Markets For Children: International Adoptions, IVF, and U.S. Foster Care

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Abstract

The likelihood that a child in U.S. foster care is adopted may depend upon alternatives available to parents. Using a child level panel from 1998-2003, we estimate the causal effect of international adoptions and assisted reproductive technologies (ART) on adoption probabilities for foster children less than nine years old. We find that international adoptions have significant and robust negative effects on foster adoptions, while estimated effects of ART births are smaller and sensitive to model specification.

Keywords: Foster Care, International Child Adoption, In Vitro Fertilization

JEL Classifications: I38, J13, J18

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1 Introduction

The U.S. foster care system places children who cannot be responsibly raised by their parents due to disability, incapacitation, or evidence of abuse. Over 400,000 children are currently housed in foster care, which includes group homes and private homes of both relatives and unrelated foster care providers. Beyond direct costs of supporting foster care (Barth et al., 2006) are a variety of long-term adverse consequences of rearing children in the foster care system, relative to placement by adoption in private households.[1] Doyle (2007a, 2008) identifies adverse causal effects of foster care placement on rates of juvenile delinquency, teen pregnancy, unemployment, adult crime, and adult incarceration. Indeed, 70 percent of the California prison population spent part of their youth in foster care (Baccara et al., 2012). Other studies document higher rates of illicit drug use and sexually transmitted disease for those raised in foster care (Jonson-Reid and Barth, 2000; Courtney et al., 2004).

In view of these costs, both research and public policy have been directed to an important avenue for reducing the foster care population and lengths of stay in the system: subsidies for adoptions out of foster care. The Adoption and Safe Families Act (ASFA) of 1997 expanded the use of adoption subsidies to cover almost twice as many children over the 1998-2006 period (Buckles, 2013; Swann and Sylvester, 2006) even while the real value of average monthly adoption subsidies declined (Argys and Duncan, 2013). Several economics studies identify the salutary effects of adoption subsidies in promoting adoption out of foster care (Hansen and Hansen, 2006; Hansen, 2007; Argys and Duncan, 2013; Buckles, 2013)[2]. Despite measures enacted under AFSA, numbers of foster adoptions have been strikingly

[1] Barth et al. (2006) estimate that longer term government costs of rearing a child in foster care are twice as large as corresponding costs of an adoption. See also Hansen (2008), who estimates total public benefits of an adoption out of foster care equal to between \$190,000 and \$235,000 (in 2000 dollars).

[2] A distinct but related literature studies how subsidies to foster children affect the supply of foster services. Doyle (2007b) finds that reducing subsidies to the fostering of related children reduces foster care provision. Doyle and Peters (2007) show that higher foster subsidies increase the supply of foster care services up to a point (with high subsidies having negligible marginal effects). Duncan and Argys (2007) find that higher foster subsidies reduce the likelihood that a child is placed in a group home.

stable over recent years (Moriguchi, 2012)[3]. However, foster adoption rates have risen due to declines in numbers of children relinquished to the foster care system.[4] Secular phenomena have contributed to a smaller foster population, including the increased availability and use of contraceptives and the legalization of abortion (Bernal et al., 2007; Bitler and Zavodny, 2002; Gennetian, 1999).

In this paper, we focus on another determinant of foster care adoptions that is also the potential object of policy, but has been relatively understudied. This is the role of two potential substitutes for foster adoptions: international adoptions and assisted reproduction technologies (ART) that enable biological conception for infertile couples. In principle, the increased availability of these substitutes (and lowered costs, broadly defined) might help to explain the stubborn stability of foster adoption numbers in the face of expanding subsidies.

Both substitutes occupy large numbers of potential adopters, relative to numbers of children actually adopted out of foster care. International adoptions have been variously estimated to represent between 17 and 25 percent of total U.S. adoptions in recent years (Bernal et al., 2007; Gumus and Lee, 2012), with their total number rising from approximately 15,000 in 1998 to 23,000 in 2004, and falling to 17,000 in 2009 (Moriguchi, 2012). By comparison, adoptions out of foster care among the prime age range for adoption (ages 0-8) averaged approximately 32,000 per year from 1998-2004, with total foster adoptions of roughly 50,000 per year (Moriguchi, 2012). Similarly, numbers of children born with the aid of ART – almost entirely in-vitro-fertilization (IVF) (Gumus and Lee, 2012) – are large relative to foster adoptions, and have grown dramatically over the past two decades. Even though IVF-related births are a small share of U.S. births achieved with fertility treatments (Schmidt, 2007), ART births grew from roughly 30,000 in 1998 to 50,000 in 2004; today, they are over 60,000 per year.

[3]From 1999 to 2010, total annual foster adoptions have ranged from a low of 46,377 (1999) to a high of 57,466 (2009), while unrelated foster adoptions have ranged from a low of 37,177 (2010) to a high of 40,166 (2009). (Source: Moriguchi, 2012.) Foster adoption statistics indicate significant increases over the earlier years, 1995-1999 (Hansen, 2007); however, these numbers may in part reflect increased reporting to the AFCARS database.

[4]Total numbers of children in foster care have fallen from 570,000 in 1999 to roughly 400,000 in recent years (2010-present).

Anecdotal evidence suggests that significant substitution between these pathways to parenthood is possible. Surveys of U.S. women considering adoptions indicate receptivity to a wide range of alternatives, including different sources (foster, international, and private domestic) and different child attributes (racial, cultural, and medical profiles, for example). From the 2002 Adoption Attitudes Survey, Hansen (2007) reports significant fractions of prospective adopters willing to consider children with medical problems (15%), in foster care (26%) and of a different race (42%). Wilson et al. (2005) indicate that focus groups of prospective adopters revealed a broad tendency to consider both international and foster children. Similarly, using data from the 2002 National Survey of Family Growth, Chandra et al. (2005) find that a significant fraction of women pursuing infertility treatments considered adoption, while Gumus and Lee (2012) find that a significant fraction of women pursuing child adoption considered infertility treatments. The empirical question remains: Is there real substitution in ultimate choices between the different categories of child demand?

Using child-level foster data over 1998-2003 and controlling for a variety of potentially correlated phenomena, we study how international adoptions and ART births affect the probability that a child of given age is adopted out of the foster system. Our empirical application builds on a simple theoretical model of local demand for four alternative strategies by which families can secure a child (Section 3). Three are the adoption alternatives: foster, international, and private/independent domestic adoption. The fourth is the biological alternative, ART. The model produces three conclusions: (1) private domestic adoptions can be "netted out" in a reduced form, a practical necessity in the empirical work due to limitations in private adoptions data; (2) costs of the alternative strategies drive foster adoption probabilities; and (3) there is an equilibrium correspondence between unobservable costs of the substitute strategies (international and ART) and observable quantities. The last two conclusions produce the hypothesis for which we test in our empirical work: Higher quantities of the substitute categories (international and/or ART) lower probabilities of adoption out of foster care.

The central econometric challenge is the likely endogeneity of the substitutes.

Unobservables can affect both foster adoption rates and demands in the substitute categories. Endogeneity bias can go in either direction: Unobservable drivers of the overall demand for children may lead to a spurious positive correlation between all demand categories. Alternately, unobservables that make one strategy for securing a child less attractive (e.g., foster adoptions) may make another strategy more attractive (e.g., international adoption), leading to a spurious negative correlation. To address the potential endogeneity, we adapt a strategy employed in the recent immigration literature (e.g., Card, 2001; Ottaviano and Peri, 2012; Ottaviano et al., 2013) by constructing shift-share-type instruments for the substitute quantities. The instruments predict local (state-year) international adoption and ART birth rates by combining pre-determined state demands for the respective substitute categories and nation-level trends so as to purge potentially endogenous panel variation in the substitute quantities (see Section 5).

Our main findings are that (1) international adoptions have a significant negative effect on probabilities of adoption out of foster care, consistent with our baseline hypothesis, and (2) ART has a small negative effect on foster adoption probabilities in some models, but both the sign and significance of the effect are sensitive to the specification. Small effects of ART are consistent with a bi-modal distribution of preferences for biological (vs. adopted) children in the population of potential demanders; demanders may have either a strong preference for a biological child or a strong preference for an adopted child. In this case, there will be few potentially adopting families on the margin between ART and foster adoption alternatives, implying (as we find) little or no significant substitution between ART demand and demand for foster adoptions.

At the end of the paper (Section 7D), we present a "back of the envelope" numerical simulation based on our estimation results. These calculations suggest that annual growth in international adoptions between 1998 and 2003 lowered U.S. foster adoptions (ages 0-3) by approximately 2,500 to 5,000 per year – 21 to 43 percent of corresponding annual foster adoption numbers.

While we are not the first to include substitute adoptions in estimating foster adoption relationships, to our knowledge we are the first to focus on these effects. Hansen and Hansen (2006) and Hansen (2007) both include international adoptions as a possible explanator of foster adoption rates, the former finding an insignificant effect in their cross-section, and the latter finding a weakly significant negative effect. Beyond other differences in approach and data, neither of these papers accounts for the endogeneity of international adoptions or the potential for ART births to act as a substitute for foster adoptions.

Gumus and Lee (2012) study how foster adoption, as a substitute for the use of ART technology to achieve biological births, affects ART demand. To some extent, our finding that ART has little effect on foster adoptions contrasts with their conclusion that foster adoptions spur significant reductions in ART demand. Different results are potentially due to different identification strategies associated with different directions of effect, foster adoptions to ART in Gumus and Lee (2012) and vice versa here.[5]

From a policy perspective, our results suggest an added social cost of international adoptions due to their adverse effect on foster adoptions. For example, U.S. adoption tax credits have risen from $5,000 in 1997-2001 to $10,390 in 2004 and over $13,000 today, providing international (and other) adopters with corresponding dollar-for-dollar subsidies that potentially worsen prospects for foster children. In contrast, our results suggest that any external effects of ART treatments on foster care adoptions, if they exist at all, are much smaller. Hence, assessments of policies targeted at these procedures – including the tax deductibility of ART expenses and proposed new tax credits under the Family Act legislation – can focus principally on their potential direct benefits in increased fecundity of fertility-impaired couples (Schmidt, 2007) and potential direct costs in promoting higher rates of twinning and poor infant health (Bitler, 2006).[6]

Section 2 follows with background and trends in U.S. adoption markets. Section 3 presents a simple theoretical model of local demand for foster adoption

[5] Gumus and Lee (2012) use state-level panel variables to identify foster adoptions, including foster adoption subsidies, supplies and attributes of the foster care population. We control for these phenomena in our foster adoption equation.

[6] See also Bitler and Schmidt (2012), who find that the state-level mandates for health insurance plans to cover infertility treatments lead to increased demand for the treatments (see also Griffin and Panak, 1998; Jain et al., 2002).

and related substitutes. Section 4 describes our econometric model and Section 5 details our identification strategy. Section 6 defines our data. Section 7 presents our results, beginning with our main estimations for infants and toddlers, followed by several robustness checks, results for other ages of foster children (2-8 years old), and our "back of the envelope" exercise. Section 8 concludes.

2 Background

Foster care is intended to provide temporary homes that protect children from abuse or abandonment. The ultimate objective is a permanent placement to an adoptive or related family (fostering-futures.com/purpose). Although roughly 60 percent of foster children return home, average stays in foster care are over two years (Doyle, 2007a). As indicated in Figure 1, longer stays (of 5 years or more) have been on the decline, perhaps in part due to measures enacted under the Adoption and Safe Families Act of 1997 (ASFA). However, with corresponding declines in the shortest stays and increases in stays of 1 to 2 years, average stays in the foster system have remained close to two years.

Reasons for entry into the foster system vary across jurisdictions (Doyle and Peters, 2007). Among foster children in New Jersey, Dwyer and Noonan (2001) find that parental reasons are cited in 94.3% of foster cases, with neglect (58.8%) and inability to cope (76.0%) dominating the list. For the older children, sexual abuse (44.9% of the total) and the child's own drug abuse (51.8% of the total) are also prevalent reasons for entry into foster care, and physical abuse is listed in a high fraction of cases for both younger (16.6% in our sample of toddlers) and older children (47.9% in the Dwyer and Noonan (2001) sample). Abandonment, parental incarceration and/or death are cited in relatively few cases (a total of 6.3% in New Jersey and 6.1% in our sample).

