Child-Adoption Matching: Preferences for Gender and Race*

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Abstract

This paper uses a new data set on child-adoption matching to estimate the preferences of potential adoptive parents over U.S.-born and unborn children relinquished for adoption. We identify significant preferences favoring girls and unborn children close to birth, and against African-American children put up for adoption. These attitudes vary in magnitudes across different adoptive parents – heterosexual, same-sex couples, and single women. We also consider the effects of excluding single women and same-sex couples from the adoption process. In our data, such policies would substantially reduce the overall number of adopted children and have a disproportionate effect on African-American ones.

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1 Introduction

1.1 Overview

Adoption is an important phenomenon in the U.S. In 2000, about 1.6 million or 2.5% of all children 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.

According to the Census, 54% of U.S.-born adopted children under the age of 10 are female, and 18% are African-American.[2] In contrast, girls and African-Americans represent 48% and 15% of all children, respectively. These differences can be explained by either the preferences of PAPs (the demand side), or the characteristics of children relinquished for adoption by BMOs (the supply side). In this paper, we exploit the unique nature of a new data set documenting the operations of an adoption facilitator in order to disentangle demand and supply effects on outcomes. We identify the preferences of PAPs over the attributes of children 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. Unlike consumers' preferences (that are observable through market behavior) or preferences over marriage partners (that are revealed in dating patterns),[3] very little is known about parents' preferences over children's attributes.[4] For the specific case of adoptive children, our analysis is a step toward filling this gap.

Second, we analyze the determinants of successful matches. In fact, unmatched children enter foster care, which is notoriously detrimental to their short- and long-term welfare.[5] Despite the

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

[2] These figures are derived from the authors' own tabulation using the 5% PUMS.

[3] See the recent papers by Fisman, Iyengar, Kamenica, and Simonson (2006, 2008), Hitch, Hortacsu, and Ariely (2010), and Lee (2009).

[4] An important exception is Dahl and Moretti (2008) and Almond and Edlund (2008), which we discuss below.

[5] 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

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.[6] 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 recently suggested and highly debated regulatory policies. Specifically, we assess the potential effects of a ban on adoption by same-sex parents (implemented in several states) and single women on the volume of successful adoptions.

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 840 cases of either born or unborn children 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 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, same-sex couples, and single women).

Each PAP pays a fixed fee to the facilitator to enter this matching process. PAPs who participate in the matching process observe the children 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.

In order to elicit parents' preferences directly from their behavior in the application process, we need to account for the supply of children of different attributes. The underlying assumption that is at the root of our estimation is that whenever PAPs apply for a subset of the children available, the PAPs prefer the children they apply for over those they do not. This allows us to estimate PAPs' marginal rates of substitution over children's attributes (gender, race, and time to birth) and adoption finalization costs. This behavior is in line with a decentralized search and matching model à-la Burdett and Coles (1997) and Eeckhout (1999). 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

California, 70% of all penitentiary inmates have spent time in foster care (Select Committee Hearing of the California Legislature, 2006).

[6] We discuss several exceptions in Section 1.2.

(their reservation utility) and a BMO accepts a PAP's application if a match with that PAP yields a utility exceeding her own reservation utility. Such a model enables us to estimate the preferences on each sides of the matching process separately. In particular, we use our data to identify which children fall above and below the PAPs' reservation utilities, and subsequently to estimate PAPs' marginal rates of substitution over children's characteristics.

The main advantage of our estimation approach is that it is not sensitive to either demand or supply shifts. On the demand side, our estimation hinges on the PAPs' ranking of the children available on the website according to their preferences. In particular, it is unaffected by PAPs' participation in alternative adoption channels that we do not observe. On the supply side, changes in the population of available children, in terms of either volume or distribution of types, will only affect the constant term in our estimation. We use PAP-day fixed effects to absorb whatever changes in reservation values occur due to supply-side shifts.

We show that PAPs exhibit a preference 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 11.7% if the baby is a girl and 8% 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 preference 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 about $\$19,500$ decrease in adoption finalization costs.

With regard to race, most children 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 before the gender is known, the probability that a given PAP expresses interest in the baby is about 13.4% if the baby is non-African-American and 1.6% if the baby is African-American. Again, converting the racial preference 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 $\$38,000$ decrease in adoption finalization costs. However, we do not observe *any* bias against Hispanic children, who represent a substantial fraction of the children in our data set.

It is interesting to contemplate what underlies these observed preferences. Consider, first, the gender preference. 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.[7]

Consider, now, the racial preference. *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, who can potentially pass as their biological children. Given that the PAPs in our sample are predominantly Caucasian, the desire for similarity is consistent with a preference for Caucasian children. 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 children are more likely to appear different from Caucasian PAPs relative to Caucasian children, homophily would suggest a (possibly weaker) bias against Hispanic children as well. However, as highlighted above, this is not confirmed by the data.

A natural concern pertains to the selection of participants on both sides into the matching process. In particular, observed characteristics of children (such as gender and race) may signal important health and behavioral attributes. Consequently, estimated PAPs' preferences may simply reflect their concerns regarding health and behavior. To address this, we look at the correlation between gender and race of the children in our data and an array of health and behavioral measures of the BMOs. We find no significant difference in any of these measures across gender and race. If anything, we find that African-American BMOs are associated with slightly more desirable health and behavioral markers. On the other side of the process, the preferences of the PAPs that select into the facilitator's operations may not be representative of the entire population of adoptive parents. However, using the Census 2000 data, we find that the cases available through the facilitator end up with adoptions of substantially more boys and African-American children relative to the average adopting household in the U.S. This suggests that PAPs selecting into the facilitator's client pool are potentially more open to adopting boys and African-American children.

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 as well as according to their sexual orientation (heterosexual and same-sex couples). We find that same-sex couples submit applications at nearly three times the rate of straight ones. The preferences mentioned above hold true for all of these categories of PAPs, and the racial preference is stronger

[7]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.

for same-sex couples.

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 child steadily increases the closer the BMO is to delivery, with the probability of an application rising from 3.7% seven months before birth to 8.8% 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 cannot legally 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 PAPs' interest in applying for a bay 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.

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. Our analysis sheds light on this debate. Banning a certain category of PAPs from the adoption process has two effects. First, it affects the volume of PAPs involved in the process, and therefore the number of expected matches. Second, given the differential preferences across PAPs' categories, it changes the distribution of preferences among active PAPs and consequently impacts the type of children that are adopted. 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 we find that this results in a 10% decrease in the probability of being matched. Furthermore, there are significantly more boys and African-American children within the lost matches. Similarly, when we shut down the possibility of single PAPs to submit applications, we find a reduction of 20% in overall matches.

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.[8] There are, however, a few important exceptions.

The paper that is closest to ours in terms of questions addressed is Bernal, Hu, Moriguchi, and

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

Nagypal (2009). 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. At the individual level, the paper estimates the propensities of PAPs to adopt and of BMOs to relinquish their children across time. These findings provide an 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 children relinquished for domestic adoption and the abundance of children in foster care. They suggest the opening of a market for children 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. Most recently, Chen, Ebenstein, Edlund, and Li (2010) show that in domestic Chinese adoption a propensity to adopt girls is compatible with post-natal discrimination against them. This is evident, for example, in the fact that for 8-13 year old children, adopted girls are less likely to attend school than biological children or adopted boys.

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, 2011 and Botticini and Siow, 2010, Del Boca and Flinn, 2011, 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 this process a particularly good fit for this class of models.

Gender and racial preferences are both common and well documented in many realms of modern society.[9] 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, 2010). This work identifies a preference for same-race partners, much in the spirit of the racial preferences we observe.[10] 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 some work suggesting preferences for biological sons in the U.S. (see Dahl and Moretti, 2008; and Almond and Edlund, 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 preferences. 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 the adoption context.

[9]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, 2010; and Flabbi, 2010), 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, 2011). For overviews, see Loury (2002) and Nelson (2009).

