A Modest Proposal for a Two-Sided Market Clearing Institution under Asymmetric Supply Constraints with Skewed Pricing: The Market for Adoption and Abortion in the United States

CHRISTOPHER BALDING
HSBC School of Business, Peking University

Abstract

This paper presents a theoretical model matching the potential supply of terminated pregnancies with the total demand for children within certain modeling constraints. First, the demand and supply of pregnancies should be studied within the theoretical framework of a market with economic incentives. Second, a theoretical model for the demand for abortion must incorporate the total market for children, which implies the market for pregnancy, abortion, and adoption. Third, there exist in the overall market for procreative goods and services certain unique characteristics that need to be carefully considered. Producers and suppliers within the procreative goods and services market have radically different price and cost elasticity functions and unique production asymmetries that create a potential net benefit for buyer and seller alike. The market for abortion and adoption, while seemingly related and similar, suffer from a fundamental disconnect, preventing a simple exchange of goods and services: abortion implies potential supply that does not flow to potential consumersthose seeking to adopt. Studying this market inefficiency will benefit

Christopher Balding, HSBC School of Business, Peking University Graduate School Shenzhen, University Town, Nanshan District, Shenzhen 518055 China (cbalding@szpku.edu.cn).

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from a two-sided market analysis used in situations where an intermediary business must attract both producers and suppliers. There are two key findings. First, I find that the producer decision to supply the good depends primarily on exogenous preference formation and not on consumer-provided incentives. Second, I find that the market would benefit from legal framework for a market clearing institution using the market for real estate as the blueprint.

1. Introduction

Abortion is arguably the most divisive issue in American politics. Acting as a litmus test for political and judicial candidates in the United States, there has been limited academic research considering its foundational status in politics. Abortion and childbirth research has generally omitted theoretical considerations, focusing instead on empirical analysis of policy analysis for unwanted pregnancies (Michael 1973, Leibowitz, Eisen, and Chow 1986, Becker and Barro 1988, Garbacz 1990, Rothstein 1992, Matthews, Ribar, and Wilhelm 1997). Despite its central place in American politics, abortion has not received significant economic study and specifically theoretical examination into the causes and outcomes. It seems appropriate that abortion warrants theoretical study.

This paper presents a theoretical model matching the potential supply of terminated pregnancies with the total demand for children. A few points are important to note. First, the demand and supply of pregnancies should be studied within the theoretical framework of a market complete with economic incentives and consumer preferences. The existing empirical research clearly demonstrates that economic incentives play a large role in the decision to procreate, but this assertion has much more profound implications as will be seen later (Gohmann and Ohsfeldt 1993, Haas-Wilson 1993, Blank, George, and London 1994, Matthews, Ribar, and Wilhelm 1997). Second, a theoretical model for the demand for abortion must incorporate the total market for children, which implies the market for pregnancy, abortion, and adoption. However, as one study noted, "...individuals—even adolescents with unintended pregnancies—so rarely select the adoption option that pregnancy resolution studies often ignore it," (Gohmann and Ohsfeldt 1993). Third, there exists in the overall market for procreative goods and services certain unique characteristics that need to be carefully considered. Producers and suppliers within the procreative goods and services market have different price and cost elasticity functions and unique production asymmetries creating a potential benefit for buyer and seller.[1]

[1]I have been encouraged to touch upon potential ethical and moral dilemmas resulting from the conclusions of this paper. Ethical and moral concerns will not be discussed because this is a theoretical economic paper and not a philosophical inquiry.

The market for abortion and adoption, while seemingly related and similar, suffers from a fundamental disconnect, preventing a simple exchange of goods and services: abortion implies potential supply that does not flow to potential consumers, those seeking to adopt. In other words, while most analysis has studied the demand for abortion, this same population could be thought of as the potential producers of children for those unable to conceive or seeking to adopt. This basic idea is not entirely new as empirical and theoretical research has indicated that the legalization of abortion has had a dramatic effect on the number of adoptions and that a potential exchange market to parents who desire the child exists (Landes and Posner 1978, Bitler and Zavodny 2002). Studying this market inefficiency will benefit from a two-sided market analysis used in situations where an intermediary business must attract both producers and suppliers. The supply side of the procreative goods market faces poor incentives and production asymmetries and the demand side suffers from too many people chasing too little product. This paper is divided into four sections. First, I analyze the supply side of the market in a theoretical framework incorporating production asymmetries and incentive structure for producers. Second, I focus on the demand side of the market. Third, I incorporate the two-sided market and production asymmetry implications into the overall model. Fourth, I propose the legal framework for a market clearing institution using the market for real estate as the blue print.

