for medical monitoring such as ultrasound exams). Furthermore, successful matches are associated with higher adoption finalization costs.

These observations feed into important policy debates regarding the inclusion of specific categories of parents in the adoption process. First, the recent political shifts allowing for more households comprised of gay and lesbian partners has triggered discussion over the impacts of gay and

lesbian participation on the domestic adoption process. A simple counterfactual experiment banning same-sex parents from our sample lowers the number of adopted children by about $6\%$. Therefore, such a ban could increase the fraction of children in foster care, which has well documented detrimental effects. In a different sphere, the recent ratification of the Hague Convention has made international adoption far more challenging and raised international controversy on the impacts of these new barriers. Again, a simple counterfactual test banning foreign parents, who are shown to be rather flexible in terms of preferences over children's attributes, reveals an estimated $33\%$ decrease in match probabilities.

While adoption is far-reaching in the U.S. ($2.5\%$ of all children are adopted in an industry that generates $2-3$ billion dollars annually), it is still an unexplored territory for economists. In our context, the domestic adoption process is unique in that it allows us to answer fundamental questions regarding preferences over race and gender in a situation in which outcomes entail significant commitment. Thus, standard models of search and matching can be used for estimation purposes.

Our study suggests that the adoption industry can be further investigated in several directions. For example, our results are consistent with adoption agencies carrying an important role in the setting of finalization costs and the generation of successful matches between adoptive parents and birth mothers. In particular, the difference in adoption finalization costs across genders is difficult to explain with the mere difference in BMOs' expenses. This is suggestive of the limited regulation the adoption industry is subject to. Accounting for particular agencies' effects would be especially useful for understanding the operation of the adoption process. From an institutional-design perspective, our analysis opens the door for contemplating alternative mechanisms geared at minimizing the chances that children remain unmatched. For instance, one could consider a more centralized design in which both adoptive parents and birth mothers submit preferences to a clearinghouse (much as in several countries throughout the world, such as Germany, Italy, and the United Kingdom).

# References


[1] **Abramitzky, R., A. Delande, L. Vasconcelos** (2009), "Marrying Up: The Role of Sex Ratio in Assortative Matching," Mimeo.

[2] **Adachi, H.** (2003), "A Search Model of Two-Sided Matching Under Nontransferable Utility," *Journal of Economic Theory*, **113**, 182–198.

[3] **Altonji, J. G., and R. M. Blank** (1999), "Race and Gender in the Labor Market," *Handbook of Labor Economics*, O. C. Ashenfelter and D. Card (Eds), Amsterdam, North-Holland.

[4] **American Civil Liberties Foundation** (2006), 'Too High a Price: The Case Against Restricting Gay Parenting."

[5] **Badget L. M. V., K. Chambers, G. J. Gates, and J. E. Macomber** (2007), "Adoption and Foster Care by Gay and Lesbian parents in the United States," *The Williams Institute and Urban Institute*.

[6] **Banerjee, A., E. Duflo, M. Ghatak and J. Lafortune** (2009), "Marry for What? Caste and Mate Selection in Modern India," Mimeo.

[7] **Barth, R. P., C. K. Lee, J. Wildfire, and S. Guo** (2006), "A Comparison of the Governmental Costs of Long-term Foster Care and Adoption," *Social Service Review*, **80(1)**, 127-158.

[8] **Bernal, R., L. Hu, C. Moriguchi, and E. Nagypal** (2007), "Child Adoption in the United States: Historical Trends and the Determinants of Adoption Demand and Supply, 1951-2002," Mimeo.

[9] **Bertrand, M. and S. Mullainathan** (2004), "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination," *American Economic Review*, **94(4)**, 991-1013.

[10] **Bertrand, M., C. Goldin, and L. F. Katz** (2008), "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors," Mimeo.

[11] **Björklund, A., M. Lindahl and E. Plug** (2006), "The Origins of Intergenerational Associations: Lessons from Swedish Adoption Data," *Quarterly Journal of Economics*, **71(3)**, 999-1028.

[12] **Botticini, M. and A. Siow** (2008), "Are there Increasing Returns in Marriage Markets?," Mimeo.

[13] **Brewaeys, A., I. Ponjaert, E. V. Van Hall, and S. Golombok** (1997). "Donor Insemination: Child Development and Family Functioning in Lesbian Mother Families," *Human Reproduction*, **12(6)**, 1349-1359.

[14] **Burdett, K. and M. G. Coles** (1997), "Marriage and Class," *Quarterly Journal of Economics*, **112(1)**, 141-168.

[15] **Cooper-Patrick, L., J. J. Gallo, J. J. Gonzales, H. T. Vu, N.l R. Powe, C. Nelson, and D. E. Ford** (1999), "Race, Gender, and Partnership in the Patient-Physician Relationship," *Journal of the American Medical Association*, **282(6)**, 583-589.

[16] **Dahl, G. and E. Moretti**, (2008), "The Demand for Sons," *Review of Economic Studies*, **75(4)**, 1085-1120.

[17] **Del Boca, D. and C. Flinn** (2006), "Household Time Allocation and Modes of Behavior: A Theory of Sorts," Mimeo.

[18] **Dulcan, M.** (1997), "Practice Parameters for the Assessment and Treatment of Children, Adolescents and Adults with Attention-Deficit/Hyperactivity Disorder," *Journal of American Academy of Child Adolescent Psychiatry*, **36(10)**, 85S–121S.

[19] **Eeckhout, J**. (1999), "Bilateral Search and Vertical Heterogeneity," *International Economic Review*, **40(4)**, 869-887.

[20] **Fisher, A. P.** (2003), "Still "Not Quite as Good as Having Your Own" toward a Sociology of Adoption," *Annual Review of Sociology*, **29**, 335-361.

[21] **Fisman, R., S. Iyengar, E. Kamenica, and I. Simonson** (2006), "Gender Differences in Mate Selection: Evidence from a Speed Dating Experiment," *Quarterly Journal of Economics*, **121(2)**, 673-697.

[22] **Fisman, R., S. Iyengar, E. Kamenica, and I. Simonson** (2008), "Racial Preferences in Dating," *Review of Economic Studies*, **75(1)**, 117-132.

[23] **Flabbi, L.** (2009), "Prejudice and Gender Differentials in the US Labor Market in the last Twenty Years," *Journal of Econometrics*, forthcoming.

[24] **Fryer, R. and S. Levitt** (2006), "The Black-White Test Score Gap Through Third Grade," *American Law and Economic Review*, **8(2)**, 249-281.

[25] **Goldberg, A. E.** (2009), "Heterosexual, Lesbian, and Gay Preadoptive Couples' Preferences about Child Gender," *Sex Roles*, **61**, 55-71.

[26] **Golombok, S., B. Perry, A. Burston, C. Murray, J. Mooney-Sommer, M. Stevens, and J. Golding** (2003), "Children with Lesbian Parents: A Community Study," *Developmental Psychology*, **39(1)**, 20-33.

[27] **Golombok, S., A. Spencer, and M. Rutter** (1983), "Children in Lesbian and Single-Parent Households: Psychological and Psychiatric Appraisal," *Journal of Child Psychology and Psychiatry*, **24**, 551-572.

