# *Are we supporting our orphans enough?* Analysis of factors that affect adoptions from foster care

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## Abstract

Currently over 800,000 children are in the U.S. foster care system. A large proportion, over 20% in most states, of these children are waiting to be adopted. Prolonged stay in foster homes can be detrimental to the welfare of the child besides externalities such as higher rates of crime (Doyle, 2008). We estimate the causal effects of two factors that impact the number of children adopted from domestic foster care: 1) the increasing number of international child adoptions in the U.S. 2) the increased births due to artificial reproductive technologies (ART). We identify the effects using instrumental variables and find a significant reduction in child adoptions from foster care due to the increase in international adoptions, but find no effect on adoptions from domestic foster care due to the ART births.

## Introduction

Child adoption has been a traditional source of family formation across the world. Adoption has been an important phenomena in the United States over the last few decades. In 2000, about 1.6 million or 2.5% of all children were adopted in the United States[1]. The U.S. continues to record the largest number of adopted children in the

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‡STILL PRELIMINARY AND INCOMPLETE

[1] Census 2000 and Riben(2007)

world, 128,000 children compared to 46,000 children in China that came second in the year 2001. Of these, 87% were U.S. born and adopted through the domestic-adoption channel, but the share of international adoptions have risen considerably in the last decade. International adoptions rose from about 2000 children in the early 90's to more than 20,000 children in 2004. Adoptions from domestic foster care has constituted more than half of the total adoptions within the U.S. and historically been even higher.

In any given year of the last decade there are about 800,000 children in the U.S. foster care system. A large proportion of these children, over 20% in most states are waiting to be adopted from foster care. Growing evidence suggests that prolonged stay in foster homes can be detrimental to the welfare of the child. For instance, nearly 20 percent of the U.S. prison population under the age of 30, and 25 percent of these prisoners with prior convictions, report spending part of their youth in foster care (Doyle 2008). In another paper, Doyle (2007) identifies causal effects of foster care on long-term outcomes - including juvenile delinquency, teen motherhood, and employment among children in Illinois. Jonson-Reid and Barth (2000) also find higher rates of juvenile delinquency among foster children. Courtney, Terao, and Bost (2004) surveyed children who turned 18 in foster care in the Midwest and found that 67 percent of the boys and 50 percent of the girls had a history of juvenile delinquency[2]. The negative welfare implications of not finding loving, permanent homes for children waiting to be adopted from foster care therefore is substantive. Therefore factors and policies that may significantly reduce adoptions from foster care should to be carefully analyzed.

There are two trends that suggest increasing reliance on family formation, outside of adoptions from foster care. First, as we noted there is a remarkable spurt in international adoptions over the last couple of decades. Secondly, a surge in child births due to Assisted Reproductive Technology (ART). More than 60,000 children (0.3 to 4.3% proportion of total births, depending on the state) born in 2010 were from ART. Fertility problems affected 7.3 million women in the United States in 2002, up 62% from 1982. Infertility or inability to bear biological children is one of the key factors that result in adoption of children. Advances in fertility treatments and increased insurance coverage of expensive ART procedures have resulted in increased fertility rates (Schmidt 2007). Is it possible that access to international sources for

[2]Foster children are also at risk of other negative life outcomes including low educational attainment and substance abuse problems (US DHHS 1999; Dworsky and Courtney 2000). An estimated 28 percent of U.S. homeless population has spent time in foster care as a youth (Burt et al. 1999). Other studies have shown considerably higher rates of teenage pregnancy and incidence of STD's in girls reporting having spent time in foster care compared to the general population.

adoptions and the births from ART are significantly reducing the adoptions from domestic foster care?

In this paper, we provide evidence for two unexamined questions in the newly emerging adoption literature: is the recent surge in international adoptions and ART births reducing the number of children adopted from domestic foster care. We estimate the elasticity of substitution between international adoptions and domestic foster adoptions and the magnitude of substitution, if any, between ART births and domestic foster adoptions.