2. The Supply Side: The Asymmetry of Production

Economic incentives are a driving factor in the decision to have children. Research has studied the decision-making process by which women and families decide to have children (Becker and Barro 1988, Lundberg and Plotnick 1995, Paton 2002). To simplify the market, I consider pregnancy as a given variable, excluding the decision making prior to conception. Pregnancy is taken as given for a few reasons. First, to understand the decision to keep a child, relinquish a child, or terminate a pregnancy, it is important to consider all pregnancies. In other words, to study the market, it is important to consider the entire population. Second, because pregnancy occurs under such a variety of circumstances, it is important to consider the event and decision-making process going forward rather than the reasoning behind conception. Pregnancies are both planned and unplanned, with the best of intentions and with no intention at all. This model can include situations of surrogacy, foreign pregnancies, and unwanted pregnancies. Though the pregnancy decision is taken as given, I will deal with the decision to conceive and potential implications later. The decision to carry a pregnancy to term or to terminate the pregnancy can be defined as

$$\begin{aligned} s_i &= V_i - (B_i + R_{i,t+n} + X_i + N_i), \\ s_i &= 1 \text{ iff } V_i - (B_i + R_{i,t+n} + X_i + N_i) \geq 0, \\ s_i &= 0 \text{ iff } V_i - (B_i + R_{i,t+n} + X_i + N_i) < 0. \end{aligned} \tag{1}$$

Where s is the binary decision of player i to carry a pregnancy through to term or terminate the pregnancy with each equaling 1 or 0, respectively. V is the value assigned to the child by the mother, B is the cost of giving birth to the child, R is the cost of raising the child, X are external costs, and N are exogenous preferences of player i. The economic logic runs that if the costs of giving birth to, raising the child, and associated psychological and sociological costs are greater than the value to the mother or parents, then the cost to terminate the pregnancy will be the preferred option and player i will terminate the pregnancy.[2] A few brief points need to be made. First, B and R may be the discounted costs of giving birth to and raising the child not the actual cost. This is important because if an expectant mother receives government benefits or health insurance, the discounted cost in this equation will be less. Second, X is a matrix of all exogenous variables or costs that impact the decision by the expectant mother to give birth to or terminate the pregnancy. Research has indicated that the decision to abort a pregnancy can be impacted by a variety of factors such as the distance to abortion service providers, socioeconomic factors such as education and income, and government policy restricting abortion (Brown et al. 1996, Matthews, Ribar, and Wilhelm 1997, Gruber, Levine, and Staiger 1999, Brown, Todd Jewell, and Rous 2001). Third, the greater than and less than symbols for the $\{0, 1\}$ decision imply that player i will always, all things being equal, prefer life to death for the fetus. In other words, if expected value equals all expected costs the mother or parents will opt to keep the child. Fourth, N is a matrix of exogenous preference variables of player i. These may include but are not limited to social considerations, beliefs about abortion, and the psychological costs associated with relinquishing a child. While the supplier does not bear the financial costs of relinquishing a child for adoption, significant emotional and psychological costs factor into the decision by the mother. These may include the social stigma associated with an unwanted pregnancy or the emotional cost of relinquishing a child. Medoff notes the importance of the psychological costs when he writes:

> "...to have an abortion or relinquish an infant for adoption are not considered to be substitutes by women with unwanted pregnancies and that for poor women with unwanted pregnancies either an abortion or raising an infant is preferable to relinquishing an infant for adoption. (Medoff 2008)"

Research has focused on the equation as the demand for abortion. However, as with many markets within economic analysis, the demand for

[2]Similar approaches to childbirth have been used by Becker and Barro and Leibowitz, Eisen, and Chow among others. Regardless of the specific variables, many authors have used similar frameworks in both theoretical and empirical work that studies the demand for abortion and children.

abortion can easily be transformed into a potential supply of children equation.

$$S_g = \sum_{i=1}^{T} s_i + \sum a_i^3, \tag{2}$$

S_g is the total potential supply of children whether for consumption by their biological families, consumption by others, or termination.[4] In other words, S_g is the total number of pregnancies. S_g is the sum of the number of pregnancies carried to term, s_i, and the number of pregnancies terminated, a_i. The total net supply of births is then defined as

$$S_n = S_g - \sum a_i. \tag{3a}$$

This equation, however, overstates the open market supply of relinquished children. Most production from pregnancies is consumed by producers of the good, the biological parents. The total net supply of relinquished children is defined as

$$S_{nr} = S_g - S_p - S_a = \sum_{i=1}^{g} s_i - \sum_{i=1}^{p} s_i - \sum a_i, \tag{3b}$$

This equation calculates the total net relinquished supply, S_{nr}, which equals the gross supply of births, S_g, minus children that remain with their parents, S_p, minus the number of abortions, S_a. This is defined as the total net relinquished supply available for adoption. As has been previously noted, relinquished supply is a relatively small number.