[28] **Hansen, M. E**. (2006), "Special Needs and Disabilities," *AFCARS Adoption Data Research Brief No. 4. Washington, DC: American University.*

[29] **Hansen, M. E. and B. A. Hansen** (2006), "The Economics of Adoption of Children from Foster Care," *Child Welfare*, **85(3)**, 559-583.

[30] **Hitsch, G., A. Hortaçsu, and D. Ariely** (2009), "Matching and Sorting in Online Dating," *American Economic Review*, forthcoming.

[31] **Howard, J. and M. Freundlich** (2008), "Expanding Resources for Waiting Children II: Eliminating Legal and Practice Barriers to Gay and Lesbian Adoption from Foster Care," *Evan B. Donaldson Adoption Institute*.

[32] **Human Rights Campaign** (2009), Adoption.

[33] **Iyengar, R.** (2007), "An Analysis of the Performance of Federal Indigent Defense Counsel," *NBER Working Paper 13187*.

[34] **Iyengar, R.** (2008), "Who is the Fairest in the Land? An Analysis of Who Makes Death Penalty Decisions," Mimeo.

[35] **Jasper, M. C.** (2008), "The Law of Adoption," *Oceana's Legal Almanac Series Law for the Layperson*.

[36] **Kreider, R. M.** (2003), "Adopted Children and Stepchildren: 2000," *Census 2000 Special Reports*, CENSR-6RV.

[37] **Landes, E. M. and R. Posner** (1978), "The Economics of Baby Shortage," *Journal of Legal Studies*, **7(2)**, 323-348.

[38] **Lee, S.** (2009), "Preferences and Choice Constraints in Marital Sorting: Evidence From Korea," Mimeo.

[39] **Loury, G. L.** (2002), "*The Anatomy of Racial Inequality*," Harvard University Press.

[40] **Mabrey, C. R.** (2006), *Adoption Law: Theory, Policy and Practice*, William S. Hein & Co.

[41] **McPherson, M., L. Smith-Lovin, and J. Cook** (2001), "Birds of a Feather: Homophily in Social Networks," *Annual Review of Sociology*, **27**, 415-444.

[42] **Melosh, B.** (2002), *Strangers and Kin: The American Way to Adoption*, Harvard University Press.

[43] **Mustard, D. B.** (2001), "Racial, Ethnic, and Gender Disparities in Sentencing: Evidence from the U.S. Federal Courts," *Journal of Law and Economics*, **44**, 285-314.

[44] **National Conference of State Legislatures** (2009), *Same-Sex Marriages, Civil Unions and Domestic Partnerships*.

[45] **Nelson, T. D.** (2009), *Handbook of Prejudice, Stereotyping and Discrimination*, New York: Psychology Press.

[46] **Pertman, A.** (2000), *Adoption Nation*, Basic Books.

[47] **Riben, M.** (2007), *The Stork Market: America's Multi-Billion Dollar Unregulated Adoption Industry*, AdvocatePublications.com.

[48] **Rogerson, R., Shimer, R., and Wright, R.** (2005), "Search-Theoretic Models of the Labor Market: A Survey," *Journal of Economic Literature*, **43**, 959-988.

[49] **Sacerdote, B.** (2002), "The Nature and Nurture of Economic Outcomes," *American Economic Review Papers and Proceedings*, **92(2)**, 344-348.

[50] **Sacerdote, B.** (2007), "How Large Are The Effects From Changes In Family Environment? A Study of Korean American Adoptees," *The Quarterly Journal of Economics*, **121(1)**, 119-158.

[51] **Sacerdote, B.** (2008), "Nature and Nurture Effects on Children's Outcomes: What Have We Learned from Studies of Twins and Adoptees?," forthcoming in the *Handbook of Social Economics* (Amsterdam: North Holland).

[52] **Sen, A.** (1990), "More Than 100 Million Women Are Missing," *New York Review of Books*, **37(20)**.

[53] **Skiba, R. J., R. S. Michael, A. C. Nardo, and R. L. Peterson** (2002) "The Color of Discipline: Sources of Racial and Gender Disproportionality in School Punishment," *The Urban Review*, **34(4)** 317-342.

[54] **Smith, L**. (2006), "The Marriage Model with Search Frictions," *Journal of Political Economy*, **114(6)**, 1124-1144.

[55] **Wainwright, J., S. T. Russell, and C. J. Patterson, C. J.** (2004), "Psychosocial Adjustment, School Outcomes, and Romantic Relationships of Adolescents with Same-Sex Parents," *Child Development*, **75 (6)**, 1886-1898.

# Appendix

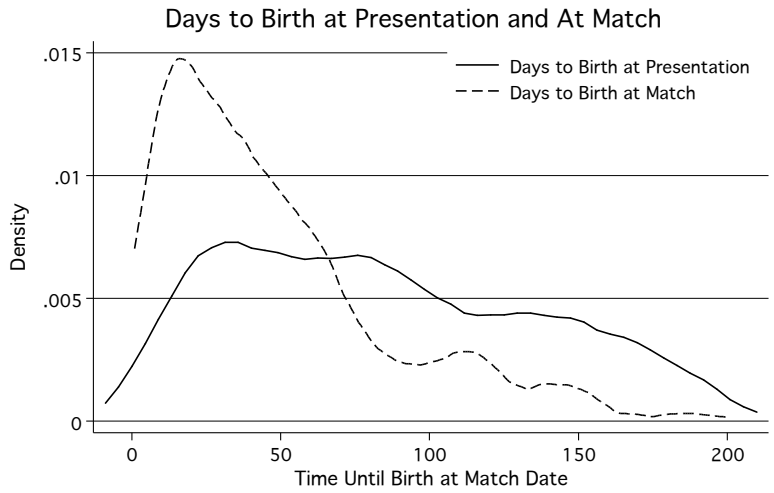


**Figure 2:** Densities of Days from Presentation and Match to Birth

| Variable | Mean | Std. Dev. | Min. | Max. | N |
|---|---|---|---|---|---|
| Already Born | 0.111 | 0.315 | 0 | 1 | 619 |
| Number of Interested PAPs | 3.158 | 2.217 | 1 | 15 | 619 |
| Number of Interested Same-Sex PAPs | 0.672 | 1.042 | 0 | 9.5 | 323 |
| Number of Interested Single PAPs | 0.362 | 0.643 | 0 | 4 | 323 |
| PAP Arrival Rate Per Day | 0.235 | 0.37 | 0.003 | 4 | 590 |
| Gender Unknown | 0.523 | 0.500 | 0 | 1 | 618 |
| Girl | 0.235 | 0.424 | 0 | 1 | 618 |
| Boy | 0.243 | 0.429 | 0 | 1 | 618 |
| African-American | 0.387 | 0.404 | 0 | 1 | 619 |
| Caucasian | 0.375 | 0.382 | 0 | 1 | 619 |
| Hispanic | 0.143 | 0.286 | 0 | 1 | 619 |
| Same-Sex PAPs Allowed | 0.186 | 0.39 | 0 | 1 | 323 |
| Single PAPs Allowed | 0.588 | 0.493 | 0 | 1 | 323 |
| Foreign PAPs Allowed | 0.87 | 0.337 | 0 | 1 | 323 |
| Matched on the Website | 0.186 | 0.389 | 0 | 1 | 619 |
| Days on Site | 45 | 67 | 1 | 469 | 590 |
| Days from Presentation to Birth | 66 | 123 | -1657 | 575 | 583 |