## Related Literature

Despite the importance of adoption, and welfare of children in foster care, the topic has received little attention in the economics literature. Apart from the Landes and Posner paper (Landes 1978) that proposed a strategy for amending the shortage of children relinquished for domestic adoption and the abundance of children in foster care, there were no papers to the best of my knowledge, until recently. Bernal, Hu, Moriguchi and Nagypal (Moriguchi et al 2012) present an historical analysis of domestic adoption, and uncover trends in different types of adoption: domestic and international, related and unrelated. At the individual level, the paper estimates the propensities of prospective adoptive Parents (PAP) and birth mothers (BMO) to relinquish their children across time. Baccara et al (Baccara et al 2012) take the PAP's and BMO's decisions to participate in the adoption process as given and focus on their behavior within the process by examining a micro-level data of an online adoption facilitator. Skidmore et al (Skidmore 2013)[3] administered a survey to a sample of Michigan adoptive families to link adoptive parent characteristics, child characteristics, and adoption-related expenses and subsidies. They estimate hedonic-model type regressions in which adoption cost is a function of child characteristics. Their analysis shows that most of the variation in adoption costs is explained by child characteristics. Pagliero and Tetenov (2012) estimate the effect of various characteristics of Italian couples on their demand for adopted and biological children. They use a unique choice-based sample which includes all Italian couples that requested court authorization to adopt unrelated children in 2003. Identification comes from exogeneity of couples fecundity status as they assume that infecund couples have the same distribution of preferences, but face a smaller choice set than fecund couples. The substitution effect between the alternatives for adoption, particularly the effect of international adoptions (in the U.S.) on domestic adoptions has previously been

[3]Presented at Allied Social Sciences Association meeting in San Diego, January 2013

unexamined. Here we take up this question, and in addition examine the effect of the rising births due to ART procedures.

# Data and Descriptive Statistics

The primary dataset we use to examine adoption outcomes in foster care and the augmented data is described below.

## AFCARS

The AFCARS is a federally mandated data collection system. AFCARS collects individual or case level information on all children in foster care for whom State child welfare agencies have responsibility for placement, care or supervision and on children who are adopted under the auspices of the State's public child welfare agency. AFCARS also includes information on foster and adoptive Parents. Under federal regulations states are required to collect and submit the child level data. Prior to 1998 fiscal penalties were not applicable, therefore pre-1998 datasets are not inclusive of all states. Dramatic improvements in data quality and completeness occurred between 1995 and 1998, since financial penalties are levied for poor quality data (AFCARS, 2000).

AFCARS was designed to address policy development and useful for researchers interested in analyzing aspects of the United States' foster care and adoption programs. In this work, I use individual level data on the child demographics including gender, race, birth date, health and other information on child attributes for the years 1995 to 2008.

In our analysis we estimate the results for children under age 10 in foster care, even though data is available for all children in foster care, up to a maximum of age 21. We do this as adoptions from foster care are primarily for younger children, mostly infants until about age 8. There is a steep fall in rate of adoptions above the age 8. In the results here, we present the regressions for age 1, but discuss results for other age cohorts[4]

[4]We report regression results for data between 1998 to 2004, although results are similar for the years up to 2009. AFCARS revised the data for 2005 - 2009 in December 2013, as they detected some data compilation errors.

## Immigrant Adoptions

The data on children adopted by citizens of United States from other countries was provided by the Department of Homeland Security for the years 1998 to 2008. The data contained information on "immigrant orphans" adopted by US citizens in each state by gender and by age groups. A detailed data set for immigrant orphans adopted by state of residence and country of origin was used to construct the predicted international adoptions (instrumental variable). I have additionally filed another FOIA for data on passports issued by state to construct another instrument for international adoptions. Passports issued by the state will be a measure of internationalization (and proxy for costs) and is expected to be correlated with the international adoptions.

## Assisted Reproductive Technology (ART) births data

Data on Assisted Reproductive Technology was sourced from CDC. The aggregate numbers for states on IVF (In Vitro Fertilization) cycles and live births from IVF for each state was compiled from fertility clinic level data for the states. The data used is for the years 1998 to 2008. The data is by type, number, and outcome of ART cycles performed, number of live births and number of infants born in U.S. fertility clinics. It also includes individual clinic tables that provide ART success rates and other information from each clinic. [Data collection on mandated fertility insurance coverage across the states to instrument for IVF births is in progress. Update: Search is on for finer instruments (data on 15 states that have mandated fertility insurance encoded)]

## Independent/Private adoptions data

National Center for State Courts (NCSC) compiles adoption data from the caseload statistics reported annually by state courts. These are estimates due to several reasons. Not all states report adoption as a separate and distinct case category. Courts count all adoption petitions brought to them, and include adoptions through public agency, private agency, individually arranged, and even inter country adoptions. NCSC staff have used the court data in combination with other sources, such as state bureaus of vital records, to develop estimates of the total number of adoptions (Flango and Flango, 1995; Viktor Flango 2007, Flango and Shuman 2013). We use these compiled estimate to arrive at numbers for independent or private adoptions. Unfortunately, this data is noisy, due to systematic and random components. Some states require international adoptions to be petitioned locally as well (assume all international adoptions are included), whereas other states automatically recognize international adoptions (assume international adoptions are not included in state records, but cautious international adopters may petition locally in any case).