The supply side of the market for children suffers from a fundamental asymmetry: producers of the good can produce the good before making a decision about whether to take the good to market or consume it. The producer can produce the good at almost no cost and terminate the produce at a low cost. The cost to the producer increases significantly only when deciding to produce the product. This gives the producer significant market and pricing power over those seeking to obtain the good. The results of this asymmetry are seen in how the producers and market act. Producers that deliver the good to the open market rather than consume or terminate the product receive a price premium from consumers. The open market price for children is typically more than double the produced cost of the good

[3] $\sum a_i = S_A$ is the sum of terminated pregnancies or when $s_i < 0$. This is important because in the binary variable s_i only equals 1 when $V_i - (B_i + R_{i,t+n} + X_i + N_i) > 0$ and $s_i = 1$. When trying to aggregate, however, this would omit a large potential supply requiring the addition of terminated pregnancies into the equation.

[4] It follows given the definition of equation (2) that gross percentage of supplied children should be written as S/T where T is the total number of considered pregnancies.

and in some cases 10 to 20 times the producer cost.[5] Many producers do not contemplate delivering the good to market because, as Equation 1 demonstrates, the decision of whether to produce the product depends on unique individual cost and preference values without consideration of the market.

Production asymmetry means the production decision resembles producers in a two-sided market. In a two-sided market, an intermediary must attract both consumers and producers, such as shopping mall developers, who must attract shoppers and shops.[6] If producers are not provided enough incentive to produce the good for consumers, then producers will withhold supply and intermediaries will not make fee or commission income. Intermediaries in a two-sided market work to attract producers and consumers by providing the necessary incentives for both parties to consummate an exchange. Under a two-sided market, it requires coordinating the market to insure exchange between the supply and demand sides of the market. It is worth noting that the supply side in this market, according to most research, appears to be highly sensitive to the factors listed in Equation 1. Suppliers are extremely cost sensitive.

3. The Demand Side: Too Many People Chasing Too Little Product

The variables of the demand for children are similar, but there exists a different market dynamic. Arriving at a theoretical supply may be straightforward, but doing the same for demand requires a different calculation. According to medical research, approximately 15% of all persons seeking to conceive children are unable for a variety of medical reasons and of that number, approximately 75% of those are unable to obtain children in any manner (Spar 2006). This provides a rather strict theoretical limit for those seeking product and the demand function. It is necessary to begin by defining a binary decision rule under which the consumers desire to have children.[7]

$$\begin{aligned} d_j &= V_j - (B_j + R_{j,t+n} + X_j + N_j), \\ d_j &= 1 \text{ iff } d_j = 0, \\ d_j &= 0 \text{ iff } d_j < 0. \end{aligned} \tag{4}$$

This binary demand decision equation replicates closely theoretical work and the decision rule used for producers except V_j is the expected value

[5]Cost fluctuations and differences exist because babies are not homogenous goods and due to international trade. A white American newborn will be priced significantly different from an African infant for instance.

[6]The reader is encouraged to read either piece by Rochet and Tirole for an overview of the research into two-sided markets.

[7]The fundamental variables are identical between supplier and consumer. The difference is in the values assigned to each by the supplier and consumer.

for player j of having children.[8] In words, player j will seek children if the expected value is greater than the expected costs.[9] However, whereas the total gross and net supply is defined by population parameters and individual preference, the net demand function will be defined by a medical constant.[10] The demand function can then be estimated as

$$D_j = S_G/(1-\alpha). \tag{5}$$

The total demand for children is estimated here as being bound by the total rate of infertility, represented by α, which represents the probability of infertility between 0 and 1, which equals approximately 15%. In words, if the binary demand decision, d_j, is equal to 1, indicating the desire to have children, then the summed demand decision will actually understate the total supply of children relative to the gross supply. D_j then represents the augmented net demand for children by the factor of α.[11] Research, however, indicates that the supply of children has not remained constant due to the evolution of infertility treatment and the change in α. As Bernal et al. note:

> "...ART (assisted reproductive technology) likely had a sizable impact on the demand for domestic infants in recent years...advancement in ART likely reduced the adoption demand particularly for those individuals with higher income or stronger preference for biological children. (Bernal et al. 2007)"

ART and *in vitro* fertilization and improvement fertility treatment productivity have lowered the demand for adoptions.[12] It is also worth noting that the advances in technology have assisted those with a "stronger preference for biological children." Consumer preferences play significant role in the demand function.