**Table 6:** Summary Statistics of BMOs if **matched**

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| PAP | | | | | | |
| Total Number of PAPs | 135 | 278 | 149 | 116 | 84 | 82 |
| Foreign PAPs (Score) | 0.575 | 0.563 | 0.588 | 0.603 | 0.503 | 0.374 |
| Gay PAP (Score) | 0.030 | 0.065 | 0.067 | 0.085 | 0.101 | 0.089 |
| Lesbian PAP (Score) | 0.061 | 0.058 | 0.056 | 0.093 | 0.117 | 0.100 |
| Gay PAP (Unambiguous) | 0.013 | 0.048 | 0.048 | 0.072 | 0.088 | 0.078 |
| Lesbian PAP (Unambiguous) | 0.044 | 0.045 | 0.043 | 0.079 | 0.103 | 0.089 |
| Single PAP | 0.179 | 0.127 | 0.114 | 0.083 | 0.193 | 0.154 |
| BABY | | | | | | |
| Number of Babies | 139 | 239 | 141 | 129 | 117 | 126 |
| Same-Sex PAP Allowed | 0.302 | 0.180 | 0.156 | 0.736 | 0.333 | 0.333 |
| Single PAP Allowed | 0.784 | 0.644 | 0.518 | 0.868 | 0.598 | 0.643 |
| Foreign PAP Allowed | 0.892 | 0.891 | 0.887 | 0.968 | 0.782 | 0.651 |
| African-American | 0.447 | 0.460 | 0.370 | 0.329 | 0.350 | 0.329 |
| Girl | 0.302 | 0.205 | 0.234 | 0.0698 | 0.231 | 0.254 |
| Boy | 0.252 | 0.378 | 0.376 | 0.0923 | 0.393 | 0.333 |
| Months to Birth | 0.621 | 0.755 | 1.22 | 0.128 | 0.414 | 2.41 |
| Finalization Cost | 20522 | 22834 | 26543 | 27081 | 31076 | 31780 |

**Table 7:** Trends from 2004 to 2009

| Dependent Variable: | All | Straight PAP | Gay PAP | Lesbian PAP | Single PAP | Foreign |
|---|---|---|---|---|---|---|
| PAP Applies for Baby | | (Score) | (Score†) | (Score†) | | (Score†) |
| **Activity Window: 90 Days** | | | | | | |
| Already Born (d) | -0.009 | -0.013* | -0.062 | -0.052 | 0.027 | -0.016* |
| | (-1.80) | (-2.46) | (-1.67) | (-0.88) | (1.08) | (-2.21) |
| Months to Birth | -0.001** | -0.001** | -0.002 | -0.001 | -0.001 | -0.001* |
| | (-2.85) | (-2.75) | (-1.17) | (-0.37) | (-1.06) | (-2.06) |
| Finalization Cost in $10,000s | -0.014*** | -0.013*** | -0.019 | -0.075** | -0.018* | -0.019*** |
| | (-5.83) | (-5.04) | (-1.04) | (-2.66) | (-2.50) | (-5.90) |
| African-American Girl | -0.039*** | -0.035*** | -0.147** | -0.144* | -0.039* | -0.030*** |
| | (-6.12) | (-5.04) | (-2.75) | (-2.47) | (-2.17) | (-3.49) |
| African-American Boy | -0.052*** | -0.050*** | -0.048 | -0.070 | -0.057** | -0.046*** |
| | (-7.47) | (-6.68) | (-0.95) | (-0.99) | (-2.59) | (-4.96) |
| African-American Unknown Gender | -0.053*** | -0.051*** | -0.077 | -0.071 | -0.054*** | -0.048*** |
| | (-8.07) | (-7.13) | (-1.39) | (-1.30) | (-3.51) | (-5.49) |
| Non-African-American Girl | 0.022*** | 0.019*** | 0.111 | 0.187** | 0.023 | 0.019* |
| | (4.29) | (3.57) | (1.78) | (2.64) | (1.33) | (2.45) |
| Non-African-American Boy | -0.005 | -0.007 | 0.008 | 0.085 | 0.003 | 0.002 |
| | (-1.06) | (-1.33) | (0.18) | (1.79) | (0.16) | (0.26) |
| Hispanic | 0.002 | 0.003 | 0.071 | -0.013 | -0.016 | 0.004 |
| | (0.26) | (0.47) | (1.14) | (-0.15) | (-0.79) | (0.45) |
| Year 2004 (d) | -0.030*** | -0.023*** | -0.031 | -0.114** | -0.002 | -0.036*** |
| | (-7.27) | (-4.98) | (-0.67) | (-3.07) | (-0.11) | (-5.47) |
| Year 2005 (d) | -0.029*** | -0.018*** | -0.052 | -0.083* | -0.012 | -0.032*** |
| | (-6.20) | (-3.35) | (-1.31) | (-2.16) | (-0.72) | (-4.18) |
| Year 2006 (d) | -0.020*** | -0.007 | 0.063 | -0.068 | -0.030* | -0.016* |
| | (-4.40) | (-1.29) | (0.95) | (-1.50) | (-2.24) | (-2.08) |
| Year 2007 (d) | -0.026*** | -0.013* | 0.005 | -0.179*** | -0.007 | -0.021** |
| | (-6.36) | (-2.44) | (0.11) | (-7.53) | (-0.30) | (-3.05) |
| Year 2008 (d) | -0.003 | 0.003 | -0.013 | 0.016 | 0.034 | 0.003 |
| | (-0.72) | (0.52) | (-0.48) | (0.49) | (1.81) | (0.44) |
| Gay PAP (Score) | 0.050*** | | | | | |
| | (5.27) | | | | | |
| Lesbian PAP (Score) | 0.075*** | | | | | |
| | (8.09) | | | | | |
| Single PAP (Score) | 0.001 | | | | | |
| | (0.10) | | | | | |
| Foreign PAP (Score) | 0.058*** | | | | | |
| | (7.30) | | | | | |
| Probability for Mean Attributes | 0.066 | 0.052 | 0.126 | 0.158 | 0.0572 | 0.068 |
| Probability for Base Case ♡ | 0.060 | 0.093 | 0.153 | 0.255 | 0.086 | 0.118 |
| $\chi^2$ | 385.90 | 148.51 | 30.36 | 63.20 | 42.60 | 105.94 |
| Log-Likelihood | -224071.1 | -185977.4 | -28673.5 | -32214.2 | -26979.0 | -229591.9 |
| Observations | 1088210 | 944423 | 80828 | 74422 | 125246 | 969035 |
| PAP-Babies | 33403 | 29277 | 2698 | 2440 | 3484 | 31245 |

(d) for discrete change of dummy variable from 0 to 1. (d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$. Standard Errors Clustered by PAP-Baby Pair. ♡ Note that the omitted category is a gender unknown, non-African-American, unborn child, less than one month to birth, with finalization cost of $26,000 in 2009. †: Gay, lesbian, and foreign estimated using weighted probit.