## Socioeconomic data

Data on per capita personal income for each state was sourced from Bureau of Economic Analysis, U.S. Department of Commerce. Data on educational attainment - percentage high school graduate and college or more of population 25 years and over, is from the U.S. Census Bureau.

## Descriptive statistics

Table 1: Summary statistics - State year variables

| **Variable** | **Mean** | **Std. Dev.** | **N** |
|---|---|---|---|
| International adoptions | 388.739 | 366.944 | 357 |
| Private/Independent adoptions | 1136.547 | 1248.118 | 245 |
| ART births | 500.005 | 640.384 | 330 |
| International adoption rate | 0.016 | 0.008 | 357 |
| ART births rate | 0.019 | 0.025 | 330 |
| Private adoption rate | 0.069 | 0.037 | 245 |
| International adoption (male) rate | 0.006 | 0.003 | 357 |
| International adoption (female) rate | 0.011 | 0.005 | 357 |
| College educated % | 25.95 | 5.231 | 350 |
| PCPI | 28848.15 | 4982.697 | 350 |

Table 2: Summary statistics - Child level attributes

| **Variable** | **Mean** | **Std. Dev.** | **Min.** | **Max.** | **N** |
|---|---|---|---|---|---|
| Adopted | 0.055 | 0.228 | 0 | 1 | 267984 |
| Male | 0.508 | 0.5 | 0 | 1 | 267724 |
| White | 0.526 | 0.499 | 0 | 1 | 267984 |
| Asian | 0.014 | 0.117 | 0 | 1 | 267984 |
| Black/African American | 0.368 | 0.482 | 0 | 1 | 267984 |
| Physically abused | 0.166 | 0.372 | 0 | 1 | 250791 |
| Sexually abused | 0.019 | 0.138 | 0 | 1 | 250784 |
| Neglected | 0.588 | 0.492 | 0 | 1 | 250788 |
| Drug abusive parent | 0.262 | 0.439 | 0 | 1 | 250745 |
| Disabled child | 0.036 | 0.187 | 0 | 1 | 246252 |
| Behavioral problem | 0.013 | 0.112 | 0 | 1 | 250755 |
| Parents died | 0.003 | 0.053 | 0 | 1 | 246233 |
| Parents in jail | 0.059 | 0.236 | 0 | 1 | 246233 |
| Abandoned | 0.046 | 0.209 | 0 | 1 | 250665 |

# A simple model of household choice

We construct a simple partial equilibrium model consistent with the trends reported in the previous section.

The households have to choose among the two alternatives: increase the probability of having a biological child undergoing ART procedures or choose to adopt. If they choose to adopt, they further have to choose among the prevailing options: 1) Adopt directly from birth mothers willing to relinquish their child either independently or through a private agency 2) Adopt a child from outside the country (international adoption) or 3) Adopt from domestic foster care. Each of these outcomes have a probability of success $\pi_j$ and $j \in (b, p, i, f)$, representing the options, biological, private, international and foster care. To formalize the above notion, we use an expected utility model.

$$Max_j\, EU^j = \pi^j(\delta)V(x^j, \delta) - C(x^j, \delta) \tag{1}$$

$\delta$ measure of child quality and $V_\delta > 0$
$V(x^j, \delta)$ is the direct utility of success from a particular option j and $C(x^j)$ is the cost associated with pursuing the option j.
$C_\delta > 0; C_{\delta\delta} > 0$, representing a convex cost function and
$C_f \leq C_i \leq C_p \leq C_b$ conditional on $\delta$

$V(0) = 0$ and $C(0) = 0$, to normalize the base utility from not choosing any option. $\pi_\delta < 0$, we assume that probability of adoption decreases with quality of child due to excess demand for high quality children

We further assume, consistent with descriptive evidence from the data and previous studies about the following quality and costs variation among the options.