There are three pathways to exit from the foster system: a return to home, adoption by related family members, and an unrelated adoption. Foster adoptions, in turn, are one of three main types of adoption, which are together responsible for roughly 130,000 U.S. child adoptions per year (Moriguchi, 2012). Overall, roughly 2 percent of U.S. children are adopted. Of all U.S. adopted children, one quarter come from international sources, and the other three-quarters are equally divided between foster adoptions and private adoptions (Adoption Factbook, 2012, p.115). Total foster adoption numbers have been strikingly stable in recent years (Figure 1), particularly for unrelated children (Moriguchi, 2012). For recent years (2002-2008), related foster adoptions constitute approximately 26 percent of total related adoptions and 27 percent of total foster adoptions, and have been quite stable at 12,000 to 16,000 per year.

Figures 2 and 3 depict U.S. trends in the two substitute categories of interest in this paper, international adoptions and ART births. Both figures indicate the growth in international adoptions over our 1998-2003 sample period and subsequent declines driven by dramatic reductions in child supplies from China and Russia. ART births exhibit a steady rise both during and after our sample period. ART births are outcomes of in-vitro fertilization, the vast majority of which are attributable to the use of non-donor eggs (88 percent in 2006, 82 percent of which use fresh vs. frozen eggs) (Gumus and Lee, 2012).

Table 1 describes attributes of adoptive children from the different sources in 2007, and Figure 4 depicts recent trends in the demographic and age composition of the foster population. With infants and toddlers (ages 0 and 1) representing over two-thirds of international adoptions and the ART/IVF alternative focused on newborns, the international adoption and ART strategies are likely to be most closely related to adoptions of the youngest foster children. We therefore focus on these two age categories of foster children in our baseline analysis, while also examining adoption of older (ages 2-8) foster children.

Adopters of international children have a greater propensity to be married, white, more educated and higher earners than adopters of foster children (Table 1). The enhanced socio-economic status of international adopters potentially suggests that any substitution effects that we find are likely to reflect substitution (from foster to international adoption) of adoptive families with the greatest economic resources to invest in child rearing. Table 1 also reveals that adopted international children are more likely to be Asian and female, and less likely to have special health needs relative to foster counterparts. In recent years, the share of foster children who are African American has fallen; the proportions that are white and

Hispanic have risen; and the proportion that is younger (0-5) has risen.

Comparing explicit costs of the different adoption strategies, foster adoptions are the least expensive, predominantly ranging from zero to $2500 (Table 1); many of these adoptions are also eligible for significant post-adoption monthly subsidies (with average values between $400 and $500 per month in 2006).[7] However, costs of foster adoption may be understated due to limited foster system resources to help adoptive parents (Wilson et al., 2005). Costs of private agency adoptions generally range between $15,000 and $40,000; Moriguchi (2012) notes that non-monetary costs are much higher, with average waiting times between two and four years. Costs of international adoptions are similar, but tend to involve shorter waiting times – typically between 10 months to two years, depending upon the country.

3 A Simple Model of Adoption Markets

We consider a simple model of local adoption markets in order to frame our empirical hypotheses. Each family in a local population of potential child adopters faces four alternative strategies for securing a child: (1) ART (assisted reproductive technology), the biological alternative (subscript b)[8]; (2) a local private adoption (subscript p); (3) an international adoption (subscript i); or (4) a local foster adoption (subscript f).

Costs and Qualities. Costs of child acquisition under options (1)-(4) are C_k, $k \in \{b, p, i, f\}$. Each option is also associated with a measure of prospective (perceived) child quality PPCQ, q_k. All costs and PPCQ are exogenous except C_p (costs of private adoptions) and q_f (PPCQ quality for foster adoptions) which are market outcomes described below. We normalize PPCQ of a biological child to one, $q_b = 1$. In the adoption categories ($k \in \{p, i, f\}$), PPCQ q_k is an indicator of expected suitability of the match, assumed never superior to the biological alternative. For international adoptions, PPCQ q_i is determined (exogenously) in international markets. For local (independent) private adoptions that focus on

[7] Argys and Duncan (2013).

[8] Potential adopters have eschewed low-cost paths to own-conception. They are therefore candidates for either adoption or ART, and we do not consider the lesser (low cost) treatments for fertility enhancement.

easy placements of healthy children, PPCQ is plausibly higher than for international adoptions, $q_p > q_i$, as we assume in this Section.[9] In the Appendix, we consider the alternative of $q_p < q_i$.

Preferences. Each potential adopter is described by three preference parameters: overall preference for a child, K; preference for a biological vs. adopted child, $B \in [0, 1]$; and unit value of adopted child quality, $\alpha \in [0, \alpha_{max}]$. These preferences produce net benefits of the four options as follows (compared with the null alternative of no child, $U_0 = 0$):
ART: $U_b = KB - C_b$,
Adoption: ($k \in \{p, i, f\}$): $U_k = K(1 - B)\alpha q_k - C_k$.

Given its (B, α) preferences, each family chooses the one alternative that delivers highest utility. For simplicity, we assume that the overall preference parameter K is a common value that is sufficiently large to produce non-degenerate outcomes. The (B, α) preferences are heterogeneous with positive support $[0, 1]$x$[0, \alpha_{max}]$.

The Private (Independent) Adoption Market. The private adoption market is local and closed, with an exogenous and fixed supply of X_p^s .[10] The cost C_p is modeled as a price that clears the local market and includes non-monetary costs of the adoption process. For example, as demand for private adoptions rises, scarce (high PPCQ) children are rationed with higher costs of documenting parental suitability, longer queuing times, and higher non-pecuniary costs of rejection and reapplication, all reflected here in a higher C_p "price".

An alternative approach to modeling private adoptions is presented in the on-

[9] This premise reflects prevailing characterizations of the "baby shortage" in private adoption markets (e.g., Landes and Posner, 1978; Posner, 1992; Blackstone et al., 2004). Hansen (2007) writes: "When economists have written about adoption, they have primarily been interested in explaining why there are so few infants available for adoption through private agencies, lawyers, and facilitators, while there are so many prospective adoptive families who seek healthy infants." See also Medoff (1993) and Gennetian (1999) who study determinants of child supplies to private adoption markets.

[10] We can allow for a supply that is less than perfectly inelastic, $X_p^s(C_p)$. However, market-clearing variation in C_p is likely to be primarily non-monetary and not available to potential birth mothers (Landes and Posner, 1978), motivating the inelastic supply assumed here. A potential alternative specification for private adoptions treats them as exogenous to the model, viz, a segmented market in which costs are lower than international counterparts, $C_p < C_i$, and PPCQ is higher, $q_p > q_i$; in such a market, private adoptions dominate international adoptions and are rationed to qualifying "high quality" parents.

line Appendix. There, the cost of private adoption C_p is fixed and both private and foster markets draw from a common pool of available children, distributed on the PPCQ (q) dimension. The private market skims the highest PPCQ children, and foster adoptions come from the highest PPCQ residual children, those not adopted in the private market.[11] An equilibrium is described by average PPCQ qualities in private and foster adoption markets, with $q_p > q_f$.

Foster Adoptions. Let N be the number of available foster children. Within this pool, PPCQ q is distributed with density/distribution $f(q)/F(q)$ on the support, $[\underline{q}, \overline{q}], 0 < \underline{q} < \overline{q} \leq 1$. Potential adopters observe only the average PPCQ of all prospective foster adoptees, q_f, when deciding whether to pursue a foster adoption strategy. Foster care authorities observe actual child PPCQ and choose the pool of foster matches out of the available pool of foster children in order to maximize foster adoption demand. They do so by designating the highest PPCQ children for adoption and thereby maximizing q_f.

Once potential adopters observe q_f (and attributes of the alternatives), they each commit to one strategy. Those committing to foster adoption are matched to a child in the pool of (highest PPCQ) foster children, with actual PPCQ of the match randomly assigned from within this pool. For simplicity we assume that foster demanders do not observe true matched child PPCQ before adoption.[12]

Because foster adoptions skim the top PPCQ children, $q > \underline{q}_f$, average PPCQ

[11] Baccara et al. (2012) study matching of parents and children in private adoption markets. Children not matched in the private market enter foster care (Baccara et al., 2012, p. 12).

[12] If foster demanders observe true child PPCQ before adoption, they can accept or reject the matched child and may reject if q is "too low." However, because demanders have committed to the foster adoption, "rejecters" are out of the child market for the time period of the model. This twist to the model has two symptoms: (1) due to rejecters, actual adoptions are fewer than the number of foster adoption demanders, and (2) the utility of the foster adoption strategy, U_f, is higher than described in this Section due to the option value of rejection. Despite these symptoms, key qualitative implications of the model persist: U_f rises with q_f and there is a monotonic relationship between the number of adoption demanders and actual foster adoption numbers (and associated adoption probabilities). Moreover, implications of the analysis for our empirical approach (netting out of private adoptions and use of substitute quantities to proxy for costs) withstand the twist.

in the foster adoption pool, q_f, is:

$$q_f = \int_{\underline{q}_f}^{\bar{q}} \frac{qf(q)}{(1 - F(\underline{q}_f))}\, dq \leftrightarrow \underline{q}_f = \underline{q}_f(q_f) \tag{1}$$

producing the total foster adoption supply,

$$X_f^s(q_f) = N(1 - F(\underline{q}_f(q_f))) \leftrightarrow \frac{\partial X_f^s}{\partial q_f} = -Nf(\underline{q}_f)(\partial \underline{q}_f / \partial q_f) < 0 \tag{2}$$

and probability of foster adoption $H = (1 - F(\underline{q}_f))$. A higher foster adoption supply requires ratcheting down the quality distribution, depleting average q_f.

Demand for Adoption Alternatives. We begin with how potential adopters choose between the adoption alternatives p, i, f and then follow with the addition of the biological/ART alternative. Throughout, we assume the following:

Assumptions: (A1) In equilibrium, there is positive local demand for all strategies to secure a child, $k \in \{b, p, i, f\}$. (A2) Relative to foster adoption, (i) international adoptions are more costly, $C_i > C_f$, and (ii) international and private adoptions have high PPCQ qualities, $q_i > E(q) = \int_{\underline{q}}^{\bar{q}} qf(q)dq$ and $q_p \geq \bar{q}$.

Assumption (A1) focuses us on the relevant cases of positive demands. Recalling the Table 1 statistics on special needs, PPCQ is "high" for both international and private adoptions relative to the foster counterpart, particularly for the lowest ages that dominate the substitute categories. Assumption (A2) reflects these realities. Together, the two assumptions imply an ordering of cost and PPCQ:

Observation 1: With $q_p > q_i$, $C_p > C_i > C_f$ and $q_p > q_i > q_f$ in equilibrium.[13]

Mapping choices in the (B, α) parameter space, the set of agents indifferent between two respective alternatives can be defined as follows:

$$\alpha_{kj}(B) : K(1 - B)\alpha q_k - C_k = K(1 - B)\alpha q_j - C_j,\ kj \in \{pi, if, pf\} \tag{3}$$

$$\alpha_{f0}(B) : K(1 - B)\alpha q_f - C_f = U_0 = 0 \tag{4}$$

[13] If $C_p \leq C_i$ (and $q_p > q_i$), then private adoptions dominate international, contrary to Assumption (A1); hence, $C_p > C_i$. Similarly, if $q_i \leq q_f$ (and $C_i > C_f$ by Assumption (A2)), then foster adoptions dominate international; hence (again by (A1)), $q_i > q_f$.

Eq. (3) defines indifference between private and international adoptions ($kj = pi$), international and foster adoptions ($kj = if$), and private and foster ($kj = pf$). Eq. (4) defines indifference between foster adoption and the null (no child) alternative. The indifference mappings have the following properties:

$$\frac{d\alpha_A(B)}{dB} = \frac{\alpha_A}{(1-B)}, \quad A \in \{pi, if, pf, f0\} \tag{5}$$

$$\alpha_{max} > \alpha_{pi}(0) > \alpha_{if}(0) > max(0, \alpha_{f0}(0)) \tag{6}$$

With $q_p > q_i$, eq. (6) is necessary for positive adoption demands ($k \in \{p, i, f\}$).