**Table 8:** Determinants of PAPs Applications (Activity Window of 90 Days) – Marginal Effects for Probit

| Dependent Variable: | All | Straight PAP | Gay PAP | Lesbian PAP | Single PAP | Foreign PAP |
|---|---|---|---|---|---|---|
| PAP Applies for Baby | | (Score) | (Score†) | (Score†) | | (Score†) |
| **♣ Application at Some Point in Time** | | | | | | |
| Already Born (d) | -0.006 | -0.008* | -0.028 | 0.029 | 0.021 | -0.010 |
| | (-1.40) | (-1.98) | (-0.79) | (0.49) | (1.11) | (-1.70) |
| Months to Birth | -0.000 | -0.000 | 0.000 | 0.001 | -0.001 | -0.000 |
| | (-1.12) | (-1.14) | (0.03) | (0.98) | (-0.91) | (-0.64) |
| Finalization Cost in $10,000s | -0.012*** | -0.011*** | 0.008 | -0.029 | -0.016* | -0.015*** |
| | (-6.55) | (-5.91) | (0.45) | (-1.24) | (-2.45) | (-6.28) |
| African-American Girl | -0.034*** | -0.029*** | -0.134** | -0.119* | -0.059*** | -0.029*** |
| | (-6.88) | (-5.47) | (-2.77) | (-2.16) | (-3.65) | (-4.29) |
| African-American Boy | -0.052*** | -0.050*** | -0.068 | -0.096 | -0.071*** | -0.049*** |
| | (-9.86) | (-8.81) | (-1.63) | (-1.85) | (-3.76) | (-7.08) |
| African-American Unknown Gender | -0.043*** | -0.042*** | -0.119*** | -0.039 | -0.039** | -0.040*** |
| | (-9.46) | (-8.55) | (-3.62) | (-0.94) | (-2.73) | (-6.65) |
| Non-African-American Girl | 0.016*** | 0.013** | -0.053 | 0.033 | 0.037* | 0.010 |
| | (3.71) | (3.06) | (-0.94) | (0.50) | (2.26) | (1.72) |
| Non-African-American Boy | -0.011** | -0.011** | -0.062 | 0.060 | -0.025 | -0.005 |
| | (-2.77) | (-2.64) | (-1.62) | (1.33) | (-1.68) | (-0.94) |
| Hispanic | -0.005 | -0.001 | 0.072 | -0.052 | -0.043* | -0.005 |
| | (-1.20) | (-0.31) | (1.27) | (-0.73) | (-2.26) | (-0.93) |
| Year 2004 (d) | -0.033*** | -0.025*** | -0.036 | -0.109** | -0.017 | -0.026*** |
| | (-9.92) | (-6.84) | (-1.02) | (-3.09) | (-1.03) | (-4.68) |
| Year 2005 (d) | -0.027*** | -0.017*** | -0.017 | -0.054 | -0.009 | -0.017** |
| | (-7.09) | (-4.32) | (-0.41) | (-1.25) | (-0.60) | (-2.76) |
| Year 2006 (d) | -0.022*** | -0.012** | 0.164* | -0.099** | -0.041*** | -0.011 |
| | (-6.54) | (-2.99) | (1.99) | (-2.76) | (-3.74) | (-1.69) |
| Year 2007 (d) | -0.031*** | -0.021*** | -0.048 | -0.160*** | -0.027 | -0.024*** |
| | (-9.28) | (-4.27) | (-1.26) | (-7.27) | (-1.50) | (-3.65) |
| Year 2008 (d) | 0.012* | 0.019** | 0.043 | -0.002 | 0.030 | 0.039*** |
| | (2.26) | (3.24) | (1.05) | (-0.05) | (1.37) | (3.95) |
| Gay PAP (Score) | 0.044*** | | | | | |
| | (5.78) | | | | | |
| Lesbian PAP (Score) | 0.062*** | | | | | |
| | (9.71) | | | | | |
| Single PAP (Score) | 0.010* | | | | | |
| | (2.40) | | | | | |
| Foreign PAP (Score) | 0.058*** | | | | | |
| | (9.16) | | | | | |
| Probability for Mean Attributes | 0.060 | 0.048 | 0.126 | 0.153 | 0.061 | 0.062 |
| Probability for Base Case ♡ | 0.056 | 0.088 | 0.164 | 0.260 | 0.109 | 0.095 |
| $\chi^2$ | 624.32 | 264.07 | 53.36 | 36.77 | 39.19 | 199.20 |
| Log-Likelihood | -5987.7 | -4974.9 | -703.9 | -822.5 | -695.3 | -6163.1 |
| PAP-Babies | 30457 | 26679 | 2162 | 1963 | 3183 | 27913 |

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. Standard Errors Clustered by PAP-Baby Pair. ♡ Note that the omitted category is gender unknown, non-African-American, unborn child who is less than one month to birth, with finalization cost of $26,000 in 2009.†: Gay, lesbian and foreign estimated using weighted probit. ♣ PAP submits an application at some point when the BMO is available on the website. Activity window of 90 days.