$\delta_f \in (0, \underline{\delta_f})$

$\delta_i \in (\underline{\delta_i}, \overline{\delta_i})$ and $\underline{\delta_i} \leq \underline{\delta_f} \leq \overline{\delta_i}$

$\delta_p \in (\underline{\delta_p}, 1)$, where $\underline{\delta_p} \leq \overline{\delta_i} \leq 1$ and $\delta_b = 1$, or biological child has the highest quality match for the household

Accordingly, the marginal conditions are:

$$\pi^j_\delta V_\delta(x^j, \delta) = C_\delta(x^j, \delta) \tag{2}$$

subject to the equilibrating probability of adoption from each alternative given by the supply and demand for each option, as below:

$$\pi^j_\delta = \frac{Ss(\delta^*)_j}{Dd(\delta^*)_j} \tag{3}$$

The above equation represents the market equilibrating probabilities that are endogenous to the aggregate choice of the households. As we can see, if the exogenous supply of an option 'j' increase, the probability of adopting a child from that alternative increase.

**Demand aggregation**

## Propositions

Suppose,

$$\delta_i \in (\underline{\delta_i}, \overline{\delta_i}) \,\text{and}\, C_f(\delta) \leq C_i(\delta) \tag{4}$$

then there exists a unique marginal foster adoption quality $\ddot{\delta} \in (\underline{\delta_i}, \overline{\delta_i})$ and the corresponding $\ddot{\pi}$ such that $C_f(\ddot{\delta}) = C_i(\ddot{\delta})$ for all $\delta \in (\underline{\delta_i}, \ddot{\delta})$ and $C_f(\ddot{\delta}) > C_i(\ddot{\delta})$ for all $\delta \in (\ddot{\delta}, 1)$. This task is implicitly defined by $\pi^f_\delta V_\delta(x^f, \ddot{\delta})$.

In addition,

Suppose,

$$\underline{\delta_p} \leq \overline{\delta_i} \leq 1 \,\text{and}\, C_i(\delta) \leq C_p(\delta) \tag{5}$$

then there exists a unique marginal international adoption quality $\tilde{\delta} \in (\underline{\delta_i}, \overline{\delta_i})$ and the corresponding $\tilde{\pi}$ such that $C_i(\tilde{\delta}) = C_p(\tilde{\delta})$ for all $\delta \in (\underline{\delta_i}, \tilde{\delta})$ and $C_i(\tilde{\delta}) > C_p(\tilde{\delta})$ for all $\delta \in (\tilde{\delta}, 1)$. This quality is implicitly defined by $\pi^f_\delta V_\delta(x^f, \tilde{\delta})$.

Intuitively, the first conditions in (4) follows from our assumption and implies that the highest quality of available international children exceed the highest quality of available children in domestic foster care. The second condition implies that the cost of adopting an international child conditional on quality is higher.

# Empirical Specifications and Econometric Results

Here we take the predictions of the model to the empirical specification. The first key prediction is one of close substitutability between international adoptions and domestic foster adoptions. The hierarchical nature of demand we outlined in the theory would naturally allow for a empirically specification akin to a shares regression. First, the impact of international adoptions on domestic foster adoptions can be specified as the equation below.

$$\begin{aligned} Adopted_{i,s,t} =& \beta_0 + \beta_1 Inter._{s,t} + \beta_2 Priv._{s,t} + \beta_3 ART_{s,t} + \\ & \beta_4 Controls_{s,t} + \beta_5 \ Child\ attrib._{i,s,t} + \tau_s + \tau_t + \epsilon_{i,s,t} \end{aligned}$$

The probability of child adopted from foster care is regressed on the rate of international adoptions, along with other controls, state and year fixed effects, that allows us to infer the degree of direct substitutability between the two types of adoptions and between foster adoption and biological child. The exogenous controls include private adoption rate and supply of foster children of the age cohort. The socio-economic controls are PCPI and percentage college-educated in the state.

The panel data lets us control for unobserved variables that differ from one state to the next, such as prevailing fertility, relinquishment for adoption, and cultural attitudes that affect child adoption, but that do not change over time. We do that with state fixed effects. It allows us to control for variables that vary through time, like improvements in Assisted Reproductive Technology that affect the rate of success in conceiving and delivering a biological child, but do not vary across states. Time fixed effects do that.

The predictions of the model naturally fits the younger age cohorts, as infants in foster care are closest substitutes to having a biological child (through a success in ART) or adoption through private agency (usually new borns) or international adoptions. As we noted earlier, international adoptions are predominantly (over 80% in the data) children under age 4 in our data set. As we see in Table, international adoptions negatively (at 1% significance level) affect adoptions from foster care. They are negative, even as we include ART births and private adoptions. As predicted by theory, international adoptions exhibits the highest elasticity of substitution to adoption from foster care, followed by independent adoptions. ART births are negative but not significant, also in line with the theoretical prediction.