Figure 5 graphs the indifference mappings, indicating respective preference for the four alternatives $p, i, f, 0 =$ null. Note the hierarchy of preferences: Private adoptions are made by agents in the top-most space of preferences; international adoptions are made by agents in the next highest space, followed below by foster adoptions and, finally, in the lowest quadrant, agents who prefer not to adopt (those with low α and/or high B).[14]

The ART Alternative. The final component of demand is ART. The minimum B preference that makes ART preferable to no child is $\underline{B} \equiv C_b/K$, where $\underline{B} < 1$ by Assumption (A1). The set of agents indifferent between ART and adoption alternative $k \in \{p, i, f\}$ is:

$$\alpha_{bk}(B) : KB - C_b = K(1-B)\alpha q_k - C_k \tag{7}$$

where

$$\tfrac{d\alpha_{bk}}{dB} = \tfrac{1+\alpha q_k}{(1-B)q_k} > \tfrac{\alpha}{(1-B)} > 0, \quad \tfrac{\partial}{\partial q_k}\left[\tfrac{d\alpha_{bk}}{dB}\right] = -\tfrac{1}{(1-B)q_k^2} < 0, \ \alpha_{bf}(\underline{B}) = \alpha_{f0}(\underline{B})$$

The (B, α) pair that yields zero net benefit of both ART and foster adoption, $(\underline{B}, \alpha_{f0}(\underline{B}))$, also leaves the agent indifferent between the two (ART and foster) alternatives. Adding these constructs to Figure 5 produces the child demands:

$$X_k = X_k^D(C_p, C_i, C_b, C_f, q_f) = \text{ demand for strategy } k \in \{b, p, i, f\}. \tag{8}$$

[14]For the alternate case of $q_i > q_p$, international and private adoptions swap places in the Figure 5 representation of demands (see on-line Appendix). In this case, substitution between international and foster adoptions (due to a change in C_i) operates through the private market; a rise in C_i leads to an equilibrium rise in C_p, which raises demand for foster adoptions.

The model is closed by an equilibrium price in the private market, C_p, and an equilibrium quality in the foster market, q_f, that equate supplies and demands:

$$C_p : X_p^D(C_p, C_i, C_b) = X_p^S \tag{9}$$

$$q_f : X_f^D(C_i, C_b, C_f, q_f) = X_f^S(q_f) \tag{10}$$

Our primary interest is the foster market equilibrium, equation (10), depicted in Figure 6. On the demand side (and referring to Figure 5), a higher quality of foster matches has three complementary effects: (1) the α_{f0} margin for positive foster net benefits shifts down; (2) the α_{if} margin for preference of foster vs. international adoptions shifts up, and (3) the α_{bf} margin for preference of foster vs. ART children shifts out. The three shifts are illustrated by dotted lines in Figure 5. All lead to increased demand for foster adoption, captured by the upsloping demand function in Figure 6. Conversely, on the supply side, a higher supply of foster adoptees requires ratcheting down the PPCQ spectrum for promising adoptive matches in the foster system; as a result, the average q_f falls – giving us the down-sloping foster supply function in Figure 6.

For our empirical analysis, the key comparative statics are for the costs of international adoption and ART, C_i and C_b. Higher costs shift the foster demand function X_f^D out (Figure 6), leading to a higher equilibrium level of adoptions (X_f^*) and a lower level of PPCQ, q_f^* . In terms of the primitive drivers of demand in Figure 5, a higher C_i shifts the α_{if} curve up, increasing foster demand. A higher C_b shifts the $\underline{B}$ and α_{bj} margins to the right, also increasing foster demand.

Although qualitative effects of the two substitute categories (international and ART) are similar, quantitative effects can be very different. Suppose, for example, that the distribution of B preferences is bimodal with almost all families having either low values of B (families who prefer to adopt) or high values of B (families who prefer a biological child). In this case, a change in costs of ART (C_b) will have negligible effect on demand for foster children as there are almost no families in the range of B values for which B and α_{bf} margins shift. However, a change in costs of international adoption (C_i) will affect agents in the low-B-value range, having a substantial effect on foster demand.

Summarizing our model predictions for the empirical analysis:

Observation 2 (Main Hypothesis). A higher cost of international adoptions (C_i) or ART (C_b) increases adoptions out of foster care, $\partial X_f^*/\partial C_k > 0$ for $k \in \{b, i\}$.

In our empirical work, costs are unobservable and we use observable proxies for costs, namely, quantities. The following observation implies invertible relationships between the equilibrium quantities (X_i and X_b) and respective costs (C_i and C_b). We exploit these relationships to infer substitution effects ($\partial X_f^*/\partial C_i$ and $\partial X_f^*/\partial C_b$) from estimated effects of normalized quantities (X_i and X_b, normalized by a relevant population of potential adopters) on foster adoption probabilities.

Observation 3. (A) Equilibrium levels of international adoptions and ART demand are negatively related to own cost: $dX_i/dC_i < 0$ and $dX_b/dC_b < 0$. (B) Costs C_i and C_b have the same signs of effect on the equilibrium foster demand X_f^* and on the equilibrium probability of foster adoption:[15]

$$\frac{dH}{dC_k} = -f(\underline{q}_f(q_f^*)) \, \mathrm{x} \, \frac{d\underline{q}_f}{dq_f} \, \mathrm{x} \, \frac{\partial X_f^*/\partial C_k}{\partial X_f^S/\partial q_f} \overset{\mathrm{s}}{=} \frac{\partial X_f^*}{\partial C_k} \, , \quad k \in \{i, b\} \tag{11}$$

where H = probability of adoption from foster care $= 1 - F(\underline{q}_f(q_f^*))$.

4 Econometrics

Our question is how substitutes for foster children – international adoptions and ART births – affect foster adoption outcomes. Our dependent variable is the (0,1) outcome, whether a given foster child is adopted (y=1) or not (y=0) at a given time. Were there time series data for every child in the foster system, we could track adoption histories and use duration models to estimate the probability of adoption, conditional on not having been adopted up until age a. However, as available data does not track children over time, we estimate this conditional probability directly with age-specific adoption regressions.

For a given age cohort of foster children (say infants of age 0, meaning less than one year old – or toddlers of age 1, meaning one to two years old), $Adopt_{ist}$

[15] In equation (11), we substitute for $\partial q_f^*/\partial C_k$ from the equilibrium relationship, $X_f^* = X_f^S(q_f^*)$, and the sign equality follows from $d\underline{q}_f/dq_f > 0$ and $\partial X_f^S/\partial q_f < 0$.

is the (0-1) for adoption of foster child i in state s at time t:[16]

$$Adopt_{ist} = \begin{cases} 1, & \text{if } A^*_{ist} + u_{ist} \geq 0 \\ 0, & \text{if } A^*_{ist} + u_{ist} < 0 \end{cases}$$

where u_{ist} is a random error, A^*_{ist} is an unobserved "adoptability index" for child i in the local adoption market,

$$A^*_{ist} = \beta_0 + \beta_1 International_{st} + \beta_2 ART_{st} + \beta_3 X_{ist} + \beta_4 Z_{st} + \tau_s + \tau_t + \gamma_s t$$

$International_{st}$ = rate of international adoptions in state s at time t (per woman of fertile age), ART_{st} = rate of ART births in state s at time t, X_{ist} = child i attributes, Z_{st} = state attributes (including attributes of foster supplies), τ_s = state s fixed effect, τ_t = time t fixed effect, and γ_s = state-specific time trend. As discussed in Section 3 above, we proxy for unobserved costs of the substitute categories (international adoptions and ART births) using observable quantities.

Adoption data are available for all children in foster care during each year of our sample period. Roughly twenty percent of these children are designated by foster care authorities with a "goal of adoption" at any given time; these children are often referred to as "waiting children", nomenclature that we will borrow. Although a high fraction of foster adoptees are waiting children, a significant fraction are not.[17] For this reason, we include all foster children in our analysis, but also restrict attention to waiting children in one of our robustness checks.

A number of econometric issues arise in this model. Most concern potential omitted variables that could bias the coefficient estimates for β_1 and β_2. First is the potential endogeneity of the key regressors, $International_{st}$ and ART_{st}. There are a number of possible sources of endogeneity which can pull in different directions. Unobserved shocks to the overall demand for children can drive all three child categories – international adoptions, ART births and foster adoptions – leading to a positive correlation between the three demands, a positive bias in the coefficient estimates, and a resulting underestimate of substitution effects. Alternately, unobservable attributes of the foster pool (lesser or greater "adoptability",

[16] Age is measured at the end of the fiscal year (September 1).

[17] Among infants in our dataset, 29.4 percent of foster adoptees are not "waiting children". For toddlers (age 1), 19.1 percent of adoptees do not have an adoption goal.

for example) could dampen foster demand and elevate demand for the substitute categories, or vice versa. Although these effects represent a form of substitution, the causal mechanism that we seek to identify - from costs of substitutes to foster adoptions – is different than substitution driven by foster attributes. These unobservables could lead to a negative bias in the estimated causal effect of the substitutes, resulting in an over-estimate of substitution effects. We use an instrumental variable approach to correct for these potential sources of endogeneity bias, discussed in detail below.

Second is the omission of explicit (unobservable) costs of foster adoption (C_f in the theory of Section 3). These costs are highly correlated with child attributes (Skidmore et al., 2016), the availability of foster adoption subsidies, and supplies of foster children, both overall and of children with different attributes (Gumus and Lee, 2012). We control for all of these phenomena by including individual child attributes that encompass gender, race, disability, and a host of abuse categories; average monthly adoption subsidies;[18] and state-level supplies of foster children, both overall and proportions within different attribute categories.

Third is the omission of private/independent adoptions from our estimations. This exclusion is motivated by the theory of Section 3, where private adoptions are jointly determined and effects of international adoptions and ART on foster outcomes are in a reduced form. The exclusion is also a practical necessity given shortcomings of available data. In the large majority of states, Court adoption records are either absent or reflect an unknowable mix of international and domestic adoptions.[19] This shortcoming is well-known in the research community (Shuman and Flango, 2013).

Finally, we consider models both with and without state-specific time trends.

[18]Due to the potential endogeneity of the adoption subsidies (Buckles, 2013), we have also estimated our models without the subsidies and obtained similar results to those reported below. However, we find that the subsidies exhibit significant negative correlation with our instruments for international adoptions and ART births. In order to avoid the potential for this negative correlation to drive our estimation results, we opted to include the subsidies in our reported models.

[19]Exceptions are six states (Louisiana, Delaware, Vermont, New Hampshire, Pennsylvania, and Kansas) where all adoptions, including international, are required to be registered in Court documents.

There are competing arguments on this subject. State trends may be picking up some of the causal effects of our endogenous regressors, perhaps arguing for their exclusion. However, conceptually, our model and estimations are period-based and short-run and not intended or designed to capture long-run dynamic effects of our endogenous regressors on adoptions. For example, early adoptions from China may promote more future adoptions from China, thereby multiplying initial impacts on foster adoptions. (Indeed, our instruments are driven by such logic.) Recalling our Section 3 model, such dynamic effects are captured in each period's cost of international adoptions C_i, the effect of which we estimate. That is, we focus on period-by-period substitution effects and not long-run multipliers. This focus suggests that a more serious concern is the potential correlation between our key substitutes and (longer-run) trends in each state, and a lesser concern is negating multiplier effects by including the trends. For this reason, and because the state trends are jointly highly significant in our estimations, we tend to favor the models that include the trends.

5 Identification

International Adoption Rates. Our identification strategy builds upon a recent literature on how immigration affects a variety of economic outcomes (see, for example, Ottaviano & Peri, 2012; Ottaviano, Peri & Wright, 2013). We are similarly interested in the effect of international migrants (child adoptions in our case) on outcomes in local markets (foster adoptions in our case) where the international immigration can potentially suffer from endogeneity bias. To avoid bias, we construct an instrument with two components.