[10]See also Banerjee, Duflo, Ghatak and Lafortune (2010) 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.

2 Institutional Environment

2.1 The Adoption Process in the U.S.

Adoption is an ancient institution. 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. 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 then, 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 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 and singles. After undergoing a certification based on a home study, the first choice that PAPs face is whether to participate in either the international or the domestic adoption

[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.

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 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]

[13]These two adoption routes entail several trade-offs. While costs are comparable, international adoption is subject to the restrictions of the Hague Convention on Protection of Children and Cooperation in Respect of Intercountry Adoption (ratified in the US in 2008), 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).

[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,

Successful PAPs can then file for an adoption tax credit that effectively reduces the cost of adoption by a fixed amount.

2.2 Gay, Lesbian, and Single Adoption

Adoption by gay and lesbian couples or individuals is permitted in only a few countries around the world.[16] 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, North Carolina, Ohio Utah, and Wisconsin imposed restrictions on gay and lesbian adoption.[17] Nonetheless, in many states in 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.[18]

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.[19]

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.

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which are classified as charity. If the BMO changes her mind regarding the adoption before finalization, all transfers are generally non-reimbursable.

[16] 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.

[17] Arkansas and Utah, while not explicitely banning gay and lesbian adoption, prohibit adoption by a couple that is not legally married. At the same time, same-sex couples cannot be legally married in these states. However, 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.

[18] 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).

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

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 December 2009.[20] Over a five year period, we collected data on the applications of 729 PAPs to 839 BMOs. The facilitator placed 123 children, while 518 were placed through other channels.

New cases of unborn children or already-born children available for adoption are posted on the facilitator's publicly accessible website regularly.[21] 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.[22] 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 children, and age for already-born children;[23] (b) the 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 PAPs, single PAPs, etc.[24]

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*.[25] 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

[20] See the Data Appendix, available at: http://www.hss.caltech.edu/~lyariv/Papers/Adoption_Data_Appendix.pdf, for detailed information on the construction of the data set.

[21] 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.

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

[23] 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.

[24] 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.

[25] 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.

themselves, their life-style, and how they plan to raise the child.[26] This letter is prepared by the PAPs, often with the help of the facilitator, at the beginning of the matching process and left with the facilitator. In other words, the only decision a PAP has to make when a child becomes available for adoption is whether or not to apply for that child.

3. *The posted cases can be resolved in several ways*: (a) the BMO chooses the desired PAP among the applicants.[27] This results in a match observable on the website, and both the BMO and the PAP leave the website;[28] (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.[29] 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 from when a child's information is first posted, 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 Appendix A.[30]

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

[26]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.

[27]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.

[28]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.

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

[30]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
Girl	0.249	0.433	0	1	839
Boy	0.343	0.475	0	1	839
Caucasian	0.369	0.392	0	1	839
African-American	0.383	0.418	0	1	839
Hispanic	0.133	0.271	0	1	839
Asian	0.022	0.111	0	1	839
Non-African-American Boy	0.203	0.372	0	1	839
Non-African-American Girl	0.137	0.321	0	1	839
African-American Girl	0.112	0.291	0	1	839
African-American Boy	0.140	0.312	0	1	839
Finalization Cost	26745	8661	3500	52300	737
Already Born	0.196	0.397	0	1	839
Months to Birth for Unborn	1.952	1.622	0.033	7.8	650
Months from Birth for Born	1.267	6.219	0.033	69.56	370
Days from Presentation to Last Day on Website	32.24	30.37	1	511	830
Days from First to Last Application	20.42	32.65	0	217	838
Days on Site if Always Born	26.80	24.80	1	146	163
Days on Site if Always Unborn	24.08	17.59	1	121	366
Days on Site if Switch from Unborn to Born	45.69	39.40	1	511	300
Number of Interested PAPs	2.316	2.295	0	16	839
Applications Per Day	0.142	0.294	0	4	830
Bad Health Words	0.002	0.049	0	1	839
Single PAP Allowed	0.616	0.486	0	1	839
Same-Sex PAP Allowed	0.247	0.431	0	1	839

Table 1: Summary Statistics for BMOs

In terms of gender, not conditioning on the achievement of a match, 24.9% of the children in our sample are girls, 34.3% are boys, and the rest are of unknown gender. 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. Conditioning on a match being created (either through the facilitator or through other channels), girls account for 23.5% of matched children, while boys account for 30.5%.

We treat race as a continuous variable to account for children of mixed descent. Averaging across percentages of each ethnicity, the unconditional breakdown in our data set is 36.9% Caucasian, 38.3% African-American, and 13.3% Hispanic. The race breakdown conditional on children finding a match is 38.7% Caucasian, 37.9% African-American, and 14.2% Hispanic.[31]

[31]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

Already-born children constitute 19.6% of our data set, while, conditional on being unborn, the 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 10.8% of all matched children.

In terms of PAPs who are acceptable to BMOs, same-sex PAPs are allowed in 24.7% of the cases, and single women in 61.6% of the cases.[32]

Finally, the 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. The 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 fees are less regulated than the BMO's expenses.[33]

In terms of the outcomes of the matching process, the average number of PAPs who apply for a given child is 2.3, varying from 0 to 16. BMOs decide to parent their child in 5.2% of the cases, are reported as a lost contact in 4.9% of the cases, and as a closed case in 24.9% of cases. A match occurs in 70.9% of the cases (13.5% through the facilitator). The average number of days a case remains on the facilitator's website is 32 days, ranging from 1 to 511 days.

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 time trends of some of the PAPs' attributes are in Table 7 in Appendix A.

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.[34] 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.[35]

are limited solid sources documenting characteristics of adopted kinships. The Census 2000 is the most recent source, according to which the breakdown of U.S.-born adopted children under the age of 10 is 54% female, and 18% African-American.

[32]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.

[33]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).

[34]According to an interview with the facilitator, there are no single men among the PAPs.

[35]For the sake of robustness, we replicated all of our results using these unambiguous classifications.

Variable	Mean	Std. Dev.	Min.	Max.	N
Gay PAP (Unambiguous)	0.041	0.199	0	1	729
Lesbian PAP (Unambiguous)	0.043	0.202	0	1	729
Single PAP (Unambiguous)	0.067	0.251	0	1	729
Ambiguous PAP Name	0.276	0.447	0	1	729
Gay PAP (Score)	0.062	0.217	0	1	600
Lesbian Couple (Score)	0.062	0.221	0	1	599
Single PAP (Score)	0.085	0.274	0	1	600
Applies for a Baby (on a Specific Day)	0.053	0.057	0	1	729
Applies for a Baby (Allowed Choices only)	0.065	0.093	0	1	729
Applies for a Baby (at Some Point in Time)	0.060	0.067	0	1	729
Days between First and Last Application	109	199	1	1797	729
Days Since Last Application for a PAP	2.431	6.669	0	85.698	722

Table 2: Summary Statistics for PAPs

Of the PAPs that have names with unambiguous gender classification, 79.1% are straight couples, 5.7% are gay men, 5.9% are lesbians, and 9.3% are single women. We use these priors to construct straight, gay, and lesbian scores for PAPs with names entailing some gender ambiguity.[36]

According to this classification criterion, 79.1% of the PAPs in our sample are straight couples, 6.2% are gay couples, 6.2% are lesbian couples, and 8.5% are single women.

With respect to PAPs' race, interviews with the facilitator suggested that virtually all of the PAPs in our data set are Caucasian.

We consider a PAP *active* from the time at which the PAP submits the first application until ten days after the last application is submitted.[37] Given these assumptions, active PAPs apply for a child for which they are acceptable with a 6.5% probability.