## Identification

We assume that driving the shifts in $\beta_1$ (rate of international adoptions) above are changes in accessibility of international children available for adoption in various source countries. Two of the key source countries in the period were China and Russia, together accounting for 30 - 50% of adoptions every year in many states. Since we do not observe the source-specific adoption costs, we began by using the direct measure, the rate of cumulative international adoptions in the states over time as explanatory variables. In our shares specification above, the state fixed effects absorb any statewide variables that might otherwise influence the level of demand in the local market. If the cost differential once we control for state and time effects, were the main source of variation in international adoptions and domestic foster adoptions, then the probit regression would identify the effect on domestic foster adoption outcomes due to changes in international adoptions. As we are aware, this is a strong assumption, so in the next section, we instrument the share of international adoptions with variables that proxy their accessibility, both costs and availability.

To the extent that local demand shocks lead to an increase in demand for both international and foster adoptions, the specified shares model will result in biased estimates. For instance, favorable demand conditions in a state may stimulate both international adoptions and domestic adoptions, leading to an upward bias in the partial correlation between international adoptions and foster adoptions. This would mean the negative effect is actually of higher magnitude than we estimate. In other words, we will be underestimating the negative effect of international adoptions on domestic foster adoptions.

Table 3: **Effect of international adoptions on children adopted from foster care**

| | OLS | Probit | Probit | Probit |
|---|---|---|---|---|
| Adopted from foster care | | | | |
| International adoption rate | -3.47* | -2.77* | -3.05* | -3.43** |
| | (-2.14) | (-2.31) | (-2.41) | (-3.72) |
| ART_rate | | | -.114 | -.768 |
| | | | (0.16) | (-1.28) |
| Private domestic adoption rate | | | | -1.13** |
| | | | | (-7.51) |
| College educated % | Yes | Yes | Yes | Yes |
| Per capita personal income | Yes | Yes | Yes | Yes |
| Supply of children (Age 1) | Yes | Yes | Yes | Yes |
| State fixed effect | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Child level attributes | Yes | Yes | Yes | Yes |
| Observations | 201960 | 201960 | 197249 | 80973 |

$z$ statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

The bigger concern for bias would be when the local demand shocks are alternative specific - for example, preference in the local population shifts away from domestic foster adoptions in favor of international adoptions. To illustrate, suppose potential adopters in California favor adopting children from China or Korea rather rather than from domestic foster care. This is a problem if this preference shift occurred between 1998 to 2004, the intervening years of our data. The state fixed effect to reiterate would capture any time-invariant variation in preferences of the states, for ex. adopters in California always favor international child to domestic child compared to adopters in Nebraska, who favor domestic child relative to international. On the other hand, any alternative-specific local demand shocks, however, remain in the error terms. This would bias the effect of international adoptions up or down depending on the shifts in the specific local preferences.

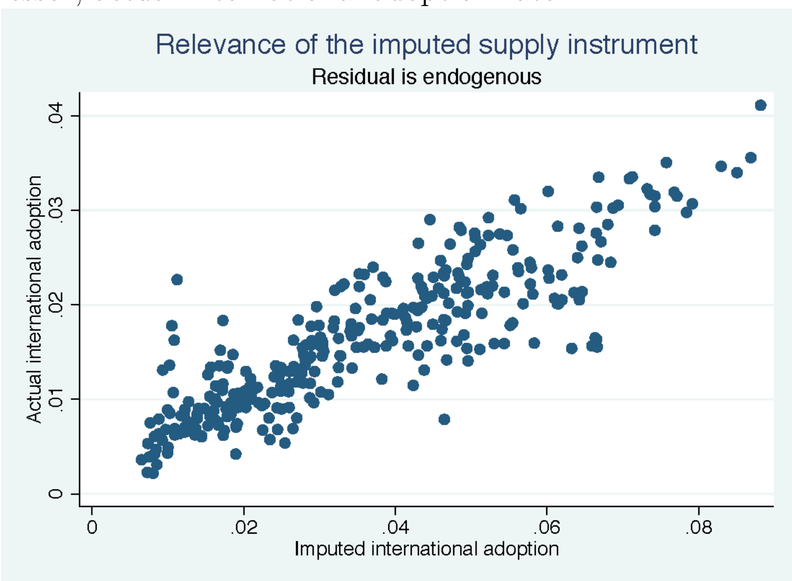
The bias in our original regression can be reduced or eliminated if there is an instrumental variable that is correlated with international adoptions (and other endogenous regressors) but uncorrelated with the state - and alternative-specific demand shock. As discussed in more detail below the supply-push component of the immigrant inflows to a particular state, which is based on historical adoption (international children from source countries) patterns and the aggregate adoptions from different source countries, is a potential candidate for such an instrumental variable.