The first component is a Card-type (2001) shift share variable (introduced by Altonji and Card, 1991).[20] The economic logic of this component is that networks lower costs of adoptions from specific countries. For example, if a state is deep in adoptions from China, local networks in that state will lower costs of more adoptions from China. With time series variation in total U.S. adoptions from different source countries and state-level variation in initial adoption intensities

[20] Other recent applications of this type of instrument include identification of imports (e.g., David, Dorn & Hansen, 2013).

from different countries, our panel shift-share variable interacts the two to predict a state's level of international adoptions in any given year. Formally, let α_{cs} denote the fraction of total U.S. international adoptions from country c to state s in 1997. The predicted inflow of country c children to state s in time t is then:

$P_{cst} = \alpha_{cs} \text{x} Y_{ct}$, Y_{ct} = total U.S. child adoptions from country c in time t

Summing across source countries gives our total predicted supply of international child adoptions in state s at time t:

$P^*_{st} = \sum_c P_{cst}$ = predicted international adoptions (state s, time t).

The second component captures cross-country spillovers in local adoptions. The idea is that adoptions from countries that are "large" as a share of total U.S. adoptions – what we will call "index countries" – can create spillovers to adoptions from "smaller" countries. Index country adoptions can create international adoption infrastructure that also promotes adoptions from other countries. We measure the spillover component in the simplest possible way by using a state's index country shares to allocate U.S. adoptions from not only the index countries themselves (as captured in the shift-share component) but also non-index countries. Formally, let $j \in \{1, , J\}$ be the set of index countries, and

$S^*_{st} = Y_{ot} \text{ x } \sum_{j=1}^{J} \alpha_{js}$ = predicted "spillovers" in international adoptions,

where Y_{ot} = total U.S. adoptions from non-index/other countries in time t. Our instrument combines the two components into the following rate:

I_{st} = instrument for international adoption rate = $(P^*_{st} + S^*_{st})/N_{st}$

where N_{st} = number of women of child-rearing age (15-44), state s time t.

Our identifying assumption is that state (s) and country (c) specific costs of international adoptions depend upon an initial spatial distribution of child migrants, with spillovers from index countries. This initial distribution makes a state more or less subject to the "supply-cost push" factors that drive changes in aggregate (U.S.) international adoptions from different countries over time. Potentially endogenous departures of state-level immigrant adoptions from these initial patterns are thereby purged from the estimation.

In defining the instrument, we make a couple of design decisions. First, we do not parse international adoptions by age class, but rather treat all international adoptions (in state s at time t) together as a substitute category in each of our age-specific foster adoption regressions. This approach avoids small numbers problems for all ages other than infants. Second, scores of countries send tiny numbers of children to the U.S. each year. In 1997, for example, there were 102 countries of origin for international adoptions in the U.S., with many (including Afghanistan, Albania and Uzbekistan) sending fewer than 5 children and only four sending more than 5% of total incoming international adoptions (China, Russia, Korea, and Guatemala); moreover, the big four were responsible for 78 percent of all international adoptions in the U.S. during 1997. In our baseline instrument, we club all countries other than those constituting more than 5% of the total as one combined source country, "other", and the big four are considered the "index" countries. As a robustness check, we also consider an alternative instrument that uses a 10% (vs. 5%) threshold.[21] Figure 7 visually depicts the strong correlation between our baseline (5%) instrument and actual state-level international adoption rates over our sample period; the raw statistical correlation is 0.91.

ART Birth Rates. We also construct a shift-share instrument to identify ART live births across states and time. There are two components to the instrument. The first (shift share) component interacts initial state shares of total ART births in the U.S. (during 1997) with total time t U.S. ART births (for each t in our sample period), and then divides by the state's time t female population in the prime child-rearing age range (ages 15-44 in 1000's, N_{st}) to obtain a rate. The second component exploits state-level (cross-section) variation in mandates for insurance coverage of fertility treatments (see Schmidt, 2007; Bitler and Schmidt, 2012). Our baseline instrument interacts the zero-one fertility mandate (FM) with the shift-share variable.[22] We expect (and find) that states with insurance mandates exhibit a greater sensitivity of ART births to nation-level trends (as captured by the shift-share component). We also consider an alternative ("weighted") ART

[21] The "big four" (5% threshold) countries account, respectively, for 29% of total U.S. international adoptions in 1997 (Russia) 27% (China), 12% (Korea) and 10% (Guatemala). We constructed another instrument using a finer threshold (1%). However, the 1% instrument does not perform as well as either the 5% or 10% counterpart.

[22] The FM interaction codes all 15 states with mandated fertility insurance during any part of our sample period as "ones" (see Schmidt, 2007, Table 1). Not all 15 states mandate insurance for IVF, although all mandate some opportunity for fertility coverage.

instrument that includes the shift-share component for both non-FM states (with a weight of one) and FM states (with a higher weight of 1.6).[23] Figure 7 visually depicts the high correlation between the shift-share ART variable and actual state-level ART birth rates in our sample.

The ideal measure of the ART substitute would be based on the number of families/couples pursuing the ART option for child birth. However, available data comes in two forms: numbers of live births achieved with ART, and numbers of ART cycles performed. The former represents ART successes and the latter represents ART attempts. Neither reveals the numbers of ART candidate couples. We use the "success" measure to estimate ART substitution effects in our baseline model, and consider the alternative "attempt" measure as a robustness check (following Gumus and Lee, 2012).

6 Data

Foster Care. Individual-level data on children in the foster care system, including adoption outcomes and detailed child attributes (without child identifiers), is obtained from the Adoption and Foster Care Analysis and Reporting System (AFCARS), a federally mandated data collection platform. Child attributes for each year include age, gender, race, and a host of child characteristics such as the presence of a disability or behavioral problem; exposure to physical abuse, sexual abuse, or neglect; and reasons for release to the foster system (parental death, imprisonment or abandonment). Dramatic improvements in data quality and completeness occurred between 1995 and 1998, when the government started levying financial penalties for poor quality data (AFCARS, 2000).[24] In view of these improvements – and with AFCARS noting errors in data compilation after 2004 – we focus our analysis on the sample period 1998-2003.[25] State-level

[23]The alternative (weighted) ART instrument = $[(1 - FM) + (1.6 * FM)] * (ARTBartik)$, where ART Bartik = shift share variable.

[24]Prior to 1998, some states did not report foster care data at all and other states had incomplete data (Gumus and Lee, 2012).

[25]Another reason to focus on the period before 2004 is a major structural change in international adoption markets in 2005, anticipated in 2004. During 2005, China – which accounted for almost 40% of international adoptions in the U.S. in prior years – placed new limits on prospective adopters, including the restriction to heterosexual couples with a minimum of two years of marriage, body mass indices of less than 40, and no consumption of any proscribed set

panel data on foster adoption subsidies is obtained from Gumus and Lee (2012), representing average monthly basic assistance rates for 2-year olds.[26]

International Adoptions. Numbers of children adopted by citizens of the United States from other countries, by state of adopter residence, source country, year of adoption, and gender and age of adoptee (less than 1, 1-4, 4-8, or greater than 8), are obtained from the Department of Homeland Security for 1998-2003.

ART Births. Data on Assisted Reproductive Technology (ART) are obtained from the CDC. Aggregate numbers of IVF (In Vitro Fertilization) cycles and live births are compiled from fertility clinic data for each state and year in our 1998-2003 sample period.

Socioeconomic Data. State-level data on per capita personal income are obtained from the Bureau of Economic Analysis, U.S. Department of Commerce. The U.S. Census provides annual state-level data on educational attainment (percentage of college graduates) and populations by gender and age.

Sample Statistics. Tables 2 and 3 provide summary statistics for the state-year panel and the child-level data (for foster toddlers between 1 and 2 years old). Table 2 indicates that annual foster adoptions, international adoptions and ART births (by state) are of comparable magnitudes in our data. Note also that IVF cycles average roughly 3.5 times annual ART births, reflecting a corresponding number of IVF attempts per actual birth. Table 3 reveals that our sample toddlers are 51 percent male, 51 percent white, 37 percent African American, with almost 60 percent victims of neglect, 17 percent objects of physical abuse, and over 25 percent with drug-abusing parents. The proportion of foster children that are adopted each year ranges from 1.56 percent for the infants (who have been in the foster system for less time) to over 12 percent for children ages 3 and 4.

of drugs. The new restrictions led to a dramatic decline in U.S. child adoptions from China (Figure 3).

[26] We are very grateful to Professor Gumus for providing us with this data, originally obtained from the North American Council on Adoptive Children (NACAC). We opted to use the basic monthly assistance data – rather than average monthly subsidies as reported in AFCARS – due to well-known errors in the latter (see, for example, Gumus and Lee, 2012, note 15).

7 Results

A. *Baseline Regressions.* Our baseline analysis concerns foster adoptions of the youngest children: infants (age 0) and toddlers (age 1). International adoptees and ART births are arguably the closest potential substitutes for these children, as ART children are babies and international adoptees are predominantly less than two years of age (Table 1).

For these two age cohorts, we begin with the simple regressions reported in Table 4. These regressions illustrate three properties of all of our estimations: (1) all models include adoption subsidies, individual child attributes, foster supplies, state-level controls (income and education), state and year fixed effects; (2) we cluster the errors in two alternate ways, one by state (allowing for cross-observation correlation between all observations from a given state) and two-way by state and by year (allowing, in addition, correlation across states within each year, see Cameron et al., 2011);[27] and (3) we consider two alternate functional models, linear probability (OLS) and probit.

Table 4 indicates that international adoptions have negative coefficients, consistent with our model hypotheses. The coefficients are statistically significant for the infants, but quite small in magnitude. To gauge the magnitudes of these effects, consider the approximate estimated impact of one additional international adoption on the number of infant / toddler adoptions out of foster care. Approximate estimated effects range between -0.039 (model (4)) and -0.068 (model (1)) for infants, and between -0.086 (model (6)) and -0.104 (model (7)) for toddlers.[28] ART births do not have significant coefficients in the simple adoption regressions.

B. *Main Results.* The regressions of Table 4 ignore the potential endogeneity of the substitutes. Table 5 presents our main regressions for infants and toddlers,

[27] The two-way clustering should not be confused with clustering by state-year. Econometric advice tends to support two-way clustering in cases like ours, although it is tempered by limitations of our short time series (Cameron and Miller, 2015).

[28] This calculation is based on the following decomposition: Estimated effect of one additional international adoption = (approximate change in international adoption rate associated with one additional international adoption) * (average supply of foster children, age a, per state-year) * (estimated marginal effect of the state-year-level international adoption rate on the age a foster adoption probability). The first term is estimated by the ratio of the mean international adoption rate and the mean number of international adoptions (by state-year), 0.158/354.71.

using our baseline shift-share instruments to identify the international adoption and ART birth rate regressors. For each age class, we present four models, three linear and one probit. The second linear model (our preferred specification) includes both endogenous regressors (international adoptions and ART births) and state-specific time trends. The probit also includes both substitutes but no state trends,[29] and is estimated using a consistent IV approach, two stage residual inclusion (2SRI) (Terza et al., 2008).

The bottom panel of Table 5 reports first stage statistics, including the coefficients on the identifying instruments. The instruments perform well in that they are highly significant in respective first stage equations. However, with two endogenous regressors, the presence of weak instruments can only be judged by statistics that account for potential collinearities in identification (see Angrist and Pischke, 2009). The Angrist-Pischke F statistics gauge the strength of the instruments in explaining variation in each endogenous regressor over and beyond variation explained by identification of the other endogenous regressor. They thereby give analogs to simple (single endogenous regressor) F statistics and are subject to the same rules of thumb. In the Table 5 models, the AP statistics are all substantially larger than the benchmark of ten (Stock and Yogo, 2003), providing statistical evidence against weak identification.

The 2SRI models provide a direct test for endogeneity of international adoptions and ART. In both infant and toddler models, we find significant positive coefficients on both fitted residuals, indicating that we reject exogeneity of the associated regressors.