The average time elapsed between the PAPs' first and last application is 109 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%.[38]

[36]For instance, 'Jack&Jamie' could be either a straight or a gay men couple. They are coded with the corresponding posterior of $0.93 = \frac{0.791}{0.791+0.057}$ that serves as their "Straight PAP" score and with the complementary posterior of 0.07 that serves as their "Gay PAP" score. Similarly, 'Kim&Jamie' is coded with a 0.87 "Straight PAP" score, a 0.06 "Gay PAP" score, and a 0.07 "Lesbian PAP" score.

[37]We provide robustness checks for our results with respect to the length of this window in Appendix A.

[38]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%.

4 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 and singles), we analyze how the preferences with respect to children's attributes vary across 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.[39]

At the root of our estimation is the assumption that when PAPs apply for a subset of the children available, they prefer the children they apply for to the others available on the site. Similarly, when BMOs select the PAPs who would adopt their child, we assume they prefer those PAPs to the others who have applied.

This assumption has two important implications for our estimation strategy. First, it allows us to assess preferences for each side of the matching process separately. Second, it enables us to evaluate marginal rates of substitution over attributes of parents and children when only a slice of the market is being observed. The latter point is particularly important in view of the fact that some PAPs may be utilizing multiple adoption channels and, likewise, some BMOs may pursue several paths when considering relinquishing their child.[40]

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

[39] 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 Appendix A, we discuss the robustness of our results to a window of *90 days* (Table 9). Also, Table 10 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 noticeable impact on our results.

[40] This is under the additional assumption that there is no adverse selection into the matching process by either side (PAPs or BMOs). This is validated empirically in Subsection 5 below.

The assumption above is tantamount to PAPs and BMOs operating using a (possibly time-dependent) reservation utility – 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 specification and assume that each PAP of type θ assesses the utility from a child of characteristics c as

$$u_{PAP}(\theta; c) = \beta_\theta \cdot c + \beta_{\theta,0} + \varepsilon_{tbp} \geq \bar{u}_{PAP}(\theta), \tag{1}$$

where $\beta_{\theta,0}$ is a constant term that varies with PAP's type and year, ε_{tbp} is an idiosyncratic unobservable distributed according to the standard normal distribution (corresponding to each triplet (t, b, p)), and $\bar{u}_{PAP}(\theta)$ is the reservation utility of PAPs of type θ.

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.[41] 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, as it is confounded with the constant term in the utility specification.

This approach enables us to encase all suppy-side factors into the reservation values. Any change in the supply of available children, in terms of either volume or distribution of types, will only change the constant term in our estimation. Therefore, PAP-day fixed effects absorb whatever changes in reservation values occur due to supply-side shifts.

In principle, individual PAPs may be using different reservation utilities (due to, say, access to different adoption channels). PAPs might also use a strategy that allows for reservation utilities that vary with the time the PAPs spend on the website. When we estimate the parameters of equation (1) controlling for the PAPs' time on the website, we obtain coefficients β_θ that are essentially identical to those presented below. As well, we have estimated the parameters of equation (1) using a conditional logit with PAP-day fixed effects, and we find coefficients β_θ that are virtually identical to those we present below (see Table 8 in Appendix A). Thus, our identification is a consequence of the variations in choice sets PAPs face on any given day, rather than of differences between PAPs or across time.

Table 3 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 PAP-BMO pair to account for serial correlation, since a PAP's application is kept on the website until the

[41] In all our estimations, African-American variables are continuous variables corresponding to the percentage characterizing how African American the child is.

baby is matched. Here and throughout the rest of the regression tables, unless otherwise indicated, the t-statistics appear in parentheses.

The first column of Table 3 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, and lesbian couples—are characterized by the same utility function—namely, the coefficients β_θ in (1) 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 3 correspond to estimated models in which different categories of PAPs are allowed to have different preferences.[42] 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 3 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 children has a 11% 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 8.9%.

According to the third and fourth columns of Table 3, 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 7.4% for straight couples, 17.8% for gay PAPs, 21.1% for lesbian PAPs, and 8% for single women. 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.[43]

[42] For the categories of gay and lesbian PAPs we restricted attention to PAPs who had a positive gay or lesbian score and children for whom these categories of PAPs were allowed. Our estimations remain virtually identical if we restrict attention to PAPs with unambiguous classifications (i.e., 100% gay or lesbian scores).

[43] 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.

Dependent Variable: PAP Applies for BMO	All	Straight PAP	Gay PAP(†)	Lesbian PAP(†)	Single PAP
Activity Window: 10 Days					
Already Born (d)	-0.015*	-0.020**	-0.044	-0.073	0.027
	(-2.14)	(-2.83)	(-0.54)	(-0.82)	(0.87)
Months to Birth	-0.001***	-0.001***	-0.002	-0.002	-0.001
	(-3.58)	(-3.45)	(-0.64)	(-0.62)	(-1.17)
Finalization Cost in $10,000s	-0.019***	-0.017***	-0.027	-0.107**	-0.023*
	(-6.02)	(-5.25)	(-0.85)	(-2.60)	(-2.31)
African-American Girl	-0.054***	-0.047***	-0.189*	-0.212**	-0.055*
	(-6.33)	(-5.21)	(-2.39)	(-2.66)	(-2.33)
African-American Boy	-0.073***	-0.070***	-0.059	-0.094	-0.080**
	(-7.95)	(-7.18)	(-0.83)	(-1.00)	(-2.90)
African-American Unknown Gender	-0.073***	-0.070***	-0.115	-0.104	-0.076***
	(-8.32)	(-7.44)	(-1.34)	(-1.38)	(-3.69)
Non-African-American Girl	0.028***	0.024***	0.111	0.256*	0.031
	(4.02)	(3.38)	(1.18)	(2.57)	(1.32)
Non-African-American Boy	-0.009	-0.012	-0.013	0.121	-0.002
	(-1.41)	(-1.73)	(-0.18)	(1.76)	(-0.10)
Hispanic	-0.001	0.001	0.131	-0.037	-0.025
	(-0.07)	(0.17)	(1.37)	(-0.29)	(-0.96)
Gay PAP	0.062***				
	(4.82)				
Lesbian PAP	0.095***				
	(8.03)				
Single PAP	0.014*				
	(2.07)				
Year Fixed Effects	X	X	X	X	X
Probability for Mean Attributes	0.089	0.074	0.178	0.211	0.080
Probability for Base Case (‡)	0.110	0.117	0.180	0.269	0.095
χ^2	342	211	35	46	45
Log-Likelihood	-208886	-169040	-6240	-9205	-21518
Observations	822441	713080	38610	33733	96883
PAP-BMO	28842	25377	1347	1142	3111

(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-BMO pair. (†): Gay and lesbian estimated using weighted probit. (‡) 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 3: Determinants of PAPs' Applications (Activity Window of 10 Days) – Marginal Effects for Probit

4.1 Preferences over Gender

In our data, the gender of each baby is "boy," "girl," or "unknown." In order not to confound gender and health effects, we measure the PAPs' gender preference 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 3.7% higher than non-African-American boys, a large effect given that the child with mean attributes has a probability of 8.9% of receiving an application. In other words, PAPs have a positive and sizable preference in favor of (non-African-American) girls. We can quantify the gender preference 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 $\$19,473$ in finalization costs. This higher desirability of girls is consistent with anecdotal evidence reported by adoption agencies and the popular press covering the adoption process.[44] It is also consistent with adoption *outcomes* in the U.S. Indeed, the 2000 Census reported that 47% of adopted children were male as compared with 51% of 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.

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 3.6% for straight couples, 12.4% for gay couples, 13.5% for lesbian couples and 3.3% for single women. The large gender preferences pertaining to gay and straight PAPs suggest that women's preference for girls is not the sole driving force behind this preference.[45] 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 3 also highlights a positive and sizable (although not statistically significant) preference 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 1.9%. This difference results in an overall application probability of 3.5% for African-American girls and 1.6% for African-American boys. In other words, the probability of an African-American

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

[45] The gender preferences we identify for gay couples and single women, despite being large in sizes, are not highly significant due to the fact that far fewer observations are available for them.

girl receiving an application is more than double that of an African-American boy. In relative terms, the gender preference for African-American children is larger than the preference for non-African-American children.