Such a supply-push instrument addresses both the milder issue of positively correlated demand shocks and the more serious, negatively correlated shocks.

### Instrumental variables

The instrument we use to proxy cost-driven international adoptions in the states and years further extends the method proposed by Altonji and Card (1991) and Card (2001), and used extensively in the immigration and labor literature. We exploit the fact that international adoptions from the different source countries (China, Russia, Korea to name a few) have varied in the U.S. according to the changes in the accessibility from these countries and the domestic conditions that are specific to their countries of origin. High initial presence or historical rates of adoption from these specific source countries, say South Korea, into particular states, say New Jersey, make those states more susceptible to those shifts in origin-specific cost and push factors compared to states with lower initial presence.

In particular, suppose that total number of international adoptions from a given source country who enter the United States is independent of country-specific demand conditions in any particular state. In other words, no disproportionately large adoptions from any state from any source country. The actual inflow of immigrant orphans (to use the US Department of State terminology for internationally adopted children) from a given source country (say China, 3953 incoming adopted children to U.S. in 1997) moving to a destination U.S. state (say Florida, 126 children accounted for 3.2% of total incoming U.S. adoptions from China in 1997) can be decomposed into an exogenous supply-push component, based on total inflows from the country and the fraction of earlier immigrants from that country who live in the state, and a residual component reflecting any departures from the historical pattern. Multiplying the total inflow from a given source country based on historical variation in the U.S. states gives an estimate of the supply-push component of recent immigrant inflows that can be used as an instrumental variable in the estimation of equation. Using these two facts we predict the international adoptions from each of the key origin countries to each of the states in the year prior to our regression analysis, and we augment it with aggregate, U.S. level, annual international adoptions from these specific countries. Then, we sum it across all the key source countries for each of the states. This gives us the predicted rate of international adoptions. Note that it varies across states over time, and highly correlated (95%) with our endogenous regressor, actual international adoption rate.




To implement our instrument, we need to group the source countries for international adoptions. There are over a hundred source countries for international adoptions in the U.S. in the last two decades. For instance, in the year 1997, there were 102 countries of origin for international adoptions in the U.S, and countries ranged from Afghanistan, Albania, Algeria to Uzbekistan, Venezuela and Vietnam. The largest number of adoptions were from Russia (4309 children, i.e., 29% of total), China (3953, 27% of total), followed by Korea (12% of total). There were scores of countries, including Afghanistan, Albania and Uzbekistan that each sent less than 5 children to the U.S. in the year 1997. Therefore using all the source countries to predict our instrumental variable would be erroneous, due to a high proportion of 0 initial proportion from those countries in several states. We retain each country that constitutes more than 10% of the total incoming international adoptions as a separate category and club the rest of the country as the "other" category. For the year 1997, this classification system constructs our instrumental variable with China, Russia, Korea and the "Other" category (22%m accounting for the rest of the total international adoptions). We later do a robustness check with a 1% and 5% classification.

Formally, we represent the number of immigrants from source country 'c' who entered the US between 1998 - 2009, and let $\alpha_{cs}$ represent the fraction of immigrants from an earlier cohort of immigrants from country 'c' who are observed living in state 's' prior to 1998. In our specific example above for Florida state from China, $\alpha_{cs}$ is equal to 0.032. In the absence of demand-pull factors, the number of immigrants from country 'c' who would be expected to move into state 's' between 1998 and 2009 is
"$P_{cst} = \alpha_{cs}$ x Total incoming children from country c into the U.S. at time t".

If $P_{cst}$ are independent of demand conditions in state 's' over the 1998 -2009 period, then this estimate is independent of any demand-pull conditions in the city. Summing across source countries, an estimate of the supply-push component of recent immigrant inflows in state 's' is equal to $P_{st} = \sum_c P_{cst}$. This is our instrumental variable, the predicted international adoption rate.