Our main interest, of course, is the top panel of coefficients on the international adoption and ART birth rates in the (second stage) foster adoption equation. In all models, we estimate significant negative coefficients on the international adoption regressor. The estimated coefficients are substantially larger than in Table 4, indicating a positive bias from endogeneity. In terms of magnitudes, the coefficients imply that one additional international adoption reduces the number of infant (toddler) adoptions from foster care by approximately 0.136 to 0.448

[29] The probits do not converge when state trends are included.

(0.442 to 1.057).

Effects of ART births are much less clear. In the models without state trends (models (1), (4), (5), and (8)), estimated effects are negative, but only significant in the probit models (4) and (8). [30] However, these estimated effects are not robust to the presence of state trends; the addition of the trends leads to a reversal in coefficient sign (from negative to positive), although the resulting (positive) coefficients are not statistically significant. In the probit models – where the ART coefficients are significant and negative - magnitudes of effect are quite small compared with international adoption analogs; one additional ART birth is estimated to reduce the number of infant (toddler) foster adoptions by approximately 0.047 (0.147) – roughly one-third of estimated reductions from an additional international adoption (using the same models).

C. *Robustness Checks.* Table 6 presents several robustness checks on the main results of Table 5. The top panel (A) considers alternative instruments for, respectively, international adoptions (the "10%" instrument, on the left) and ART births (the "weighted" instrument, on the right).[31] The bottom left panel (B1) measures ART use with the number of "attempts", ART cycles (vs. the number of "successes", ART births). And the bottom right panel (B2) restricts the sample to "waiting" foster children – those explicitly designated with a goal of adoption.[32] In all cases, we present two models for each of the child age classes: our full linear model (with state trends) and the probit model (without state trends).

Results in Table 6 are remarkably consistent with those of our benchmark (Table 5) regressions in terms of signs of effect, significance, and magnitudes. However, the alternative measures used in the lower panel B do affect related marginal effects. As ART cycles are more numerous than ART births (more than

[30] The probit results are qualitatively similar to Gumus and Lee (2012) who study how foster adoptions affect ART demand.

[31] See Section 5 for elaboration on the alternative instruments. In each case, we use the alternative instrument (e.g., the 10 percent instrument for international) in conjunction with the baseline instrument for the other endogenous regressor (e.g., for ART births).

[32] In both cases (B1 and B2), we use the baseline instruments to identify the endogenous substitutes. For the ART cycles measure, we considered alternative ART instruments (more closely related to cycles); however, the baseline (births-based) instrument exhibited superior performance in the first stage.

three times, see Table 2), the corresponding negative effects of the ART rate in the panel B1 probits are roughly one-third the magnitude of counterparts for ART births. More importantly, the restriction to waiting children (in panel B2) raises the size of coefficients on international adoptions. Because the marginal effects on adoption probabilities relate to many fewer children, estimated effects of one additional international adoption on the number of foster adoptions is actually smaller in the waiting child regressions than in our baseline regressions with all foster children, despite the higher coefficients in Table 6-B2. The latter coefficients translate to approximate reductions of 0.05 to 0.14 infant adoptions, and 0.16 to 0.44 toddler adoptions, from one more international adoption.

D. *Older Age Cohorts.* Table 7 presents results of IV estimations for adoptions of foster children ages 2-8. Adoptions of the younger (ages 2-3) children respond in similar ways to the endogenous substitutes as do the youngest (ages 0 and 1), with negative and significant effects of international adoptions. For the higher ages 4-8, these effects are statistically significant in the models with state trends. In all cases, estimated impacts of ART births are again sensitive to specification, with insignificant positive coefficients when state trends are included.

Impacts of international adoptions on adoptions of the older foster children likely reflect a form of indirect substitution. In this paper, we estimate reduced forms for each age and cannot explicitly measure between-age substitution. When costs of international adoptions decline, we expect to see substitution away from the closest age cohorts of potential foster adoptees – the infants and toddlers. However, the resulting decline in demand for the youngest foster children may also lead to substitution from older to younger foster adoptions. In Table 7, we may be picking up this indirect negative effect of the international substitutes on the older age cohorts.

E. *Back of the Envelope.* Over our sample period (1998-2003), international adoptions rose at a 6.47% annual growth rate. What do our estimates suggest about the effects of this growth on the numbers of foster adoptions? Table 8 gives a rough answer using estimated marginal effects from Tables 5 and 7.

Consider the average of estimates from the two models without state trends, the linear (2SLS) and probit (2SRI), denoted by "A" in Table 8. Based on the "A" estimates, annual growth in international adoptions over the sample period reduced annual foster adoptions of the younger cohorts (ages 0-3) by approximately 2471, or 21 percent of average annual foster adoptions for these ages (11,689). The corresponding estimate for all considered cohorts (ages 0-8) is a reduction of 4511 in annual foster adoptions, or 14.7 percent of the corresponding average annual total (30,530). Recall, however, that our models without state trends produce smaller estimated marginal effects of international adoptions than do our (preferred) models with state trends. The latter are indicated by the "B" effects in Table 8. The "B" effects imply that annual growth in international adoptions reduced annual foster adoptions of the younger children (ages 0-3) by approximately 42.8 percent, and of all cohorts (0-8) by an estimated 32.3 percent.

8 Summary and Conclusion

Adverse effects of raising children in foster care, rather than adoptive families, are well documented. Even though the number of children in the U.S. foster care system is relatively small (at roughly 400,000 today), potential societal costs of long term child placements in the foster system are disproportionately large, including higher rates of juvenile delinquency, teen pregnancy, drug use, sexually transmitted disease, unemployment, adult crime, and incarceration (Doyle, 2007a, 2008; Courtney et al., 2004). Policies that promote adoption out of foster care may potentially deliver benefits in avoiding some of these adverse outcomes.[33]

In this paper, we study how two substitute paths to parenthood – international adoption and the use of Assisted Reproductive Technology (ART) to bear a child – affect probabilities that foster children of different ages are adopted. Resulting evidence on effects of ART births is mixed. However, our most complete (preferred) models produce no significant coefficients on ART birth rates, consistent with a distribution of preferences in the population of potential parents that is bimodal: most families may have strong preferences for either adoption

[33]While Doyle's (2007a, 2008) work is suggestive of long-term benefits from foster adoptions, this translation is not entirely transparent. Doyle focuses on the randomly assigned placement of children to their own family vs. foster care, whereas children adopted out of foster care (our focus) are exposed to foster care for a time and are selected into adoption.

or a biological child, with few “in the middle”. In contrast, estimated effects of international adoptions in displacing foster adoptions are statistically significant, robust to a variety of model specifications, and large. For example, in our sample, one additional international adoption is estimated to displace between 0.58 and 1.50 adoptions of foster infants and toddlers.[34] Qualitatively, these effects are likely to be even more pronounced as international adoptions siphon off potential parents who are economically particularly well-positioned to invest in their children (Table 1).

The results have potential implications for the calculus of government intervention in markets for children. While few would dispute the social / external benefits of foster adoptions, whether current subsidies to these adoptions succeed in “internalizing the externality” is another question. At present, however, the U.S. employs dueling subsidies: international adoptions enjoy large dollar-for-dollar federal tax credits (currently $13,400). To the extent that international adoptions respond to the tax subsidies, our results suggest that they displace adoptions out of foster care, countering benefits of subsidies that promote foster adoptions (Buckles, 2013). Associated costs merit consideration by policy-makers as they weigh any offsetting external benefits of international adoptions to the immigrant children and adoptive communities.

While we identify one key effect of a substitute on foster adoptions, other demand-side drivers merit study. For example, Landes and Posner (1978) and others criticize the absence of markets for the allocation of babies by private adoption agencies. If market prices were paid to prospective mothers, a supply response could potentially exacerbate challenges in management of the foster system by increasing numbers of unwanted babies. However, the current system of rationing and queuing locks up many potential adoptive parents in a fruitless quest for private adoptions. With demand-side pricing of babies that eliminates queues, these parents could be freed up for foster adoption. More generally, study and consideration of the demand side of adoption markets offers the potential to

[34]Greater than one-for-one displacement is entirely possible as the number of actual (realized) international adoptions is substantially exceeded by the number of families who attempt international adoptions and are thereby removed from the pool of potential foster adopters.

improve adoption outcomes in the foster system and thereby deliver substantial social dividends.

9 References

Altonji, J. and D. Card. 1991. "The effects of immigration on the labor market outcomes of less-skilled natives." In: *Immigration, Trade, and the Labor Market*, 201-234, Chicago: University of Chicago Press.

Angrist, J. and J. Pischke. 2009. *Mostly Harmless Econometrics.* Princeton Univ. Press.

Argys, L. and B. Duncan. 2013. "Economic incentives and foster child adoption." *Demography* 50 (3): 933-54.

Baccara, M., A Collard-Wexler, L. Felli, and L. Yariv. 2012. "Child adoption matching: Preferences for gender and race." NBER Working Paper.

Barth, R., C. Lee, J. Wildfire, and S. Guo. 2006. "A comparison of the governmental costs of long-term foster care and adoption." *Social Service Rev.* 80 (1): 127-58.

Bernal, R., L. Hu, C. Moriguchi, and E. Nagypal. 2007. "Child adoption in the United States: Historical trends, 1951-2002." W.P., Northwestern U.

Bitler, M. 2006. "Effects of increased access to infertility treatment on infant and child health: Evidence from health insurance mandates." RAND/PPIC W.P.

Bitler, M. and L. Schmidt. 2012. "Utilization of infertility treatments: The effects of insurance mandates." *Demography* 49: 125-49.

Bitler, M. and M. Zavodny. 2002. "Did abortion legalization reduce the number of unwanted children? Evidence from adoptions." *Perspectives on Sexual and Reproductive Health* 34 (1): 25-33.

Blackstone, E., A. Buck, and S. Hakim. 2004. "Privatizing adoption and foster care: Applying auction and market solutions." *Children & Youth Services Rev.* 26: 1033-49.

Buckles, K. 2013. "Adoptions subsidies and placement outcomes for children in foster care." *J. Human Resources* 48 (3): 596-627.

Cameron, C., J. Gelbach, and D. Miller. 2011. "Robust inference with multi-way clustering." *J. Business & Econ. Stat.* 29 (2): 238-49.

Cameron, C. and D. Miller. 2015. "A practitioners guide to cluster-robust inference." *J. Human Resources* 50 (2): 317-72.

Card, D. 2001. "Immigration inflows, native outflows, and the local labor market impacts of higher immigration." *J. Labor Econ.* 19: 22-64.

Chandra, A., G. Martinez, W. Mosher, J. Abma, and J. Jones. 2005. "Fertility, Family Planning, and Reproductive Health of US Women: Data from the 2002 National Survey of Family Growth." *Vital Health Stat.* 23: 1-160.

Courtney, M., S. Terao, and N Bost. 2004. *Midwest Evaluation of the Adult Functioning of Former Foster Youth.* U. Chicago, Chapin Hall Center.

David, H., D. Dorn, and G. Hanson. 2013. "The China syndrome: Local labor market effects of import competition in the United States." *American Econ. Rev.* 103 (6): 2121-2168.

Doyle, J. 2007a. "Child protection and child outcomes: Measuring the effects of foster care." *American Econ. Rev.* 97 (5): 1583-1610.

Doyle, J. 2007b. "Can't buy me love? Subsidizing the care of related children." *J. Public Econ.* 91: 281-304.

Doyle, J. 2008. "Child protection and adult crime: Using Investigator assignment to estimate causal effects of foster care." *J. Political Econ.* 116 (4): 746-70.

Doyle, J. and E. Peters. 2007. "The market for foster care: An empirical study of the impact of foster care subsidies." *Rev. Econ. Household* 5: 329-51.

Duncan, B. and L. Argys. 2007. "Economic incentives and foster care placement." *Southern Econ. J.* 74: 114-42.

Dwyer, D. and K. Noonan. 2001. "Measurement error in the reported reasons for entry into the foster care system." Working Paper, SUNY Stony Brook.

Gennetian, L. 1999. "The supply of infants relinquished for adoption: Did access to abortion make a difference?" *Econ. Inquiry* 37 (3): 412-31.

Griffin, M. and W. Panak. 1998. "The economic cost of infertility-related services: An examination of the Massachusetts infertility insurance mandate." *Fertility and Sterility* 70 (1): 22-29.