**Table 9:** Determinants of PAPs' Applications (Application at Some Point in Time) – Marginal Effects for Probit

| Dependent Variable: | All | Straight PAP | Gay PAP | Lesbian PAP | Single PAP | Foreign |
|---|---|---|---|---|---|---|
| PAP Applies for Baby | | (Score) | (Score†) | (Score†) | | (Score†) |
| **Activity Window: 10 Days** | | | | | | |
| Already Born (d) | -0.013 | -0.018** | -0.045 | -0.053 | 0.024 | -0.022* |
| | (-1.88) | (-2.71) | (-0.81) | (-0.68) | (0.74) | (-2.39) |
| 1 Month Before Birth (d) | -0.000 | -0.002 | 0.043 | 0.001 | 0.003 | -0.002 |
| | (-0.07) | (-0.59) | (1.09) | (0.03) | (0.25) | (-0.70) |
| 2 Month Before Birth (d) | 0.000 | -0.001 | 0.059 | 0.004 | -0.009 | -0.002 |
| | (0.08) | (-0.33) | (1.42) | (0.09) | (-0.74) | (-0.45) |
| 3 Month Before Birth (d) | -0.006 | -0.007 | 0.056 | -0.007 | -0.017 | -0.010 |
| | (-1.49) | (-1.79) | (1.22) | (-0.16) | (-1.32) | (-1.84) |
| 4 Month Before Birth (d) | -0.016*** | -0.015*** | -0.048 | -0.060 | -0.020 | -0.021*** |
| | (-3.89) | (-3.57) | (-1.43) | (-1.43) | (-1.42) | (-3.98) |
| 5 Month Before Birth (d) | -0.024*** | -0.024*** | -0.066 | -0.083 | -0.022 | -0.028*** |
| | (-5.60) | (-5.27) | (-1.88) | (-1.89) | (-1.45) | (-4.74) |
| 6 Month Before Birth (d) | -0.029*** | -0.028*** | -0.061 | -0.115** | -0.020 | -0.033*** |
| | (-5.43) | (-5.01) | (-1.33) | (-2.91) | (-1.07) | (-4.52) |
| 7 Month Before Birth (d) | -0.045*** | -0.045*** | 0.067 | -0.155*** | -0.054*** | -0.062*** |
| | (-7.83) | (-7.75) | (0.63) | (-3.55) | (-4.15) | (-10.90) |
| 8 Month Before Birth (d) | -0.050*** | -0.046*** | -0.014 | -0.196*** | -0.066*** | -0.069*** |
| | (-7.46) | (-6.07) | (-0.11) | (-9.39) | (-8.65) | (-9.83) |
| Month After Birth | -0.000 | -0.001 | -0.002 | -0.005 | 0.000 | -0.001 |
| | (-0.65) | (-1.60) | (-0.60) | (-1.58) | (0.45) | (-0.94) |
| Finalization Cost in 10 000's of $ | -0.019*** | -0.018*** | -0.017 | -0.090** | -0.022* | -0.026*** |
| | (-6.37) | (-5.58) | (-0.76) | (-2.61) | (-2.34) | (-6.54) |
| African-American Girl | -0.064*** | -0.056*** | -0.205** | -0.245*** | -0.065** | -0.054*** |
| | (-7.54) | (-6.12) | (-3.20) | (-3.34) | (-2.68) | (-4.78) |
| African-American Boy | -0.081*** | -0.077*** | -0.065 | -0.151 | -0.087** | -0.075*** |
| | (-8.99) | (-7.98) | (-1.13) | (-1.77) | (-3.13) | (-6.40) |
| African-American Unknown Gender | -0.079*** | -0.075*** | -0.113 | -0.144* | -0.081*** | -0.073*** |
| | (-9.28) | (-8.14) | (-1.69) | (-2.20) | (-3.88) | (-6.57) |
| Non-African-American Girl | 0.019** | 0.016* | 0.076 | 0.169 | 0.023 | 0.014 |
| | (2.79) | (2.23) | (0.98) | (1.89) | (0.97) | (1.41) |
| Non-African-American Boy | -0.015* | -0.017* | -0.014 | 0.058 | -0.007 | -0.007 |
| | (-2.34) | (-2.47) | (-0.26) | (0.94) | (-0.34) | (-0.83) |
| Hispanic | -0.003 | -0.001 | 0.088 | -0.081 | -0.029 | -0.002 |
| | (-0.45) | (-0.12) | (1.16) | (-0.72) | (-1.12) | (-0.20) |
| Gay PAP (Score) | 0.059*** | | | | | |
| | (4.70) | | | | | |
| Lesbian PAP (Score) | 0.093*** | | | | | |
| | (7.76) | | | | | |
| Single PAP | 0.004 | | | | | |
| | (0.57) | | | | | |
| Foreign PAP (Score) | 0.076*** | | | | | |
| | (7.26) | | | | | |
| Years (d) | X | X | X | X | X | X |
| Probability for Mean Attributes | 0.086 | 0.072 | 0.161 | 0.194 | 0.080 | 0.092 |
| Probability for Base Case ♡ | 0.092 | 0.143 | 0.182 | 0.357 | 0.121 | 0.188 |
| $\chi^2$ | 462.43 | 256.42 | 65.40 | 73.67 | 65.67 | 210.93 |
| Log-Likelihood | -206421.9 | -171588.1 | -26844.0 | -29869.6 | -25557.9 | -210405.7 |
| Observations | 825982 | 715179 | 67210 | 61560 | 97418 | 742059 |
| PAP-Babies | 29364 | 25746 | 2416 | 2161 | 3164 | 27431 |

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05,^{**} p < 0.01,^{***} p < 0.001$. Standard Errors Clustered by PAP-Baby Pair. ♡ Note that the omitted category is gender unknown non-African-American unborn child with finalization cost of 26 000 dollars in 2009 who is less than one month from birth.†: Gay, lesbian, and foreign estimated using weighted probit, with weights corresponding to probability that PAP is gay, lesbian or foreign respectively.

**Table 10:** Determinants of PAPs' Applications (Activity Window of 10 days) – Marginal Effects for Probit

| Dependent Variable:<br>PAP Applies for Baby | All | Straight PAP<br>(Unambiguous) | Gay PAP<br>(Unambiguous) | Single<br>PAP | Lesbian PAP<br>(Unambiguous) | Foreign PAP†<br>(Score) |
|---|---|---|---|---|---|---|
| **♠ Activity Window: 10 Days** | | | | | | |
| Already Born (d) | -0.014* | -0.017* | -0.064 | 0.029 | -0.054 | -0.025** |
| | (-2.07) | (-2.20) | (-1.02) | (0.95) | (-0.58) | (-2.66) |
| Months to Birth | -0.001** | -0.001* | -0.000 | -0.001 | -0.001 | -0.001* |
| | (-3.05) | (-2.44) | (-0.13) | (-1.03) | (-0.17) | (-2.50) |
| Finalization Cost in $10,000s | -0.017*** | -0.016*** | -0.005 | -0.017 | -0.096* | -0.024*** |
| | (-5.61) | (-4.59) | (-0.16) | (-1.73) | (-2.26) | (-5.89) |
| African-American Girl | -0.050*** | -0.048*** | -0.210** | -0.051* | -0.208* | -0.039*** |
| | (-6.13) | (-4.84) | (-2.58) | (-2.14) | (-2.49) | (-3.51) |
| African-American Boy | -0.062*** | -0.063*** | -0.014 | -0.073** | -0.084 | -0.062*** |
| | (-7.19) | (-6.02) | (-0.19) | (-2.59) | (-0.87) | (-5.19) |
| African-American Unknown Gender | -0.067*** | -0.071*** | -0.100 | -0.079*** | -0.096 | -0.061*** |
| | (-8.04) | (-6.94) | (-1.10) | (-3.71) | (-1.21) | (-5.50) |
| Non-African-American Girl | 0.029*** | 0.029*** | 0.138 | 0.034 | 0.258* | 0.025* |
| | (4.45) | (3.84) | (1.41) | (1.44) | (2.43) | (2.49) |
| Non-African-American Boy | -0.004 | -0.008 | 0.009 | 0.004 | 0.134 | 0.003 |
| | (-0.65) | (-1.08) | (0.13) | (0.17) | (1.89) | (0.34) |
| Hispanic | 0.006 | 0.002 | 0.146 | -0.028 | -0.022 | 0.005 |
| | (0.84) | (0.28) | (1.53) | (-1.08) | (-0.17) | (0.48) |
| Year 2004 (d) | -0.042*** | -0.032*** | 0.023 | 0.022 | -0.049 | -0.052*** |
| | (-7.87) | (-4.88) | (0.21) | (0.80) | (-0.61) | (-6.37) |
| Year 2005 (d) | -0.036*** | -0.020** | -0.048 | 0.003 | -0.051 | -0.043*** |
| | (-5.80) | (-2.72) | (-0.69) | (0.14) | (-0.74) | (-4.36) |
| Year 2006 (d) | -0.014* | 0.014 | 0.144 | 0.018 | -0.071 | -0.006 |
| | (-2.12) | (1.48) | (1.36) | (0.48) | (-1.03) | (-0.57) |
| Year 2007 (d) | -0.025*** | -0.003 | 0.037 | 0.035 | -0.217*** | -0.022* |
| | (-4.06) | (-0.29) | (0.54) | (0.70) | (-6.12) | (-2.27) |
| Year 2008 (d) | 0.014* | 0.026** | -0.008 | 0.026 | 0.065 | 0.026* |
| | (2.01) | (2.58) | (-0.16) | (1.02) | (1.30) | (2.32) |
| Unambiguous Gay PAP (d) | 0.090*** | | | | | |
| | (3.92) | | | | | |
| Unambiguous Lesbian PAP (d) | 0.156*** | | | | | |
| | (5.74) | | | | | |
| Single PAP (d) | 0.013 | | | | | |
| | (1.73) | | | | | |
| Foreign (Score) | 0.080*** | | | | | |
| | (7.63) | | | | | |
| Probability for Mean Attributes | 0.086 | 0.072 | 0.189 | 0.076 | 0.223 | 0.091 |
| Probability for Base Case ♡ | 0.069 | 0.111 | 0.168 | 0.088 | 0.271 | 0.151 |
| $\chi^2$ | 415.98 | 173.91 | 27.80 | 40.67 | 50.18 | 148.01 |
| Log-Likelihood | -214635.4 | -141391.0 | -5754.8 | -20389.0 | -8600.3 | -208980.9 |
| Observations | 864727 | 588064 | 13583 | 79448 | 16939 | 734659 |
| PAP-Babies | 30664 | 21452 | 499 | 2512 | 583 | 27128 |