As we suspected, if the unobserved demand shocks are positively correlated for both international adoptions and domestic foster adoptions, the instrumental variable estimates based on exogenous short-run supply shifts (such as supply-push component of immigrant inflows to each state) should be larger in magnitude and closer to the parameter values. As we see in the IV results below, the substitution effect is significantly higher in magnitude compared to the previously specified probit regression model.

The first stage Wald F-statistic are all close to or above the Stock and Yogo critical value (20% maximal IV value) equals to 6.71 (see last two rows in table), indicating the strength of the instrument. The z statistics are in parentheses and are significant at 1% level. The standard errors in each of the regressions are clustered at state-year unit and accounts for potential serial correlation of errors (Bertrand et al, 2004).

Table 4: **Effect of international adoptions: Instrumental variable results**

| Method of estimation | (2SLS) | (IV Probit) | (IV Probit) | (IV Probit) |
|---|---|---|---|---|
| Adopted from foster care | | | | |
| International adoption rate | -25.50* | -31.97** | -26.06** | -8.28 |
| | (-2.44) | (-2.84) | (-3.60) | (-1.28) |
| ART births rate | | | -1.03 | -1.03 |
| | | | (-0.95) | (-1.32) |
| Private domestic adoptions rate | | | | -1.28** |
| | | | | (-6.05) |
| **First stage:** | International adopt rate | International adopt rate | International adopt rate | International adopt rate |
| Predicted adoption rate | 11.20* | 11.20* | 15.33** | 15.49* |
| (Supply side instrument) | (2.51) | (2.52) | (3.50) | (2.47) |
| ART births rate | | | -0.0895* | -0.0519 |
| | | | (-2.50) | (-1.28) |
| Private domestic adoptions rate | | | | 0.00249 |
| | | | | (0.25) |
| F - test of first stage | 6.32 | 6.35 | 12.25 | 6.10 |
| Wald Test of exogeneity | | Reject | Reject | Do not reject |
| Observations | 201960 | 201960 | 197249 | 80973 |

$z$ statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

## Extensions and Robustness Checks

These results hold for robustness checks with the other instrumental variables (country groups constituting with over 1% or 5% of total adoptions in 1997), and also the independently constructed passport instrument (see Appendix for these results).

### Multiple endogenous regressors

Further more, we allow for endogeneity for potential adopters choice among the alternatives. As we elucidated in the simple model of choice, unmatched children through private agencies go in the supply of children available for adoption in foster care. This is accounted by controlling for supply of children in foster care. There might be concerns that a section of adopters may be attempting to have a biological child (via ART procedures) or adopt an international child simultaneously. This simultaneous demand for both these alternatives leads to endogeneity issue in our original specification. To address this concern, we instrument both ART births and international adoptions. The results are consistent for these specifications. We discuss instrumental variable, state laws that mandate fertility insurance coverage in the next section. See Appendix for other results from the two-endogenous and three-endogenous regressor models and brief note on possible issues.

### Fertility mandates

Since costs of infertility treatments are high ranging from less invasive hormone therapies in the range of $ 200 - 3000 per cycle to IVF with an average cost of $12,400 per IVF cycle, medical assistance for infertility was sought by women and couples that are white, college-educated, and affluent. 15 states have already mandated fertility treatments coverage. We examine the effect of such coverage of expensive fertility procedures on adoption outcomes from foster care. We use the data on live births due to IVF treatments for the period.

We exploit the variation in fertility insurance mandates across states to instrument for the IVF births. The Wald F-statistics on the excluded instruments are over the thumb rule of 10 in the multiple endogenous regressor models, evidencing for strong instruments. The results continue to be of similar magnitude for international adoptions and ART births.

Table 5: Two endogenous regressors: International adoptions and ART births

| Method of estimation | Probit | Probit |
|---|---|---|
| International adoption rate | -28.01** | -27.74** |
| | (-4.96) | (-5.03) |
| ART births rate | 0.746 | 0.284 |
| | (0.55) | (0.45) |
| Residuals (International) | 26.68** | 26.45** |
| | (4.69) | (4.76) |
| Residuals (ART) | -0.605 | |
| | (-0.40) | |
| First Stage | Intern. rate | ART rate |
| Imputed international adoption rate | 12.47** | 26.64** |
| | (2.76) | (3.77) |
| Fertility law | -0.00125+ | 0.00802** |
| | (-1.74) | (4.51) |
| Observations | 201960 | 201960 |

$z$ statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

## Conclusions

We have analyzed the effect of international adoptions and ART births on the adoption outcomes of children in domestic foster care. This has never been examined previously. We identify the effects using instrumental variables and find there is a significant reduction in child adoptions from foster care due to the increase in international adoptions, but little or no effect due to the increased ART births. As discussed earlier, children who stay longer stay in foster care have poor life-outcomes compared to general population. This includes externalities such as delinquency and adult crime. Our results among other policy implication imply that the current federal tax-credit (about 13,000$) for international adoptions may need to account for these externalities. Our results also inform the choice of potential adopters, some of who might hold the belief that international adoption improves the welfare of all parties involved and without any negative effects.