Gumus, G. and J. Lee. 2012. "Alternative paths to parenthood: IVF or child adoption?" *Econ. Inquiry* 50 (3): 802-20.

Hansen, M. 2007. "Using subsidies to promote the adoption of children from foster care." *J. Family and Econ. Issues* 28: 377-93.

Hansen, M. 2008. "The value of adoption." *Adoption Quarterly* 10 (2): 65-87.

Hansen, M. and B. Hansen. 2006. "The economics of adoption of children from foster care." *Child Welfare* 85: 559-83.

Jain, T., B. Harlow, and M. Hornstein. 2002. "Insurance coverage and outcomes of in vitro fertilization." *New England J. Medicine* 347 (9): 661-6.

Jonson-Reid, M. and R. Barth. 2000. "From placement to prison: The path to adolescent incarceration from child welfare supervised foster or group care." *Children and Youth Services Rev.* 22 (7): 493-516.

Landes, E. and R. Posner. "Economics of the baby shortage." *J. Legal Stud.* 7(2): 323-48.

Medoff, M. 1993. "An empirical analysis of adoption." *Econ. Inquiry* 31: 59-70.

Moriguchi, C. 2012. "The evolution of child adoption in the United States, 1950-2010." *Institute of Econ. Research*, Tokyo.

Ottaviano, G. and G. Peri. 2012. "Rethinking the effect of immigration on wages." *J. European Econ. Association* 10 (1): 152-197.

Ottaviano, G., G. Peri, and G. Wright. 2013. "Immigration, offshoring, and American jobs." *American Econ. Rev.* 103 (5): 1925-59.

Posner, R. 1992. *Sex and Reason.* Cambridge, MA: Harvard University Press.

Schmidt, L. 2007. "Effects of infertility insurance mandates on fertility." *J. Health Econ.* 26 (3): 431-46.

Shuman, M. and V. Flango. 2013. "Trends in U.S. adoptions: 2000-2009." *J. Public Child Welfare* 7 (3): 329-49.

Skidmore, M., G. Anderson, and M. Eiswerth. 2016. "The child adoption marketplace: Parental preferences and adoption outcomes." *Public Finance Rev.* 44: 163-96.

Stock, J. and M. Yogo. 2003. "Testing for weak instruments in linear IV regression." Harvard University.

Swann, C. and M. Sylvester. 2006. "The foster care crisis: What causes caseloads to grow?" *Demography* 43 (2): 309-35.

Terza, J., A. Basu, and P. Rathouz. 2008. "Two-stage residual inclusion estimation: Addressing endogeneity in health econometric modeling." *J. Health Econ.* 27: 531-43.

Wilson, J., J. Katz, and R. Green. 2005. "Listening to parents: Overcoming barriers to the adoption of children from foster care." KSG Working Paper.

Table 1: Attributes of U.S. Adopted Children and Adoption Costs by Source (% of Total)

Variable	Foster Care	Inter-national	Private Domestic	Variable	Foster Care	Inter-national	Private Domestic
Gender and race (2007)				**Age distribution at adoption (2007)**			
Male	57	33	51	Age less than 2	28	67	60
White	37	3	50	Age 2-5	42	25	21
Afr. Am.	35	9	25	Age 6-17	30	9	20
Asian	-	59	-				
Other (incl. hispanic)	28	19	25	**Child has special health care needs**			
				Children ages 0-5	39	10	25
Attributes of adoptive parents (2007)				Child w/ADD-ADHD	38	17	19
White	63	92	71	Child behavior problems	25	7	11
Afr. Am.	27	-	19				
Married	70	82	59	**U.S. adoption costs**			
No biological child	38	71	46	< $1000	69	0	0
High school (or >) educ.	70	95	79	$1-10,000	25	0	8
Related to child	23	-	41	$10-20,000	6	1	23
Household income to poverty ratio				$20-30,000	0	32	26
< 100% pov. line	16	-	17	$30-40,000	0	51	25
100 - 400% pov. line	58	39	50	> $40,000	0	16	18
> 400% pov. line	25	58	33				

Source: Adoption Factbook V (2012), Moriguchi (2012), *Adoptive Families* magazine

Table 2: Summary Statistics: State-Year Variables

Variable	**Mean**	**Std. Dev.**	**N**	**Variable**	**Mean**	**Std. Dev.**	**N**
Foster adoptions ($\leq$ 4)	299.66	465.63	296	IVF cycles	1598.7	2154.5	260
Int'l adoptions	354.71	353.4	267	IVF cycles rate +	0.6	0.594	260
ART births	462.2	603.15	255	Avg. adopt subsidy	380.38	108.84	260
Int'l adoption rate +	0.158	0.083	267	% College educ.	25.6	5.061	297
ART birth rate +	0.173	0.164	255	Per capita income	28442	4794	297
Int'l adopt instr. (5%)+	0.351	0.201	278	Fost. supply (age 0,1)+	0.443	0.179	291
Alt. int'l instr. (10%) +	0.346	0.189	278	Fost. supply (age 2-8)+	2.072	0.888	291
ART birth instr. +	0.084	0.199	278	Wait. child (age 0,1)+	0.087	0.069	291
Alt. ART instr. +	0.262	0.326	278	Wait. child (age 2-8)+	0.633	0.400	291

+ Rates are per 1000 women of child-rearing age (15-44).

Table 3: Summary Statistics: Child Level +

Variable	Mean	N	Variable	Mean	N
Foster children age 1 (toddlers)					
Adopted	0.053	224319	Parental drug abuse	0.252	208846
Waiting child	0.189	224319	Child disability	0.035	204353
Male	0.506	224090	Behavioral problems	0.013	208856
White	0.508	224319			
Amer. Indian	0.028	224319	Reasons for being in foster care		
Asian	0.014	224319	Parents died	0.003	204334
Afr. American	0.375	224319	Parents in jail	0.058	204334
Hispanic origin	0.193	191526	Inability to cope	0.223	208848
Physically abused	0.166	208892	Abandonment	0.047	208766
Neglected	0.584	208889	Inadequate housing	0.116	204201
Parental alcohol abuse	0.078	208851			
Proportion of foster children adopted by age					
Age 0 (Infants)	0.0156	107248	Age 5	0.1123	216952
Age 1 (Toddlers)	0.0528	224319	Age 6	0.1038	212482
Age 2	0.1072	242692	Age 7	0.0959	213728
Age 3	0.1270	240831	Age 8	0.0902	214787
Age 4	0.1184	225959			

+ All variables are (0,1). All means are sample proportions.

Table 4: Adoption Probabilities for Infants and Toddlers in Foster Care: Simple Regression

	Infants				Toddlers			
	OLS		Probit		OLS		Probit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intl. adopt. rate	-0.420*	-0.358+	-0.327**	-0.245**	-0.294	-0.255	-0.307+	-0.261
	(-2.02)	(-1.83)	(-3.64)	(-2.56)	(-1.48)	(-1.36)	(-1.77)	(-1.59)
	[-2.40]	[-1.99]	[-5.20]	[-2.98]	[-1.67]	[-1.33]	[-2.00]	[-1.70]
ART birth rate	0.004		-0.040		0.036		0.015	
	(0.05)		(-0.56)		(0.38)		(0.13)	
	[0.06]		[-0.59]		[0.41]		[0.17]	
Observations	89093	91481	88863	91251	181054	185971	181054	185971

t statistics in parentheses. Robust standard errors clustered by state (round brackets) and two-way by state and year [square brackets]. Probit marginal effects at means. All models include adoption subsidies, mean state child attributes, individual child attributes, foster supply rates (ages 0-1, 2-8), foster waiting child supply rates (ages 0-1, 2-8), state-level controls, state and year fixed effects. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$ (state cluster, df=42 (46) for odd (even) models)

Table 5: Adoption Probabilities for Infants and Toddlers in Foster Care: IV Estimations

	Infants				Toddlers			
	2SLS			Probit 2SRI	2SLS			Probit 2SRI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intl. rate	-1.714*	-2.777**	-2.666**	-0.846**	-1.309+	-3.131**	-2.940**	-1.358**
	(-2.40)	(-2.85)	(-3.20)	(-4.67)	(-1.92)	(-2.67)	(-3.09)	(-3.26)
	[-3.35]	[-4.10]	[-4.45]	[-4.27]	[-2.37]	[-4.25]	[-5.18]	[-3.91]
ART rate	-0.286	0.387		-0.294**	-0.386	0.627		-0.435*
	(-1.27)	(1.00)		(-2.67)	(-1.30)	(1.54)		(-2.22)
	[-1.36]	[1.09]		[-2.64]	[-1.44]	[2.02]		[-2.40]
Residuals Int'l				0.652**				1.235**
				(3.11)				(2.79)
				[2.88]				[3.25]
Residuals ART				0.420**				0.723**
				(3.28)				(3.25)
				[2.73]				[3.20]
State trends	No	Yes	Yes	No	No	Yes	Yes	No
First stage (international adoption rate)								
Intl. instrument	0.261**	0.200**	0.199**	0.261**	0.244**	0.188**	0.187**	0.244**
	(5.67)	(3.87)	(4.16)	(5.67)	(5.30)	(3.63)	(3.91)	(5.30)
	[6.69]	[4.88]	[4.95]	[6.69]	[6.29]	[4.09]	[4.20]	[6.29]
ART instrument	-0.099*	0.350+		-0.099*	-0.091*	0.379*		-0.091*
	(-2.52)	(1.97)		(-2.52)	(-2.46)	(2.21)		(-2.46)
	[-2.00]	[2.40]		[-2.00]	[-1.93]	[3.02]		[-1.93]
AP F Stat	29.94	13.45	17.29	29.94	24.48	11.46	15.27	24.48
First stage (ART birth rate)								
Intl. instrument	0.238**	0.044		0.238**	0.248**	0.052		0.248**
	(2.84)	(0.50)		(2.84)	(2.89)	(0.59)		(2.89)
	[2.34]	[0.60]		[2.34]	[2.35]	[0.71]		[2.35]
ART instrument	0.424**	2.182**		0.424**	0.415**	2.134**		0.415**
	(4.35)	(5.35)		(4.35)	(4.18)	(5.22)		(4.18)
	[4.95]	[5.90]		[4.95]	[4.75]	[5.32]		[4.75]
AP F Stat	35.44	17.04		35.44	31.22	15.07		31.22
Observations	89093	89093	91481	89093	181054	181054	185971	181054

t statistics in parentheses. Robust standard errors clustered by state (round brackets) and two-way by state and by year [square brackets]. Probit marginal effects at means. All models include adoption subsidies, mean state child attributes, individual child attributes, foster supply rates (ages 0-1 and 2-8), foster waiting child supply rates (ages 0-1 and 2-8), state-level controls, state and year fixed effects. AP F statistic = Angrist Pischke test statistic for weak instruments (state cluster, df=(1,G-1), G-1=42 (Models 1-2,4-6,8), G-1=46 (Models 3,7)). 2SLS = two stage least squares. 2SRI = two stage residual inclusion (Terza et al., 2008). State trends are state-specific time trends. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$ (state cluster, df=G-1)

Table 6: Robustness Checks: IV Estimations for Adoption of Infants and Toddlers in Foster Care

A. Alternative Instruments								
	Alt. (10%) Instrument for Intl. Adopt.				Alt. (Weighted) Instrument for ART			
	Infants		Toddlers		Infants		Toddlers	
	2SLS	Probit	2SLS	Probit	2SLS	Probit	2SLS	Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intl. adopt	-3.007**	-0.745**	-3.565*	-1.315**	-2.670**	-0.942**	-2.993**	-1.407*
rate	(-2.72)	(-3.76)	(-2.40)	(-2.63)	(-2.99)	(-3.78)	(-2.93)	(-2.67)
	[-3.80]	[-3.54]	[-3.39]	[-3.40]	[-4.20]	[-3.61]	[-5.13]	[-2.90]
ART birth	0.432	-0.279*	0.719	-0.433*	0.176	-0.242+	0.384	-0.400
rate	(1.01)	(-2.42)	(1.49)	(-2.14)	(0.72)	(-1.75)	(1.59)	(-1.67)
	[1.04]	[-2.43]	[1.71]	[-2.33]	[0.84]	[-1.75]	[2.15]	[-1.80]
State trends	Yes	No	Yes	No	Yes	No	Yes	No
First stage identification statistics								
Intl. AP F Stat	10.54	23.55	8.91	21.11	14.99	23.25	13.20	19.31
ART AP F Stat	18.46	34.08	16.37	30.32	25.39	16.77	24.55	15.80
Observations	89093	88863	181054	181054	89093	88863	181054	181054