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.[46] 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.[47]

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.[48] 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.[49]

4.2 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

[46]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).

[47]In terms of incarceration, the U.S. Department of Justice reports that the imprisonment rates in 2001 were: 16.6% for African-American males, 7.7% for Hispanic males, 2.6% for Caucasian males, 1.7% for African-American females, 0.7% for Hispanic females, and 0.3% for Caucasian females.

[48]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.

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

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 preferences in the adoption environment.[50]

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.

Projecting the marginal effect linearly, the probability that a 100% African-American baby (of unknown gender) receives an application is 1.6% in contrast to a probability of 13.4% for a 0% African-American baby.[51] Similarly, application probabilities decrease dramatically for both African-American girls and boys. In other words, PAPs in our sample exhibit a large and negative preference against African-American children.

Again, the estimated effect of finalization costs in Table 3 allows us to convert the racial preference into dollars. The decrease in desirability of an African-American baby of unknown gender with respect to one with mean attributes is equivalent to a $\$38,421$ increase in adoption finalization costs. In fact, using a linear interpolation as above, we obtain a willingness to pay for a 100% African-American baby with respect to a 0% African-American baby as high as $\$62,270$.

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, Smith-Lovin, and Cook, 2001 and references therein).[52] 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 virtually all of the PAPs in our data set are Caucasian, homophily would be consistent with a negative attitude toward African-American children.[53]

Hispanic children account for 13.3% of children on the website. However, we do not find a racial preference 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 0.1% if the baby is Hispanic. To the extent that Hispanic children may look different than Caucasian children, this

[50] 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.

[51] The 13.4% probability is derived through a linear interpolation of the 1.6% probability of application for a 100% African-American baby (of unknown gender) and the 8.9% probability of application for the baby with mean attributes (according to Table 1, 38.3% of babies are African-American).

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

[53] In the entire population of adoptive parents in the U.S., according to the Census 2000, only 12% are African-American.

suggests that a preference for physical similarity alone cannot account for the racial preferences we observe.

In terms of different PAP categories, we find that the preference against African-American children is similar across straight, gay men, and lesbian couples. The negative effect on the application probability for an African-American child of a straight couple is -4.7% for a girl, -7% for a boy, and -7% for a child of unknown gender, off an application probability of 7.4% for a child with mean attributes. This same effect on the application probability of gay men is -18.9% for a girl, -5.9% for a boy and -11.5% for a child of unknown gender, off an application probability of 17.8% for a child with mean attributes. Likewise, this effect for lesbian couples is -21.2% for a girl, -9.4% for a boy, and -10.4% for a child of unknown gender, off an application probability of 21.1% for a child with mean attributes. These observations suggest that the racial preference 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 strong and significant racial preferences for single women, for whom we find an effect on the application probability for an African-American child of -5.5% for a girl, -8% for a boy, and -7.6% for a baby of unknown gender, off an application probability of 8% for a child with mean attributes.

4.3 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 3 and 11 show estimates regarding the desirability of unborn children over the pregnancy and of already-born children. Table 3 reports a probability of 7.4% for an already-born child to receive an application, while the same probability for an unborn child is 8.9%. Note that this significant decrease occurs despite the fact that the average age of already-born children in our sample is *just over* 1 *month*.

Table 3 suggests a significant negative effect of time to birth for unborn children. In Table 11, 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 3.7% to 7.2%, they are fairly constant over the three months preceding birth.[54]

[54]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).

In principle, there are two opposing effects at work that influence children's 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.[55] On the other hand, several forces make BMOs early in their pregnancy potentially less appealing. First, since by law the BMO cannot 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.[56] Indeed, if the BMO eventually reconsiders the adoption plan, most of 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.

4.4 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 3 shows that an increase in adoption finalization costs of $\$10,000$ decreases the probability of receiving an application from 8.9% to 7%.

As it turns out, there is a strong dependence of adoption finalization costs on children's attributes. We find that African-American children of unknown gender are associated with costs that are $\$7,050$ lower relative to non-African-American children of unknown gender. In addition, non-African-American boys are associated with costs that are $\$2,300$ lower than non-African-American girls (see Table 12 in Appendix A). While these differences are significant, notice that they are far smaller than the differences in willingness to pay discussed in Sections 4.1 and 4.2. Thus, while differences in costs mitigate the differences in desirability for race and gender, they provide only partial compensation.[57]

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

[55] 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.

[56] Detailed information we collected on auxiliary cases suggests that out of the total adoption finalization costs, up to 60% is non-refundable in the event the match falls through.

[57] We stress that even though costs depend to some extent on children's attributes and are therefore not exogenous, the preferences we estimate using our application regressions remain valid since we effectively control for this dependence.

more than straight and gay couples and single women. Thus a $\$10,000$ increase in adoption finalization costs reduces the desirability of a child by 1.7% for straight couples, 2.7% for gay men, 10.7% for lesbian couples and 2.3% for single women. 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.

5 Selection into the Matching Process

A natural concern regarding our analysis pertains to the selection of participants on both sides into the matching process. In particular, observed characteristics of children (such as gender and race) may signal important health and behavioral attributes. In turn, PAPs may take into account the signaling aspect of observed characteristics when applying for children. Estimated preferences may then simply reflect PAPs' concerns regarding health and behavior. On the other side of the process, the preferences of the PAPs that select into the facilitator's operations may not be representative of the entire population of adoptive parents.

5.1 Adverse Selection of BMOs

We obtained auxiliary data from the facilitator containing more detailed information about 196 BMOs corresponding to recently posted cases. These data document BMOs' age, medical history, education background, criminal record, as well as drug and alcohol abuse. If the observed child characteristics (namely, gender and race) are proxies for any of these, we should observe a nontrivial correlation between observed characteristics and indicators of health and behavioral issues.

Table 4 reports means of the BMOs' health, demographic, and behavioral markers conditional on the children's gender and race.

Regarding gender, the cases corresponding to boys and girls do not appear significantly different from one another (with 10% confidence) in any of the dimensions we consider.

Regarding race, we have split the data according to whether the race composition of the child is above or below 50% African-American.[58] Overall, we find that African-American BMOs, who are associated with the less desirable children according to our preference analysis in Section 4.2, consistently exhibit slightly superior values in each of the markers. The level of pre-natal care, age,

[58] Of the 196 cases in our additional data, 62 involve children whose race composition is at least partly African-American. Of these, 6 children are 25% African-American, 29 are 50% African-American, and 24 are fully African-American. The division of the data utilized to create the table therefore corresponds to a median split over these cases.

	African-American				Gender					
	$< 50\%$		$\geq 50\%$		Boy		Girl		Unknown	
	Mean	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
Pre-Natal Care*	0.91	74	0.89	39	0.86	35	0.88	43	0.95	38
	(0.03)		(0.05)		(0.06)		(0.05)		(0.04)	
Criminal Record$^{\Diamond}$	0.56	43	0.56	25	0.57	23	0.48	23	0.60	20
	(0.08)		(0.10)		(0.11)		(0.11)		(0.11)	
Serious Health Problems†	0.59	63	0.43	35	0.53	34	0.58	33	0.47	34
	(0.06)		(0.08)		(0.09)		(0.09)		(0.09)	
Drug or Alcohol Use‡	0.68	69	0.53	40	0.66	44	0.67	33	0.43	28
	(0.06)		(0.08)		(0.07)		(0.08)		(0.10)	
Obesity (BMI Above 30)	0.28	101	0.30	56	0.25	56	0.29	49	0.26	47
	(0.04)		(0.06)		(0.06)		(0.07)		(0.06)	
Age	28.2	94	28.5	50	29.0	50	28.5	45	28.0	44
	(0.6)		(0.8)		(0.8)		(0.9)		(1.01)	
Education$^{\spadesuit}$	1.95	75	2.18	42	2.09	44	1.88	39	2.19	27
	(0.09)		(0.14)		(0.13)		(0.14)		(0.13)	

Standard Errors in parenthesis. $*$ Pre-Natal Care refers to a binary variable that records whether the BMO received medical attention during the pregnancy. $\Diamond$ Criminal Record refers to felony convictions or jail time. † Serious Health Problems include cancer, diabetes, heart condition, coma, epilepsy, severe depression, and chlamydia during pregnancy. ‡ Drug Use includes meth, crack, heroin, cocaine, amphetamines. Alcohol Use refers to heavy alcohol consumption during pregnancy. $\spadesuit$ Education refers to the last grade completed as follows: 1 for some high school, 2 for completed HS/GED, 3 for some college, and 4 for a college degree.