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# Appendix

Alternative model
Population of $P_n$ potential adopters of children.
$\alpha \in [0, \hat{v}]$: preference parameter for own child(IVF) or no adoption.
$\beta \in (0, 1)$: preference parameter for domestic adoption
$\gamma \in [0, \bar{v}]$: preference for international adoption
$\alpha, \beta, \gamma \in g(\beta, \alpha, \gamma)$ a joint distribution
$\delta$ measure of child quality and $u'(\delta) > 0$
Utility from domestic adoption: $\beta u(\delta)$
Utility from international adoption: $\gamma\bar{v}$, $\bar{v} \geq u(\delta)$, and $\bar{v}$ can change
No adoption: $\alpha$

Equilibrium:
$\beta(\gamma) : \alpha^*(\beta) = \alpha^{**}(\gamma)$

$\alpha^* d\beta = \alpha^{**} d\gamma \Longrightarrow \frac{d\beta}{d\gamma} = \frac{\alpha^{**}}{\alpha^*} > 0$

$$\beta \geq \beta^*(\gamma) \quad \Longrightarrow \quad \begin{array}{l} \text{no adopt if } \alpha > \alpha^*(\beta) \\ \text{foster adopt if } \alpha \leq \alpha^*(\beta) \end{array}$$

$$\beta < \beta^*(\gamma) \quad \Longrightarrow \quad \begin{array}{l} \text{no adopt if } \alpha > \alpha^{**}(\beta) \\ \text{international adopt if } \alpha \leq \alpha^{**}(\beta) \end{array}$$

$\alpha * (\beta) : \alpha = \beta E(U(\gamma))$
$\alpha * *(\gamma) : \delta\bar{v} = \alpha$

Table 6: **Effect of international adoptions: Alternative Instruments**

| Method of estimation | (IV Probit) | (IV Probit) | (IV Probit) | (IV Probit) |
|---|---|---|---|---|
| | (1% instrument) | (5% instrument) | (10% instrument) | (Passport) |
| Adopted from foster care | | | | |
| International adopt rate | -15.50* | -21.77** | -26.06** | -10.85+ |
| | (-2.09) | (-3.76) | (-3.60) | (-1.28) |
| ART births rate | -0.482 | -0.881 | -1.03 | -0.991 |
| | (-0.56) | (-0.93) | (-1.32) | (-1.48) |
| **First stage:** | International adopt rate | International adopt rate | International adopt rate | International adopt rate |
| Imputed adoption rate | 29.36** | 11.20* | 15.33** | 1.54** |
| (Supply side instr.) | (2.59) | (3.66) | (3.50) | (2.97)) |
| F - test of first stage | 6.71 | 13.40 | 12.25 | 8.82 |
| Observations | 201960 | 201960 | 201960 | 201960 |

$z$ statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 7: 2SRI estimation (Three endogenous regressors)

| | Immig. rate | ART | Oth. adpt r. | adopted | adopted |
|---|---|---|---|---|---|
| Immig. adopt rate | | | | -8.956 | -4.255** |
| | | | | (-1.19) | (-4.42) |
| ART birth rate | | | | -0.814 | -0.729 |
| | | | | (-0.49) | (-0.46) |
| Other adopt rate | | | | 0.867 | 0.840 |
| | | | | (0.86) | (0.83) |
| Residuals | | | | 4.922 | |
| | | | | (0.62) | |
| Residuals | | | | -0.418 | |
| | | | | (-0.25) | |
| Residuals | | | | -2.274* | -2.283* |
| | | | | (-2.21) | (-2.21) |
| F - test of first stage | 6.65 | 23.13 | 3.03 | | |
| Instrument | 10% instrum. | Fertility law | Bartik | | |
| Observations | 118609 | 118609 | 118609 | 118609 | 118609 |

*t* statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$