B. Alternative Measures of ART and Foster Children								
	1. ART Cycles (vs. ART Births)				2. Adoption of Waiting Foster Children			
	Infants		Toddlers		Infants		Toddlers	
	2SLS	Probit	2SLS	Probit	2SLS	Probit	2SLS	Probit
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Intl. adopt	-2.534**	-0.886**	-2.777*	-1.302**	-6.898**	-2.433**	-6.982**	-2.466+
rate	(-2.78)	(-5.74)	(-2.54)	(-2.83)	(-3.48)	(-3.18)	(-3.11)	(-1.79)
	[-4.36]	[-4.76]	[-6.73]	[-2.96]	[-4.93]	[-3.37]	[-3.40]	[-1.89]
ART rate	0.451+	-0.111**	0.808*	-0.166*	0.543	-0.645	1.253	-1.068+
(cycles (9)-(12))	(1.82)	(-3.28)	(2.66)	(-2.46)	(0.93)	(-1.64)	(1.64)	(-1.94)
(births (13)-(16))	[2.94]	[-3.21]	[4.35]	[-2.83]	[0.76]	[-1.60]	[1.80]	[-2.20]
State trends	Yes	No	Yes	No	Yes	No	Yes	No
First stage identification statistics								
Intl. AP F Stat	18.24	30.99	16.25	28.23	29.30	61.79	13.22	44.11
ART AP F Stat	6.14	6.57	6.33	5.81	26.44	41.27	16.90	47.44
Observations	90222	89992	183483	183483	11909	11563	35961	35961

See notes to Table 6. t statistics in parentheses. Robust standard errors clustered by state (round brackets) and two-way by state and by year [square brackets]. Probit 2SRI marginal effects. State cluster degrees of freedom (G-1) = 42 (Tab 7A), 43 (Tab 7B1), 46 (Tab 7B2).

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$ (state cluster)

Table 7: Adoption Probabilities for Foster Children Ages 2-8: IV Estimations

(Model) Method	State Trends	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
Intl. rate								
(1)	No	-1.797*	-1.755	-0.704	-0.819	-1.103	-0.878	-0.963
2SLS		(-2.07)	(-1.64)	(-0.56)	(-0.63)	(-0.87)	(-0.69)	(-0.84)
		[-2.44]	[-1.87]	[-0.67]	[-0.71]	[-0.92]	[-0.79]	[-0.93]
(2)	No	-2.400**	-2.438**	-1.195	-1.283	-1.455+	-1.3	-1.366*
Probit		(-4.51)	(-3.64)	(-1.20)	(-1.32)	(-1.70)	(-1.49)	(-1.97)
2SRI		[-4.39]	[-4.68]	[-1.71]	[-1.88]	[-2.26]	[-2.03]	[-2.91]
(3)	Yes	-3.914**	-4.694*	-2.924+	-2.699+	-2.982*	-2.757*	-2.584+
2SLS		(-2.20)	(-2.29)	(-1.99)	(-1.99)	(-2.14)	(-2.11)	(-1.96)
		[-2.85]	[-2.91]	[-2.29]	[-2.19]	[-1.83]	[-1.96]	[-1.86]
(4)	Yes	-3.956*	-4.297**	-2.794*	-2.550*	-2.861*	-2.539**	-2.398*
2SLS		(-2.72)	(-2.89)	(-2.49)	(-2.42)	(-2.58)	(-2.71)	(-2.57)
		[-3.53]	[-3.81]	[-2.93]	[-2.59]	[-2.24]	[-2.62]	[-2.38]
ART rate								
(1)	No	-0.536	-0.73	-0.920+	-0.882+	-0.884+	-0.927*	-0.798+
2SLS		(-1.38)	(-1.32)	(-1.84)	(-1.82)	(-1.90)	(-2.15)	(-1.77)
		[-1.67]	[-1.56]	[-2.23]	[-2.29]	[-2.36]	[-2.69]	[-2.14]
(2)	No	-0.708**	-0.898*	-0.876**	-0.810**	-0.785**	-0.811**	-0.670**
Probit		(-2.69)	(-2.51)	(-3.72)	(-4.22)	(-3.78)	(-4.82)	(-3.25)
2SRI		[-3.40]	[-2.94]	[-4.07]	[-5.22]	[-4.18]	[-4.82]	[-3.48]
(3)	Yes	0.615	1.077	0.769	0.589	0.843	0.836	0.858
2SLS		-0.96	-1.5	-1.26	-0.93	-1.38	-1.2	(1.50)
		[1.18]	[1.87]	[1.48]	[1.23]	[1.45]	[1.29]	[1.68]
First stage identification statistics (Angrist Pischke F statistics distributed F(1,G-1))								
(1)-(2) Intl. AP	No	29.36	30.9	12.16	11.91	12.49	12.61	12.75
(1)-(2) ART AP	No	28.54	28.41	27.99	27.55	28.59	28.27	26.36
(3) Intl. AP	Yes	9.73	8.93	7.9	8.26	7.69	8.24	8.08
(3) ART AP	Yes	13.44	12.34	8.52	8.3	7.74	8.12	7.70
(4) Intl. AP	Yes	13.35	13.23	10.89	11.47	11.06	11.72	11.90
(1)-(3) Obs.		195893	189761	181032	172754	168645	169391	169957
(4) Obs.		201405	195171	184282	176176	172013	173033	173739

See notes to Table 6. Models (1)-(3) include Intl. rate and ART rate as endogenous regressors. Model (4) only includes Intl. rate. t statistics in parentheses. Robust standard errors clustered by state (round brackets) and two-way by state and by year [square brackets]. Probit marginal effects at means. State cluster degrees of freedom = G-1=43 (Models 1-3), G-1=46 (Model 4).

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$ (state cluster, df=G-1)

Table 8: Estimated Impact of Intl. Adoptions on Foster Adoptions: Back of Envelope

Age	(1) Avg. Ann. Foster Child Numbers ('98-'03)	(2) Avg. Ann. Foster Adopt. Numbers ('98-'03)	(3) Intl. Marg. Effect A +	(4) Intl. Marg. Effect B +	(5) Est. Δ Foster Adopt. (Intl.-A) ++	(6) Est. Δ Foster Adopt. (Intl.-B) ++
0	17874.7	279.7	-1.280	-2.666	-233.9	-487.1
1	37386.5	1974.3	-1.333	-2.940	-509.6	-1123.6
2	40448.7	4338.0	-2.098	-3.956	-867.7	-1635.8
3	40138.5	5097.0	-2.096	-4.297	-860.2	-1763.1
4	37659.8	4458.8	-0.949	-2.794	-365.5	-1075.6
5	36158.7	4060.0	-1.051	-2.550	-388.5	-942.6
6	35413.7	3677.0	-1.279	-2.861	-463.0	-1035.7
7	35621.3	3417.7	-1.089	-2.539	-396.5	-924.6
8	35797.8	3227.7	-1.164	-2.398	-426.1	-877.5
Totals						
ages$\leq$ 3	135,848	11,689			-2471.5	-5009.7
ages 0-8	316,500	30,530			-4511.2	-9865.7

Columns (5)-(6) give estimated effects of annualized growth in intl. adoptions over the 1998-2003 sample period on annual adoptions of foster children in age brackets 0-8. "A" values correspond to estimated negative effects from 2SLS and 2SRI models without state trends. "B" values correspond to larger estimated negative effects from 2SLS models with state trends. Estimated changes in foster adoption numbers (totals in columns (5)-(6)) can be compared to average annual adoptions of 11,689 (ages $\leq$ 3) and 30,530 (ages 0-8).
+ Intl. Marginal Effect (ME) A (Col. (3)) = Average ME for intl. rate, 2SLS and 2SRI with no state trends. Intl. ME B (Col. (4)) = ME for intl. rate, 2SLS with trends.
++ Col. (5) = col. (1) * col. (3) * avg. annual growth in intl. adoptions (0.0647) * mean intl. adoption rate (0.158). Col. (6) = col. (1) * col. (4) * 0.0647 * 0.158.

Figure 1. Children in U.S. foster care

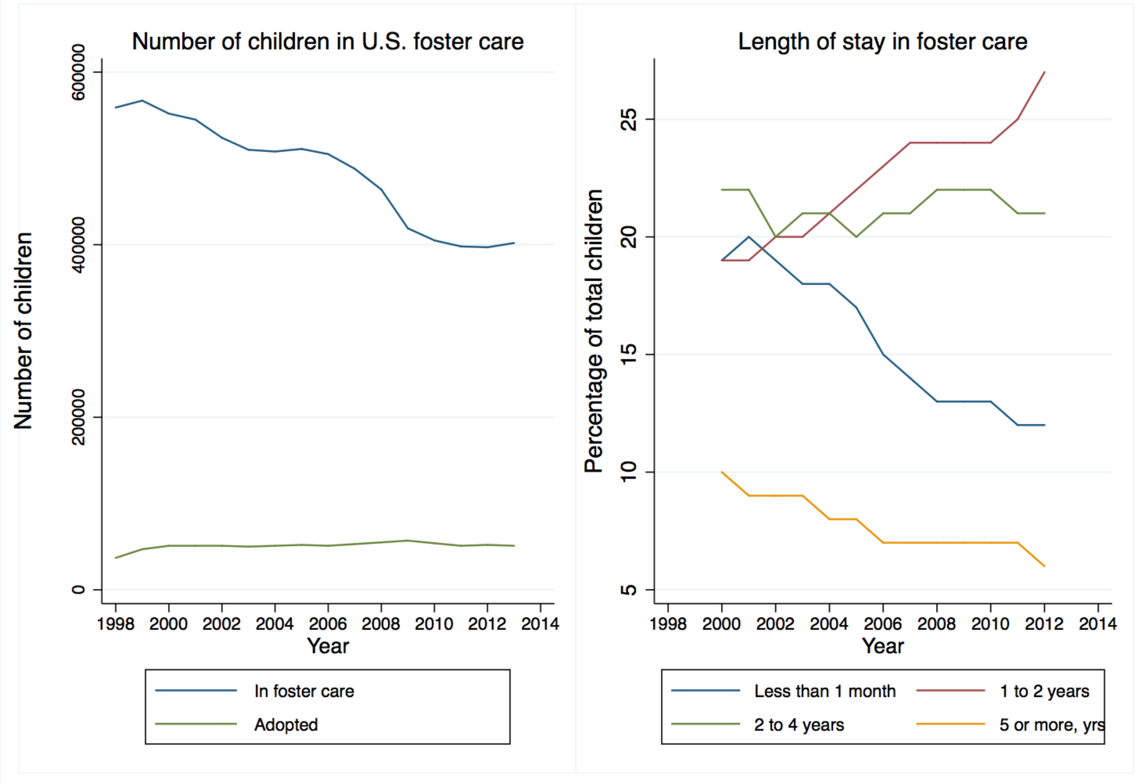
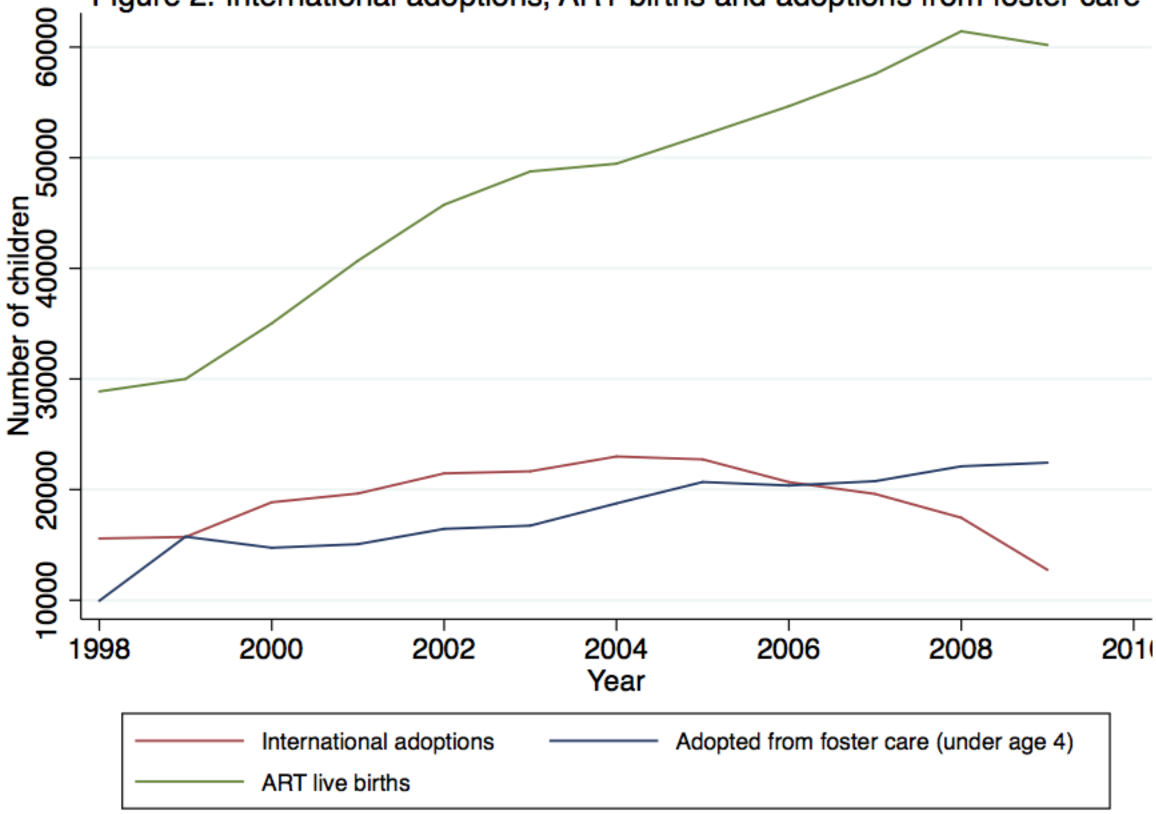