Table 4: BMOs' Selection

and education achievement are all very similar across the two groups of BMOs. However, criminal records, serious health problems, serious drug abuse, and obesity are more frequent (albeit not in a statistically significant way, even with 10% confidence) among the less African-American cases.

5.2 Selection of PAPs

Using the Census 2000, we can compare aggregate characteristics of adopted children in the U.S. and of matched children in our data set.[59] Specifically, the Census identifies 54% of adopted children as girls. In our data set, 25% of posted cases correspond to girls and 34% to boys (with the remaining cases corresponding to unborn children of unknown gender). Out of matched cases in which the children's gender is known, 44% correspond to girls, while 56% correspond to boys. This difference is consistent with the preference for girls we have identified. However, the comparison with the Census figures suggests that PAPS who select into our data set are, if anything, more open to adopting a boy relative to the average adopting household in the U.S.

[59] As mentioned, all reported figures are derived from the authors' own tabulation using the 5% PUMS for domestic adoptions of children under the age of 10.

With respect to race, the Census reports 18% of adopted children as African-American, while only 6.4% of adopted children are reported as African-American when the head of the household is classified as Caucasian (the Census' data is based on self-reported coarse classification of race). In our data, of all cases of matched children (through the facilitator or through other channels), 54% correspond to children who are at least partially African-American and 24% correspond to children who are 100% African-American. Recall that PAPs in our data set are virtually all Caucasian. This suggests that PAPs who select into our data set are, if anything, more open to adopting an African-American child than the average adopting household in the U.S.

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.

The ex-ante choice of acceptable categories of PAPs cannot be explained by baby attributes, as can be seen in Table 13 in Appendix A. 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 $12\% - 55\%$ between 2004 and 2006, relative to 2009). According to the time trends reported in Table 7 in Appendix A, the fraction of gay and lesbian 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.[60]

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 14 in Appendix A).

[60] 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.

Dependant Variable	Matched	Matched through Facilitator
Already Born (d)	-0.05	-0.08***
	(-0.54)	(-5.44)
African-American	0.08	0.02
	(1.34)	(0.69)
Girl (d)	0.11*	0.02
	(2.02)	(0.45)
Boy (d)	0.16**	0.07
	(3.07)	(1.90)
PAP Arrival Rate Per Day	0.24**	0.13***
	(2.80)	(3.59)
Finalization Cost (in $10,000s)	0.11**	0.05*
	(3.03)	(2.34)
Months from Presentation to Birth	0.00*	-0.00
	(1.99)	(-0.75)
Same-Sex PAP Allowed (d)	-0.20**	0.09
	(-3.14)	(1.90)
Single PAP Allowed (d)	0.03	-0.01
	(0.50)	(-0.29)
Year Fixed Effects	X	X
Probability for Mean Attributes	0.686	0.071
χ^2	47.54	51.63
Log-Likelihood	-262.8	-127.2
BMOs	452	452

(d) for discrete change of dummy variable from 0 to 1. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. 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.

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).[61] In our sample, 13.5% of cases result in a match through the facilitator, and, overall, 70.9% of cases become matched through the facilitator or in other ways.[62] Table 5 contains estimation results regarding the determinants of a successful match, through the facilitator or through other channels, controlling for all observable baby characteristics.

[61] As mentioned above, 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).

[62] 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).

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.

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 20 days, our estimations suggest that an increase of two applications corresponds to the overall probability of a successful match increasing by approximately 2.4%.

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.

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 5% in the probability of a match through the facilitator, and an increase of 11% 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 generating matches, and (ii) more expensive agencies targeting children that are desirable in terms of unobserved characteristics, resulting in more successful matches.

7 Policy Implications

When considering the debate on whether or not to ban a certain category of PAPs (in our case same-sex couple) from the adoption process, there are two effects to consider. First, reducing the volume of participating PAPs will potentially decrease the number of adopted children. We stress that reducing the number of adopted children comes at significant costs. For example, 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 foster care at age three if he or she is

adopted rather than remaining there throughout childhood. Furthermore, Hansen (2006) calculated that the human service costs of adoption are about one-half the costs of long-term foster care.[63] Second, given the difference in preferences across PAP categories identified in Section 4, excluding particular PAPs will affect the distribution of attributes (gender, race, etc.) of adopted children. In this section, we provide counterfactual exercises that quantify these two effects for same-sex and single PAPs.

We start by noting that studies tracking adopted children identify some positive effects and no negative effects of adoption by gay or lesbian parents as opposed to heterosexual parents.[64] Therefore, given the likely costs generated by children that remain unmatched, the number of successful adoptions is a reasonable proxy for the effectiveness of the matching process. Therefore, we estimate the impact of the participation of same-sex couples in the adoption process by assessing the number of matches that would be lost should gay and lesbian PAPs be restricted from participating.[65] In our data, same-sex couples are chosen by the BMOs in 12% of all cases of matched children 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. In order to generate a more conservative estimate, 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 submitted.[66,67] This amounts to 10% of matched cases in our data. This is clearly a large effect given that, according to Table 6, only 19% 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, reducing the pool of potential parents

[63] 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.

[64] 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).

[65] In this counterfactual exercise we study the comparative statics within one equilibrium of the model presented in Appendix 14.

[66] The significant variance observed in the number of applications BMOs receive by the time of a match suggests that they are not determining their stay on the website based on the number of applications received. However, our counterfactual estimates do not take into account that, had certain PAP categories been excluded, BMOs could stay on the website longer, possibly receiving additional applications that we do not observe.

[67] 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.

would reduce the competition on the parents' side and could lead to an increase in the threshold utility. 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.

In terms of the attributes associated to children whose match would have been lost under our counterfactual exercise, we find that 47% of severed matches correspond to boys (to be contrasted with boys representing 24% of the overall observed matches). In terms of race, 41% of lost matches correspond to African-American children (as compared with 37% of matched children being African-American). This suggests that, while same-sex couples have strong preferences against boys and African-American children, they still play an important role in their placement due to lower reservation utilities, as we discussed in Section 4.

As for single PAPs, a similar counterfactual exercise generates even starker results. In our data, 24% of matched children are ultimately matched with a single PAP. 20% of matched children received applications only from single PAPs, which serves as an estimate of the percentage of matches that would be lost had single PAPs been banned from the process. This is a particularly large effect given that only 57% of matched cases allow single PAPs to apply.

Of the matches that would have been lost, 44% are African-American children, slightly higher than the percentage in the entire population of matched children. Consistent with our estimate of the strong gender preference single PAPs exhibit, only 6% of the severed matches due to the exclusion single PAPs correspond to boys.

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 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 $\$19,500$ 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 8.9% to 7%.

Different categories of adoptive parents—straight, gay, lesbian, or single—have different behaviors in the matching process. We find that gay men and lesbian couples submit applications to 17.8% and 21.1% of children, respectively, while straight couples submit applications to only 7.4% of children. 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 preferences in favor of girls and against African-American children.