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$. Standard Errors Clustered by PAP-Baby Pair. ♡ Note that the omitted category is gender unknown non-African-American unborn child with finalization cost of $26,000 in 2009. †: Foreign estimated using weighted probit.

**Table 11:** Determinants of PAPs' Applications (Activity Window of 10 days) – Unambiguous Gay and Lesbian Couples

| Dependent Variable | Same-Sex PAPs Allowed | Foreign PAPs Allowed | Single PAPs Allowed |
|---|---|---|---|
| Already Born | 0.090 | -0.087* | 0.075 |
| | (1.71) | (-2.16) | (1.29) |
| Months to Birth | -0.001 | -0.004 | 0.000 |
| | (-0.38) | (-0.94) | (0.06) |
| Finalization Cost in $10,000s | -0.020*** | 0.000 | -0.007* |
| | (-6.77) | (0.11) | (-2.36) |
| African-American Girl | -0.043 | 0.052 | 0.212* |
| | (-0.57) | (0.88) | (2.42) |
| African-American Boy | -0.133 | 0.016 | 0.112 |
| | (-1.82) | (0.28) | (1.46) |
| African-American Unknown Gender | -0.002 | 0.019 | 0.147* |
| | (-0.03) | (0.37) | (2.01) |
| Non-African-American Girl | -0.088 | -0.044 | -0.076 |
| | (-1.24) | (-0.94) | (-1.12) |
| Non-African-American Boy | -0.077 | 0.006 | -0.008 |
| | (-1.25) | (0.14) | (-0.14) |
| Hispanic | -0.085 | 0.075 | 0.026 |
| | (-1.10) | (1.34) | (0.36) |
| Year 2004 (d) | -0.187*** | 0.121*** | 0.094 |
| | (-4.13) | (4.63) | (1.42) |
| Year 2005 (d) | -0.303*** | 0.157*** | -0.028 |
| | (-7.73) | (5.66) | (-0.43) |
| Year 2006 (d) | -0.230*** | 0.133*** | -0.204** |
| | (-6.21) | (5.93) | (-2.81) |
| Year 2007 (d) | 0.166* | 0.179*** | 0.175** |
| | (2.02) | (9.63) | (2.86) |
| Year 2008 (d) | -0.038 | 0.089** | -0.017 |
| | (-0.64) | (3.27) | (-0.26) |
| Probability for Mean Attributes♡ | 0.280 | 0.868 | 0.672 |
| $\chi^2$ | 142.38 | 63.20 | 76.06 |
| Log-Likelihood | -341.8 | -266.6 | -399.0 |
| Babies | 683 | 683 | 683 |

$^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$. ♡ Note that the omitted category is gender unknown non-African-American unborn child with finalization cost of $26,000 in 2009.

**Table 12:** Determinants of Restrictions: Marginal Effects for Probit

| Dependent Variable: Chosen PAP | I | II | III | IV |
|---|---|---|---|---|
| Same-Sex PAP (Score) | 0.09 | | | |
| | (0.94) | | | |
| Single PAP (Score) (d) | -0.08 | -0.08 | -0.27 | |
| | (-0.64) | (-0.69) | (-1.71) | |
| Gay PAP (Score) | | -0.04 | -0.23 | |
| | | (-0.32) | (-1.41) | |
| Lesbian PAP (Score) | | 0.24 | 0.29 | |
| | | (1.55) | (1.53) | |
| Foreign Score | | | -0.06 | -0.03 |
| | | | (-0.41) | (-0.15) |
| Baseline | 0.507 | 0.506 | 0.427 | 0.484 |
| $\chi^2$ | 1.41 | 3.91 | 5.13 | 0.02 |
| Log-Likelihood | -144.9 | -143.6 | -90.7 | -95.0 |
| Observations | 517 | 517 | 323 | 329 |

$^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$

**Table 13:** Marginal Effect (at Fixed Effect=0) of Multinomial Logit of Chosen PAP.

# Data Appendix for "Gender and Racial Biases: Evidence from Child Adoption"

Mariagiovanna Baccara Allan Collard-Wexler
Leonardo Felli Alistair Wilson Leeat Yariv

November 7, 2009

**Abstract**

We document the construction of the data used in "Gender and Racial Biases: Evidence from Child Adoption".

# 1 Data Construction

## 1.1 Data Sources

The data was collected from the adoption facilitator's website. On this website, there are two linked pages that we utilized:

- *"List of Currently Available Children,"* containing the list of children currently available on the website. We refer to this page as CA for short.
- *"Archive,"* containing the list of children who have been placed on the website in the past.

The data used in this project originates from four separate collection efforts:

1. **Perlscript Data** correspond to CA and archive data harvested via HTML on a daily basis. These data refer to the period from September 2008 to August 2009.
2. **PDF Data** correspond to data harvested from the same sources as above (the CA and archive pages), but transcribed from screengrabs in pdf using an external company. These data refer to the period from May 2008 to September 2008.
3. **RA data** contain CA data only. They were assembled by a research assistant who manually uploaded a spreadsheet with daily observations. These data were gathered from May 2007 to January 2008.
4. **Archive Data** contain CA data only and were put together using an Internet archive. We used this source to generate data between June 2004 and September 2007.