Figure 2. International adoptions, ART births and adoptions from foster care



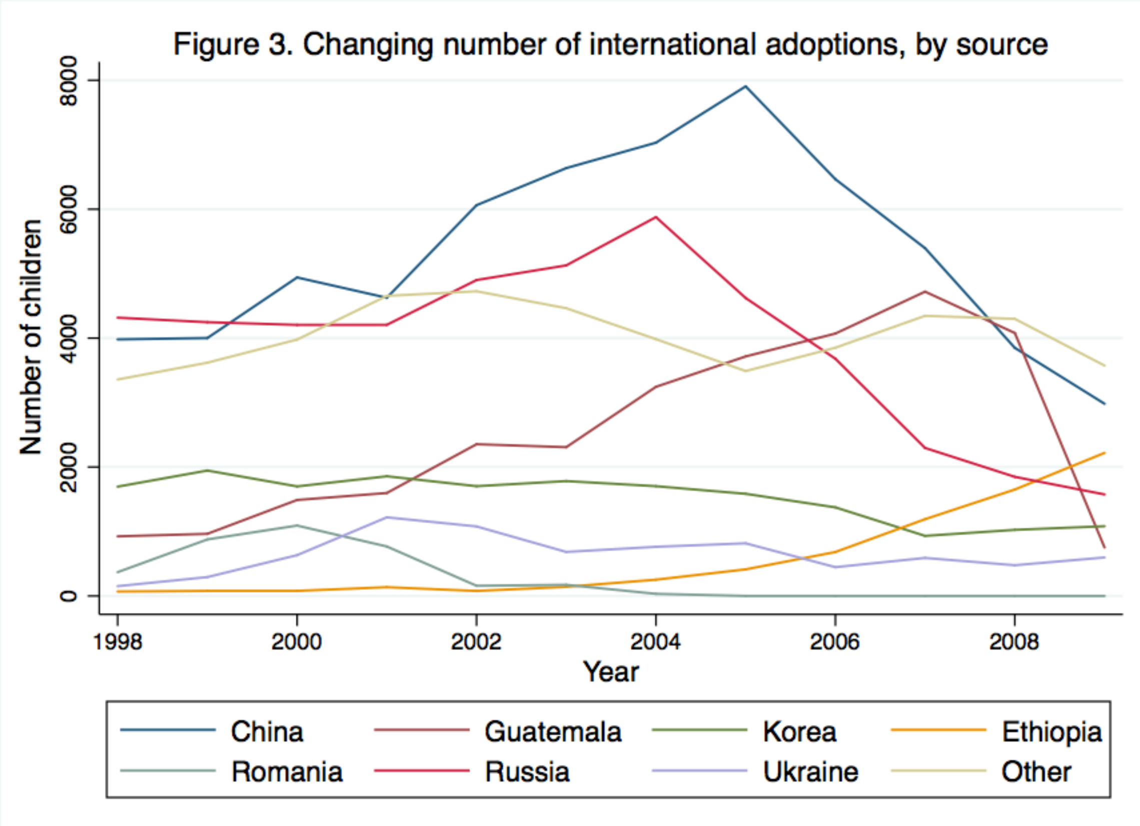


Figure 3. Changing number of international adoptions, by source
Number of children
0
2000
4000
6000
8000
1998
2000
2002
2004
2006
2008
Year
China
Guatemala
Korea
Ethiopia
Romania
Russia
Ukraine
Other

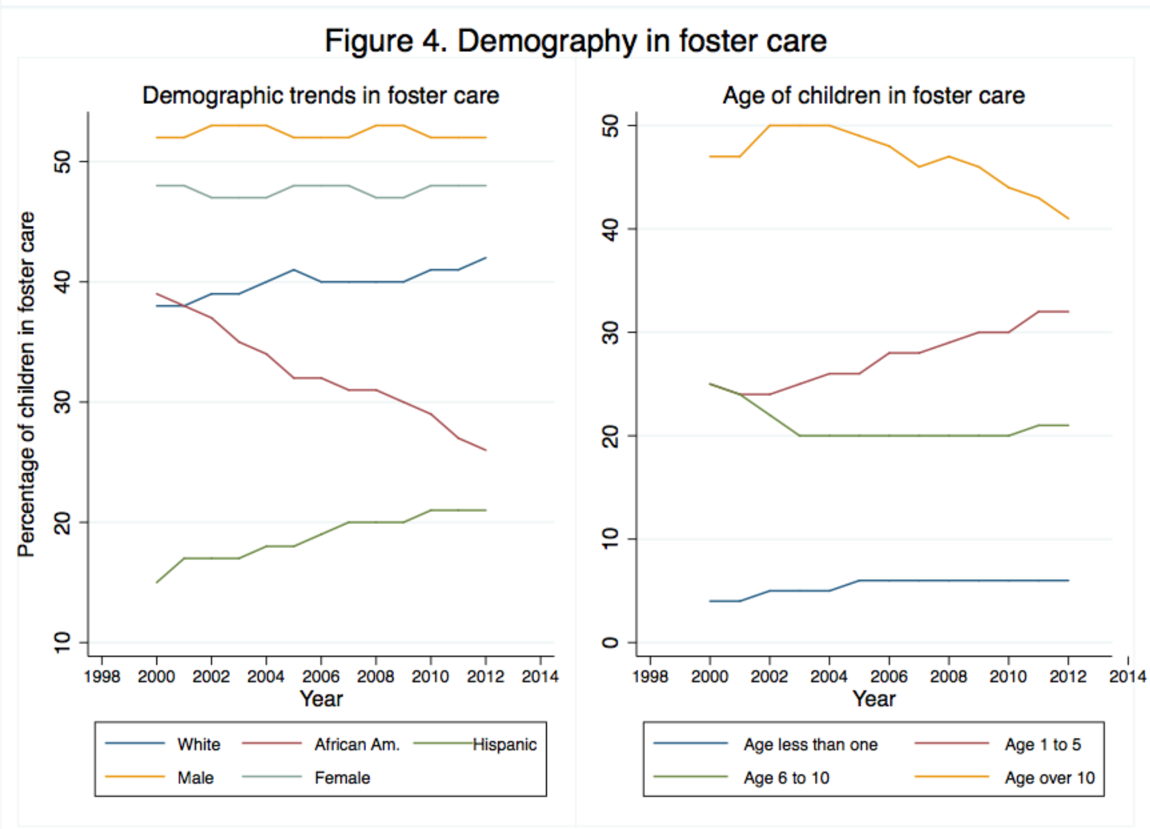


Figure 4. Demography in foster care
Demographic trends in foster care
Percentage of children in foster care
10
20
30
40
50
1998
2000
2002
2004
2006
2008
2010
2012
2014
Year
White
African Am.
Hispanic
Male
Female
Age of children in foster care
0
10
20
30
40
50
1998
2000
2002
2004
2006
2008
2010
2012
2014
Year
Age less than one
Age 1 to 5
Age 6 to 10
Age over 10

Figure 5. Adoption and ART demands

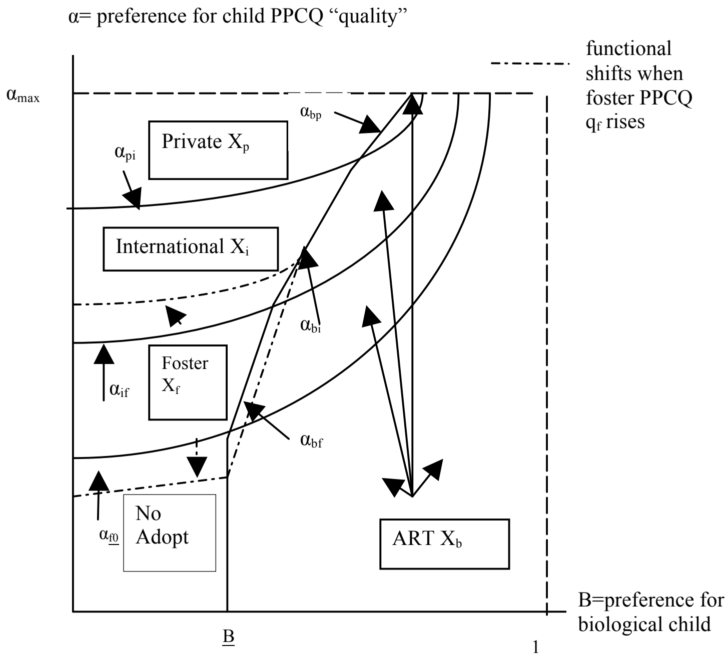


Figure 6. Equilibrium in the foster adoption market

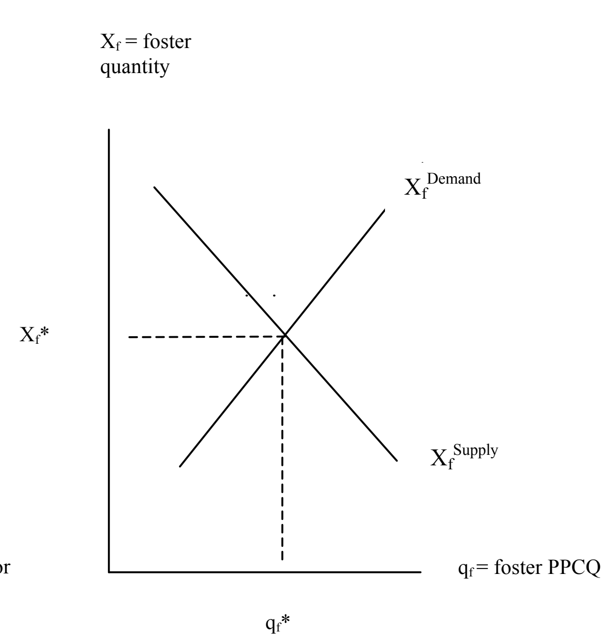


Figure 7. Correlation of instrumental variables with endogenous regressors