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. More specifically, 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 exercise banning same-sex parents from our sample lowers the number of adopted children by about 10%. A similar exercise entailing the exclusion of single women from our sample lowers the number of adopted children by approximately 20%. Therefore, such bans could increase the fraction of children in foster care, which has well documented detrimental effects.

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).

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Appendix A: Supplementary Analysis

Variable	Mean	Std. Dev.	Min.	Max.	N
Girl	0.235	0.424	0	1	639
Boy	0.305	0.461	0	1	639
Gender Unknown	0.46	0.499	0	1	639
African-American	0.379	0.405	0	1	639
Caucasian	0.387	0.388	0	1	639
Hispanic	0.142	0.285	0	1	639
Same-Sex PAPs Allowed	0.187	0.39	0	1	343
Single PAPs Allowed	0.574	0.495	0	1	343
Already Born	0.108	0.311	0	1	639
Days from Birth to Presentation if Born	217.551	743.653	1	5879	479
Days from Presentation to Birth if Unborn	243.667	105.468	7	338	9
Number of Interested PAPs	3.164	2.235	1	15	639
Number of Interested Same-Sex PAPs	2.974	1.486	0.43	6.553	343
Number of Interested Single PAPs	5.873	2.647	0.266	12.133	343
PAP Arrival Rate Per Day	0.243	0.392	0.003	4	610
Matched on the Website	0.192	0.395	0	1	639
Days from Presentation to Last Day on Website	44.561	66.27	1	469	610

Table 6: Summary Statistics of BMOs if matched

	2004	2005	2006	2007	2008	2009
PAP						
Number of PAPs	135	278	149	103	88	151
Gay PAP	0.030	0.067	0.066	0.068	0.090	0.072
Lesbian PAP	0.061	0.059	0.056	0.091	0.104	0.132
Single PAP	0.175	0.126	0.124	0.082	0.078	0.108
BMO						
Number of BMOs	139	238	141	88	117	210
Same-Sex PAP Allowed	0.302	0.176	0.156	0.295	0.333	0.345
Single PAP Allowed	0.784	0.643	0.518	0.602	0.590	0.631
African-American	0.447	0.457	0.370	0.365	0.350	0.304
Girl	0.302	0.206	0.234	0.216	0.231	0.257
Boy	0.252	0.378	0.376	0.239	0.393	0.362
Months to Birth	0.621	0.749	1.22	0.409	1.79	1.02
Finalization Cost	20522	22834	26543	27294	31076	31638

Table 7: Trends from 2004 to 2009

Dependent Variable:	I	II	III
PAP Applies for Baby			
Activity Window: 10 Days			
Already Born (d)	-0.193	-0.211	-0.213
	(-1.51)	(-1.50)	(-1.65)
Months to Birth	-0.016**	-0.017**	-0.016***
	(-3.27)	(-2.75)	(-3.34)
Finalization Cost in $10,000s	-0.395***	-0.400***	-0.378***
	(-8.54)	(-7.67)	(-8.22)
African-American Girl	-0.749***	-0.748***	-0.758***
	(-5.95)	(-5.56)	(-6.02)
African-American Boy	-1.110***	-1.048***	-1.121***
	(-7.70)	(-6.30)	(-7.75)
African-American Unknown Gender	-1.028***	-1.111***	-1.043***
	(-7.58)	(-8.10)	(-7.69)
Non-African-American Girl	0.387***	0.460***	0.372***
	(4.09)	(4.35)	(3.91)
Non-African-American Boy	-0.122	-0.032	-0.134
	(-1.32)	(-0.34)	(-1.46)
Hispanic	0.025	0.065	0.013
	(0.22)	(0.48)	(0.12)
Months PAP on Site			-0.06***
			(-10.91)
χ^2	233.57	12056.04	349.52
Log-Likelihood	-266292.1	-169793.6	-261379.7
Observations	1390960	889326	1390960
PAP-BMO	40122	40122	40122
PAP-Day FE		X	
Year FE	X		X
PAP Type FE	X		X

T-statistic in parenthesis. $^{*}p < 0.05,^{**}p < 0.01,^{***}p < 0.001$. Coefficients of Logit shown in Columns I and III. Coefficients of Conditional Logit shown in Column II. Standard Errors Clustered by PAP-BMO Pair (using a bootstrap procedure with 100 replications for Column II).

Table 8: Determinants of PAPs' Applications Accounting for Fixed Effects (Activity Window of 10 days)

Dependent Variable: PAP Applies for Baby	All	Straight PAP	Gay PAP†	Lesbian PAP†	Single PAP
Activity Window: 90 Days					
Already Born (d)	-0.008	-0.011*	-0.032	-0.051	0.027
	(-1.40)	(-2.07)	(-0.53)	(-0.79)	(1.07)
Months to Birth	-0.001**	-0.001**	-0.002	-0.001	-0.001
	(-3.11)	(-2.79)	(-0.87)	(-0.68)	(-1.07)
Finalization Cost in $10,000s	-0.015***	-0.013***	-0.027	-0.106***	-0.020**
	(-6.40)	(-5.40)	(-1.14)	(-3.48)	(-2.71)
African-American Girl	-0.037***	-0.033***	-0.133*	-0.135*	-0.039*
	(-6.01)	(-5.06)	(-2.07)	(-2.26)	(-2.22)
African-American Boy	-0.051***	-0.048***	-0.049	-0.077	-0.056**
	(-7.66)	(-6.87)	(-0.89)	(-1.08)	(-2.68)
African-American Unknown Gender	-0.051***	-0.049***	-0.087	-0.078	-0.054***
	(-8.13)	(-7.27)	(-1.30)	(-1.36)	(-3.57)
Non-African-American Girl	0.020***	0.018***	0.089	0.177**	0.022
	(4.12)	(3.61)	(1.29)	(2.63)	(1.30)
Non-African-American Boy	-0.006	-0.007	-0.007	0.076	0.001
	(-1.27)	(-1.52)	(-0.14)	(1.52)	(0.09)
Hispanic	0.001	0.002	0.094	-0.007	-0.014
	(0.20)	(0.32)	(1.32)	(-0.08)	(-0.72)
Gay PAP	0.056***				
	(6.09)				
LesbianPAP	0.076***				
	(9.04)				
Single PAP	0.011*				
	(2.26)				
Year Fixed Effects	X	X	X	X	X
Probability for Mean Attributes	0.062	0.048	0.137	0.157	0.056
Probability for Base Case‡	0.066	0.069	0.137	0.203	0.073
χ^2	298.33	151.17	30.75	57.10	51.22
Log-Likelihood	-233066.0	-189086.6	-7081.8	-10555.9	-23414.2
Observations	1173780	1026158	50218	46025	134323
PAP-BMO	34788	30713	1607	1465	3639

(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-BMO pair. (‡)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 and lesbian estimated using weighted probit.