Table 1 specifies the distribution of our data across these sources. Figure 1 depicts the data collection efforts across time.

| Data Source | Frequency | Percent |
|---|---|---|
| RA Data | 9,819 | 1 |
| Internet data | 191,807 | 19 |
| Interpolated from Internet data | 531,590 | 53 |
| PDF data | 22,872 | 2 |
| Interpolated PDF data | 35,941 | 4 |
| PerlScript data | 205,175 | 21 |
| Total | 997,204 | 100 |

Table 1: Provenance of CA Data.

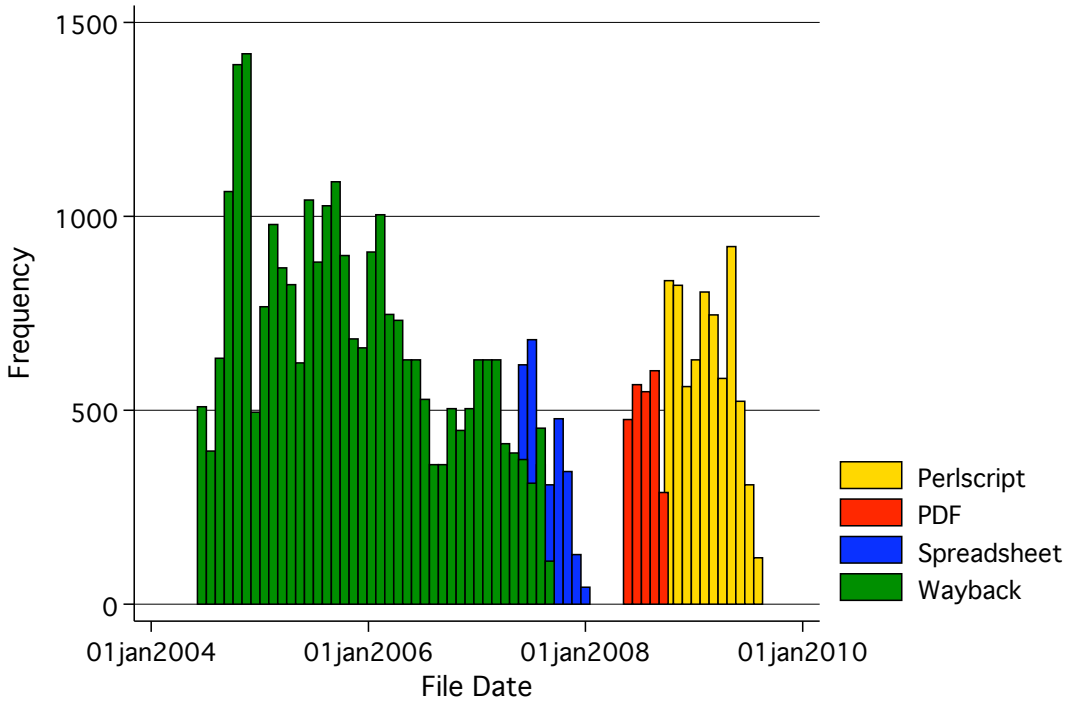


Figure 1: Data Collection over Time.

## 1.2 PAP Activity

The activity period of individual PAPs on the site is defined using two dates: the first time that an individual PAP appears in our records (i.e., the first application for a child, which is conditional on the PAP having become a client of the facilitator by paying an initial fee), and the last time that same PAP submits an application for a child. We assume that PAPs are actively checking the website and are aware of each child available on each day between these two end-points. Moreover, for some results in the paper, we define a PAP as 'active' up to either 10 or 90 days following their last application. In the case that a PAP was eventually matched to a BM on the website, we consider the PAP inactive since the last application they submitted, assuming that the PAP became aware of the match as soon as the BM made her choice (possibly a few days before the match appears on the website).

## 1.3 Interpolation

Some of our data points (in particular, the PDF and Archive Data) have resolution smaller than one day. In these cases the data are filled via a one-sided interpolation: if an observation on a given day is missing, the data are assumed identical to the data point on the day before (that includes available children, outstanding applications for children, etc.). That is, if we observed data $A$ on day 1, data $B$ on day 5, and data $C$ on day 7, our filled data set was constructed as $A, A, A, A, B, B, C$. Additionally, we coded the resolution of each element in our data as the time lag between actual observations, so the resolution for the example above would be: $0, 4, 4, 4, 0, 2, 0$.

## 1.4 BMs' Attributes and Restrictions

BM data were entered using the text produced by the HTML files in the CA data. Exploiting the consistency of the organization of the website, specific strings were searched for within specific columns of the data table. For instance the string 'lesbian' in the column of the CA data detailing the PAPs types acceptable to the BM was used to code BMs open to lesbian couples (note that all restrictions are worded in the direction of acceptance, e.g., 'BM wants a married couple or a single woman,' 'BM will consider all families including lesbians, gay, single,' etc.). Race percentages were coded using a similar method, using a database of words used in referring to ethnicities within the BM characteristics column (e.g., '3/4 Caucasian, 1/4 African-American,' etc.).

BM's due date and the date on which the case was presented to the facilitator were captured searching for several alternative date formats and accuracies, as well as performing a local search in nearby lines for explanatory strings. For example, 'Due Date: 08-Feb' in a data point with date 25th December, 2008 would translate into a coded due date of 02-08-2009. 'Presented on 08-05-09' would force the presentation date to be coded as 08-05-2009.

Finally, to code the estimated finalization costs, a Research Assistant went through the raw data determining the final monetary costs associated with every BM.[1]

## 1.5 PAPs' Attributes

### 1.5.1 Single and Same-Sex Scores

The website refers to PAPs reporting their first names or initials only. Thus, PAPs are coded in the data via strings such as 'jack&jill,' 'mary,' or 'a&b.'[2] We used this information to determine the sexual orientation of a PAP, as well as whether the PAP is a couple or a single woman. When the names or initials did not indicate a couple, we assigned a value of 1 to the "Single PAP" score. We classified PAPs' sexual preferences as follows:

1. We determined the gender of each name according to the classification 'male,' 'female,' and 'unisex.' In particular:
   (a) For well-known anglo and foreign names coding was automatic.
   (b) For obscure names that were unknown to the coders, we checked with online baby name databases to determine the classification of the name.
   (c) If a name's gender specificity could not be determined, or the PAP couple was identified only through its initials, each name was assumed to be 'unisex.'
2. If the couple was identified by one 'male' and one 'female' name, we assigned a value of 1 to the "straight couple" score. Similarly, if the couple were identified by two 'male' names or two 'female' names, we assigned a value of 1 to the "Gay PAP" or "Lesbian PAP" score, respectively.
3. Off the PAPs that had names with unambiguous gender classification, 73.7% were straight, 6.1% were gay, 6.9% were lesbian, and 13.3% were single. We used these priors to construct scores for PAPs with names entailing some gender ambiguity. In particular:
   (a) If the couple was identified by one 'unisex' name and one 'male' name, we assigned a value of 0.92 to the "Straight PAP" score and a value of 0.08 to the "Gay PAP" score.
   (b) If the couple was identified by one 'unisex' name and one 'female' name, we assigned a value of 0.91 to the "Straight PAP" score and a value of 0.09 to the "Lesbian PAP" score.
   (c) If the couple was identified by two 'unisex' names, we assigned a value of 0.85 to the "Straight PAP" score, a value of 0.07 to the 'Gay PAP' score, and a value of 0.08 to the 'Lesbian PAP' score.