Table 9: Determinants of PAPs' Applications (Activity Window of 90 Days) – Marginal Effects for Probit

Dependent Variable:	All	Straight PAP	Gay PAP†	Lesbian PAP†	Single PAP
PAP Applies for Baby					
♣ Application at Some Point in Time					
Already Born (d)	-0.004	-0.008	-0.008	0.045	0.023
	(-0.93)	(-1.84)	(-0.15)	(0.65)	(1.18)
Months to Birth	-0.000	-0.000	0.001	0.002	-0.001
	(-1.14)	(-1.14)	(0.36)	(1.11)	(-0.91)
Finalization Cost in $10,000s	-0.012***	-0.011***	-0.006	-0.039	-0.016*
	(-7.07)	(-6.27)	(-0.31)	(-1.73)	(-2.54)
African-American Girl	-0.032***	-0.027***	-0.128*	-0.106	-0.054***
	(-6.67)	(-5.43)	(-2.39)	(-1.92)	(-3.49)
African-American Boy	-0.050***	-0.046***	-0.064	-0.103*	-0.068***
	(-9.95)	(-8.83)	(-1.42)	(-2.04)	(-3.69)
African-American Unknown Gender	-0.043***	-0.042***	-0.157***	-0.043	-0.041**
	(-10.07)	(-9.22)	(-3.67)	(-1.04)	(-2.93)
Non-African-American Girl	0.013**	0.012**	-0.045	0.040	0.035*
	(3.24)	(2.86)	(-0.73)	(0.67)	(2.21)
Non-African-American Boy	-0.011**	-0.010**	-0.074	0.056	-0.026
	(-3.00)	(-2.69)	(-1.67)	(1.29)	(-1.78)
Hispanic	-0.005	-0.001	0.006	-0.054	-0.039*
	(-1.09)	(-0.16)	(0.08)	(-0.78)	(-2.11)
Single PAP	0.018***				
	(4.69)				
Gay PAP	0.054***				
	(7.81)				
Lesbian PAP	0.061***				
	(10.16)				
Year Fixed Effects	X	X	X	X	X
Probability for Mean Attributes	0.059	0.047	0.129	0.150	0.061
Probability for Base Case ‡	0.066	0.070	0.139	0.147	0.089
χ^2	504.40	268.46	65.72	36.20	42.15
Log-Likelihood	-6741.5	-5493.3	-195.9	-285.8	-608.2
PAP-BMO	34439	30422	1442	1312	3444

(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-BMO pair. (‡) 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 and lesbian 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 10: 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
PAP Applies for Baby					
Activity Window: 10 Days					
Already Born (d)	-0.011	-0.016*	-0.001	-0.058	0.024
	(-1.53)	(-2.15)	(-0.01)	(-0.62)	(0.74)
1 Month to Birth (d)	-0.001	-0.001	0.045	0.003	-0.000
	(-0.19)	(-0.45)	(0.98)	(0.08)	(-0.04)
2 Months to Birth (d)	0.001	0.001	0.069	0.003	-0.010
	(0.30)	(0.13)	(1.30)	(0.07)	(-0.87)
3 Months to Birth (d)	-0.005	-0.005	0.044	-0.016	-0.018
	(-1.32)	(-1.18)	(0.83)	(-0.30)	(-1.44)
4 Months to Birth (d)	-0.017***	-0.015***	-0.063	-0.067	-0.023
	(-4.23)	(-3.50)	(-1.62)	(-1.35)	(-1.67)
5 Months to Birth (d)	-0.027***	-0.024***	-0.083*	-0.093	-0.025
	(-6.21)	(-5.52)	(-2.17)	(-1.83)	(-1.73)
6 Months to Birth (d)	-0.032***	-0.030***	-0.072	-0.120*	-0.025
	(-6.31)	(-5.65)	(-1.46)	(-2.49)	(-1.43)
7 Months to Birth (d)	-0.049***	-0.046***	0.062	-0.173***	-0.056***
	(-9.44)	(-8.56)	(0.52)	(-3.64)	(-4.74)
8 Months to Birth (d)	-0.052***	-0.046***	-0.023	-0.217***	-0.066***
	(-7.71)	(-6.12)	(-0.16)	(-9.13)	(-8.78)
Month After Birth	-0.000	-0.001	-0.003	-0.005	0.000
	(-0.71)	(-1.63)	(-0.82)	(-1.44)	(0.42)
Finalization Cost in $10,000s	-0.021***	-0.019***	-0.036	-0.107**	-0.024*
	(-6.83)	(-6.03)	(-1.18)	(-2.65)	(-2.53)
African-American Girl	-0.068***	-0.059***	-0.226**	-0.275***	-0.069**
	(-7.84)	(-6.47)	(-2.88)	(-3.32)	(-2.88)
African-American Boy	-0.086***	-0.081***	-0.091	-0.162	-0.092***
	(-9.44)	(-8.42)	(-1.32)	(-1.72)	(-3.36)
African-American Unknown Gender	-0.084***	-0.079***	-0.148	-0.165*	-0.085***
	(-9.61)	(-8.50)	(-1.78)	(-2.24)	(-4.03)
Non-African-American Girl	0.017*	0.014*	0.060	0.190	0.020
	(2.38)	(1.99)	(0.67)	(1.89)	(0.86)
Non-African-American Boy	-0.019**	-0.020**	-0.051	0.057	-0.012
	(-2.87)	(-2.91)	(-0.73)	(0.81)	(-0.55)
Hispanic	-0.007	-0.004	0.089	-0.101	-0.030
	(-0.93)	(-0.55)	(0.97)	(-0.79)	(-1.16)
Gay PAP	0.061***				
	(4.78)				
Single PAP	0.015*				
	(2.18)				
Lesbian PAP	0.095***				
	(8.11)				
Years (d)	X	X	X	X	X
Probability for Mean Attributes	0.089	0.074	0.172	0.211	0.081
Probability for Base Case‡	0.137	0.145	0.206	0.369	0.126
χ^2	410	276	64	61	68
Log-Likelihood	-210318	-170325	-6131	-9149	-21654
Observations	830756	720485	39285	34144	97761
PAP-BMO	29182	25691	1372	1160	3143

(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-BMO pair. (‡) 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, and lesbian estimated using weighted probit, with weights corresponding to probability that PAP is gay, lesbian or foreign respectively.

Table 11: Determinants of PAPs' Applications (Activity Window of 10 days) – Marginal Effects for Probit

Dependent Variable	Full Sample		Unborn		Born	
Finalization Cost in $1,000s	I	II	III	IV	V	VI
Already Born	1.11	0.84				
	(1.19)	(0.94)				
Month to Birth	0.02	0.03	-0.46**	-0.35*	0.15	0.14
	(0.29)	(0.41)	(-2.72)	(-2.16)	(1.92)	(1.85)
African-American Girl	-7.99***	-7.38***	-9.30***	-8.35***	-8.97	-9.97
	(-7.46)	(-7.02)	(-7.69)	(-6.98)	(-1.47)	(-1.66)
African-American Boy	-7.43***	-7.05***	-8.19***	-7.87***	-9.98	-10.01
	(-7.14)	(-6.95)	(-6.91)	(-6.81)	(-1.66)	(-1.69)
African-American Unknown Gender	-7.05***	-6.60***	-7.53***	-7.01***		
	(-7.05)	(-6.75)	(-7.32)	(-6.94)		
Non-African-American Girl	0.53	0.32	-0.05	-0.13	-1.47	-2.78
	(0.55)	(0.34)	(-0.04)	(-0.13)	(-0.24)	(-0.45)
Non-African-American Boy	-1.77*	-1.65*	-2.08*	-1.83*	-5.17	-6.38
	(-2.11)	(-2.03)	(-2.31)	(-2.08)	(-0.84)	(-1.05)
Hispanic	-0.03	-0.18	-0.41	-0.52	-1.31	-2.95
	(-0.03)	(-0.18)	(-0.37)	(-0.49)	(-0.37)	(-0.82)
Asian	1.25	0.31	1.53	0.64	-3.34	-7.59
	(0.53)	(0.13)	(0.62)	(0.27)	(-0.31)	(-0.70)
Year 2004	-10.52***	-10.56***	-10.95***	-10.98***	-9.60**	-9.87**
	(-11.52)	(-11.85)	(-11.23)	(-11.51)	(-3.12)	(-3.27)
Year 2005	-8.39***	-9.20***	-9.00***	-9.78***	-6.24*	-6.77**
	(-10.35)	(-11.52)	(-10.30)	(-11.38)	(-2.53)	(-2.79)
Year 2006	-5.56***	-6.29***	-6.08***	-6.77***	-3.35	-3.58
	(-6.06)	(-6.99)	(-6.12)	(-6.96)	(-1.14)	(-1.24)
Year 2007	-4.59***	-4.76***	-5.40***	-5.47***	0.76	-2.39
	(-4.41)	(-4.72)	(-4.95)	(-5.17)	(0.12)	(-0.38)
Year 2008	-0.39	-0.64	-0.96	-1.33	3.01	3.15
	(-0.41)	(-0.70)	(-0.94)	(-1.35)	(1.12)	(1.17)
Single PAP Allowed		-0.17		0.08		-2.65
		(-0.30)		(0.13)		(-1.57)
Same-Sex PAP Allowed		-3.77***		-3.88***		-1.68
		(-5.88)		(-5.68)		(-0.82)
Constant	34.80***	36.09***	36.59***	37.48***	36.76***	39.94***
	(41.80)	(41.78)	(35.87)	(36.46)	(5.87)	(6.21)
R^2	0.40	0.44	0.40	0.44	0.53	0.56
Adjusted-R^2	0.39	0.42	0.39	0.42	0.43	0.46
F-Stat	29.8	30.2	28.6	28.7	5.5	5.2
Babies	644	644	573	573	71	71