[1] We discarded the few cases in which the BM's ID name changed over the period in which the case was posted on the website. This occurred in about four cases.

[2] Names were sorted alphabetically to make sure their reversal on the website was not coded as identifying a separate PAP unit.

### 1.5.2 Foreign Score

To code the "Foreign PAP" score, assuming a symmetric prior, we used Bayesian updating over a multinomial process to update the probability of a PAP being foreign. Specifically, we assumed a 10% error-probability for foreign parents applying for children for which they are barred from adopting. Then, given a $50\% - 50\%$ division of foreign and domestic PAPS (our symmetric prior), and an observed count of applications for "Foreign PAPs Allowed" and for "Foreign PAPs Not Allowed" children, we computed the posterior probability of each PAP being foreign.

The probability of observing $n_f$ applications for "Foreign PAP Allowed" children and $n_d$ applications for "Foreign PAP Not Allowed" children conditional on a PAP being foreign is:

$$Q_f = \Pr\left\{(n_f, n_d)\,|\text{Foreign}\right\} = \left(\begin{array}{c} n_d + n_f \\ n_f \end{array}\right)(0.1)^{n_d}(0.9)^{n_f}.$$

The computation of the probability of observing $n_f$ applications for "Foreign PAP Allowed" children and $n_d$ applications for "Foreign PAP Not Allowed" children conditional on a PAP being domestic assumes that domestic PAPs are equally likely to apply for a "Foreign PAP Allowed" child and a "Foreign PAP Not Allowed" child. We denote by $p_d$ the proportion of children available (over the entire period of activity of a PAP) for which foreign are not allowed to apply. The probability of observing the distribution of $n_f$ and $n_d$ applications as above conditional on the PAP being domestic is then given by:

$$Q_d = \Pr\left\{(n_f, n_d)\,|\text{Domestic}\right\} = \left(\begin{array}{c} n_d + n_f \\ n_f \end{array}\right)p_d^{n_d}(1-p_d)^{n_f}.$$

Bayesian updating with our symmetric prior over PAPs being foreign or domestic yields the posterior probability of a PAP being foreign:

$$\Pr\left\{\text{Foreign}\,|(n_f, n_d)\right\} = \frac{Q_f}{Q_f + Q_d}.$$

# 2 Data and Program Glossary

## 2.1 Data Glossary

case_data_all.dta: Data from the archive webpage.

ChoicePanel.dta: Combination of PAP choices for each baby on each day.

grid_data.dta: Data from the CA webpage.

## 2.2 Statistical Program Glossary

grid_hedonic_regression1.do: runs the finalization cost regressions.

Matching_Regression_Match-Not.do: runs the regression on finding a match or not.

Matching_Regression.do: runs the regressions on the BM's choice of a PAP.

ChoicePanel_Sum9.do: creates all the tables and figures in the paper, except for those describing matching, finalization cost, and the determinants of a BM's choice.

## 2.3 Data Construction Programs

HTMLdata.m: reads in data on archive from html and pdf files and imports them; general purpose script file calling the main functions, and getting data into matlab through the *outdata* cell variable.

generate_PAP_file.do: generates the data set file *ChoicePanel.dta* from the data. Uses *pap_data.dta* and *CA_data.dta*

replacePAPnames.do: changes a long list of misspellings, errors, etc. to the 'correct' values, as coded by hand.

import_CA_data-AJW.do: imports the csv file generated by *FlatFileOutputPAP.m*, changes the names and various details that need correction. Also assigns unique ids as necessary and generates a couple of diagnostic values. The main function is generating the file *pap_data.dta*.

DateEnter.m: finds and codes date information using differing formats and regular expressions. In particular 'mm-dd-yy' and 'mm-dd-yyyy' formats. Pre-processes the strings to replace words and other formats to create richer information. Dates are attributed to events via the strings on the same or previous lines.

DateEnterCD.m: customized version of *DateEnter.m* for use with the Cases data. Changes where the algorithm looks for explanatory strings and dates.

DateExtract.m: similar date extraction routine to *DateEnter.m*, but used with Cases data.

GenerateData.m: global Script. Runs the data entry part within MATLAB.

InterestedPersonsVector.m: formats the interested PAPs data from a row of the CA file. Takes the interested PAPs string and converts to a cell array.

MatchedPersonsVector.m: similar to *InterestedPersonsVector.m*, but customized for data from the Cases file.

FlatFileOutputPAPs.m: converts data from cell variable in MATLAB through to csv file for entry into STATA file for Grid data, where a row is a day-mother-pap entry.

HTMLtimemachine.m: enters data from the HTML data captured from Internet Archive.

EnterHongData.m: enters data from a customized csv-version of the RA entered data. Each $i$ entry in outdata $(i, \cdot)$ represents a BM, where the second element represents the time on site.

StripArchive.m: Function that saves HTML for targeted website for specified date ranges.

RaceFractionCode.m: For each column entry in the cell given by the coordinate system, codes the racial fraction and word given in the text. Used to extract well-specified race data from the HTML.

AgeCode.m: Codes ages of children from string data.

CodeLanguage.m: Script file that runs the data refinement routines, i.e. those that convert string data to numeric coded data.

CodeLanguageCD.m Retasked version of *CodeLanguage.m* for the Archive data instead of the CA data.

CreateMatchInformation.m: Tries to match string data near to date information with known phrases, thereby coding matches, cases closed, missing, etc.

DateReplaceWords.m: Pre-formatting for dates; tries to put dates into a systematic format for subsequent data capture.

MoneyCode.m: Extracts monetary amounts from string data, looking for date ranges and stated amounts. For date ranges the code is the top limit of the range. This data is superseded in the final analysis by the hand-entered amounts for each BM.

RearrangePAP.m: Orders PAP pairs so that the names are listed in alphabetical order.

FlatFileOutputCaseData.m: converts data from cell variable in MATLAB through to csv file for entry into STATA file for Archive data where a row is a date-mother entry.

HTMLcaseData.m: enters information from the Archive page html.

FlatFileOutput.m: converts data from cell variable in MATLAB through to csv file for entry into STATA file for CA data where a row is a date-mother entry.

## 2.4 Helper Programs Glossary

The following codes are "helper" functions in that they perform specific tasks such as manipulating strings and so on.

coderow.m: enters data from a HTML-table tow into MATLAB. Used as an extraction tool for rows after the *gettabledata.m* file populates from the string.

coderowCaseData.m: customized version of *coderow.m* for use with data from the Archive data rather than the CA data.

gettabledata.m: finds the first table within an HTML file.

PreviousLine.m: string manipulation utility. Function returns the line above/or below the current position within the string using custom line delimiters.

LineContents.m: string manipulation utility. Function returns the line above/or below the current position.

replacestring.m: string manipulation utility. Replaces one string with another.

RenameFiles.m: unused. File manipulation utility. Basic utility for renaming files in a particular directory.

striptags.m: string manipulation utility. Removes HTML tag information, i.e. transforms
\<a href="link.htm"\>link address\<\/a\> to "link address" using regular expressions.