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

Table 12: Adoption Finalization Cost Regressions

Dependent Variable	Same-Sex PAPs Allowed	Foreign PAPs Allowed	Single PAPs Allowed
Already Born	-0.006	-0.102*	0.022
	(-0.11)	(-2.41)	(0.36)
Months to Birth	-0.001	-0.004	-0.000
	(-0.38)	(-0.86)	(-0.01)
Finalization Cost in $10,000s	-0.016***	0.001	-0.005
	(-6.25)	(0.24)	(-1.82)
African-American Girl	0.030	0.068	0.276**
	(0.44)	(1.09)	(3.07)
African-American Boy	-0.027	0.034	0.174*
	(-0.41)	(0.59)	(2.20)
African-American Unknown Gender	0.030	0.038	0.193*
	(0.47)	(0.67)	(2.52)
Non-African-American Girl	-0.016	-0.047	-0.065
	(-0.25)	(-0.97)	(-0.94)
Non-African-American Boy	-0.007	0.008	0.039
	(-0.13)	(0.18)	(0.64)
Hispanic	-0.121	0.069	0.033
	(-1.64)	(1.20)	(0.45)
Year 2004 (d)	-0.149***	0.127***	0.119
	(-3.58)	(4.47)	(1.74)
Year 2005 (d)	-0.255***	0.165***	-0.006
	(-7.04)	(5.61)	(-0.10)
Year 2006 (d)	-0.191***	0.141***	-0.191**
	(-5.67)	(5.89)	(-2.63)
Year 2007 (d)	-0.065	0.156***	-0.023
	(-1.26)	(7.49)	(-0.31)
Year 2008 (d)	-0.021	0.093**	-0.010
	(-0.38)	(3.16)	(-0.15)
Probability for Mean Attributes[‡]	0.218	0.856	0.641
χ^2	76.30	50.14	60.93
Log-Likelihood	-336.7	-273.0	-413.0
BMOs	673	673	673

$^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$. ([‡])The omitted category is gender unknown non-African-American unborn child with finalization cost of $26,000 in 2009.

Table 13: Determinants of Restrictions: Marginal Effects for Probit

Dependent Variable: Chosen PAP	I	II
Single Mother PAP	-0.06	-0.07
	(-0.48)	(-0.58)
Same-Sex PAP	0.10	
	(1.68)	
Gay PAP		0.05
		(0.36)
Lesbian PAP		0.17
		(1.15)
Baseline	0.53	0.53
χ^2	2.67	2.91
Log-Likelihood	-111.0	-110.9
Observations	361	361

Table 14: Marginal Effect of Multinomial Logit of Chosen PAP

Appendix B
A Model of Matching with Search

We present a basic model of matching with search frictions that is related to Burdett and Coles (1997) and Eeckhout (1999).The model is useful in two respects. First, it provides a justification for the estimations presented in the paper. In 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).

In our data set, we observe several types of PAPs: straight couples, gay men, lesbian couples and single women. 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 (θ, 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, single women, 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}.[68]

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.[69]

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

Birth Mothers

Each BMO gains a match utility $u_{BMO}(\theta, a)$ from giving up her child to a PAP with attributes (θ, a).[70] We normalize the BMO's utility from being unmatched to zero and assume that $u_{BMO}(\theta, a) > 0$ for some PAP attributes (θ, a).[71] 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 (as described in Section 6).

BMOs have an arrival rate of γ and experience a discount factor of δ_{BMO}. This discount factor can be interpreted as the forgone monetary flow that birth mothers give up by not committing immediately to a match.[72]

[68] 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. However, none of the observable characteristics of children explains these restrictions (see Table 13 in the Appendix A). Having said that, the model would extend directly to a situation in which the BMOs' attributes do affect these limitations.

[69] We justify this assumption on the basis of the considerable fixed (time, financial and emotional) costs associated with deciding to pursue adoption in general and adoption through this facilitator in particular.

[70] 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.

[71] 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.

[72] 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 5). 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.

The Dynamic Matching Process

Upon arrival in the matching process, a PAP of type θ may or may not submit an application to each BMO that enters the process and allows applications from PAPs of type θ. Notice that key to the adoption process is the fact that PAPs can submit as many applications as they want. In other words, the (opportunity) costs associated with each additional application is negligible.[73]

As described above, an application involves a letter from the PAP to the BMO. This letter is effectively comprised of two elements: the type θ of the PAP submitting the application and a noisy signal α 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 (θ, α), where we assume that the signal α 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 (θ, α). We assume that the parameters of the model are common knowledge among all participants.[74] A BMO who receives an application immediately decides whether to accept it or reject it.[75] 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.

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.[76]

In equilibrium, each PAP of type θ and attributes a has a reservation utility $\bar{u}_{PAP}(\theta, a)$. That is, upon considering a BMO i with a set Θ^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 Θ^i and a child of attributes c has a reservation utility $\bar{u}_{BMO}(\Theta^i, c)$.

[73] This is a key difference between the process analyzed here and, for example, the school admission process where the number of applications each candidate can submit is institutionally fixed, hence every application is associated with an opportunity cost. See, for example, the discussion of school choice in Roth (2008).

[74] 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.

[75] 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 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 as well as the limited, if at all present, access BMOs have to the internet in general and the website in particular.

[76] 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.

Upon considering an application (θ, α) 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 λ, γ, together with the distributions $F_{PAP}, G_{PAP}, F_{BMO}$, and H_{BMO}, each PAP of type θ 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 Θ with a child of attributes c faces an arrival rate of applications $s_{\Theta,c}$ and an equilibrium distribution of these PAPs' attributes $\psi_{\Theta,c}$.[77]

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

$$V_{PAP}(\theta; c) = \max\left\{u_{PAP}(\theta; c), \mathbb{E}_{r_{\theta,a}, \phi_{\theta,a}} \delta_{PAP}^t V_{PAP}(\theta; c')\right\},$$

where t is the random time it takes a PAP to encounter a BMO in the process.

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

$$\bar{u}_{PAP}(\theta, a) = \mathbb{E}_{r_{\theta,a}, \phi_{\theta,a}} \delta_{PAP}^t V_{PAP}(\theta; c').$$

A similar analysis applies to the BMO's behavior.[78]

We conclude with three 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 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. However, the arrival and departure rates do not affect the marginal rates of substitution given by the underlying preferences of participants. Therefore, our approach of using the information on whether PAPs and BMOs fall above or below each other's reservation utility in order to make inferences on the relative importance of different children's and PAPs' characteristics is valid even when other channels are being utilized by either side.

Third, the model described above derives stationary reservation utilities for both PAPs and BMOs. In principle one might conceive a behavior by PAPs that leads to a reservation utility that varies while the PAP is active on the website. In our empirical estimations we do allow for PAPs' reservation utilities that varies with the time spent on the website (see Table 8 in Appendix A). Our estimates of the marginal rate of substitutions are invariant to this generalization.

[77] 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.

[78] Notice 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.