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[8]In two-sided market and fertility literature it is used as a utility function, but the same principles apply.

[9]I use the V term value, but it should be noted that this variable has been given different monikers throughout the relevant research. Becker and Barro used utility and "the arbitrage condition for consumption across generations..." to "maximiz(e) a dynastic utility function" instead of discounted future costs as I use. Though the meanings are not identical, they are strikingly similar.

[10]It is worth noting that while medical advances have been able to help some couples seeking to have children, technology has not been able to structurally alter the 15% of couples unable to have children. Simple math indicates that of the 15% of couples that are unable to conceive, 75% are unable to obtain children either through conceiving or adoption. This indicates that roughly 12% of couples remain unable to have children improving only from 15%.

[11]Gross supply is the base factor because of all people who actually become pregnant, whether it is carried through to term or terminated, this represents only 85% of people that could become pregnant as 15% of couples at anytime are medically unable to become pregnant.

[12]Bernal et al. (2007) document the change over time in the efficacy of fertility treatments and the subsequent evolution in the number of adoptions. Please see Figures 7 and 8 and page 10 of their paper for a more complete explanation of the empirical evidence.

It is important to briefly consider the case of individual j who falls into the 15% of persons unable to conceive children biologically. In the individual case as $\alpha \rightarrow 1$, when the probability of infertility approaches 1, the exogenous value assigned by the consumer to having children rises constrained by the budgetary constraint. In words, infertile parents who want children attach a very high value to being able to have or obtain children. This can be represented in relation to the individual demand decision of Equation 4 by Equation 4'.

$$d_j = g_j(V_j/1 - \alpha) - (B_j + R_{j,t+n} + X_j + N_j). \tag{4'}$$

In this equation, g_j is the budgetary constraint of player j in assigning value to obtaining children. Equation 4' states that the value assigned by player j to having children is inversely related to the probability of infertility but bound by the budgetary constraint of player j. In other words, as the probability of not having children approaches 1 for player j, most players are willing to expend large amounts of funds in order to have children and are restrained only by their budgetary constraint. Equation 4' means that the ability of consumers seeking to obtain children outside their own procreative capacity is highly dependent on their budgetary constraint. *In vitro* fertilization and nonfoster care or international adoptions, for instance, are expensive methods of obtaining children. This limits most methods of obtaining children to infertile couples or women to wealthy couples or individuals. Adoption rates for women at more than 300% of the poverty level in 1995, were nearly twice the adoption rate of women between 150 to 299% of the poverty level and four times that of women under 149% of the poverty level (Chandra, Joyce, and Penelope 1999). Available supply goes to those with the ability to pay.

Research confirms that while the supply side of the market for children is rather sensitive to economic conditions, the demand side is relatively insensitive to price (Spar 2006). If a couple wants children and are unable to conceive, they tend to be price insensitive up to the given budgetary constraint. The low supply of relinquished children in the United States has forced those seeking children to turn where supply exists. The legalization of abortion reduced the number of infants given up for adoption (Gennetian 1999). The primary sources of new supply of adoptable children come from foster care and foreign sources (Bernal et al. 2008). Specifically concerning the role of supply in fueling foreign adoptions in the United States, Bernal et al. write, "as the demand for inter-country adoption exceeds the supply, the recent changes in inter-country adoption can be accounted almost entirely by the supply-side factors."

Consumers, however, are discriminating with clear preferences. For instance, while 97% of women would accept a child for adoption under 2 years of age, only 56% would accept a child between 6 and 12, and only 36% would accept a child 13 or older; while 100% of women would accept a child with no mental or physical disability, less than one-third of women would accept a child with severe physical or mental disability (Chandra,

Joyce, and Penelope 1999). Foster children waiting to be adopted were an average 8.1 years old and 75% of foster care adoptions qualified for special needs assistance (Bernal et al. 2007). Neither of these product characteristics is consistent with consumer preferences. This mismatch between the characteristics of available supply and consumer preferences led one study to conclude:

> Given the systematic difference in the characteristics of adoptable children in foster care and domestic private agency, despite much lower monetary costs for foster care adoption, one may expect a low degree of substitutability between the two. Depending on source countries, inter-country adoption may be a closer substitute. (Bernal et al. 2007)

This price insensitivity that meets consumer demand with desired characteristics, they are willing to pay for, has created a burgeoning market in the procreation businesses. Research has generally omitted combining the abortion and the adoption market.[13]

4. Wrapping it Up Into One Coherent Theoretical Two-Sided Market

So far, I have only covered the theoretical supply and demand using decision rules for producers and consumers without creating a market. The factors discussed in the previous analysis will help to define some of the unique qualities and problems in creating the two-sided market and the market clearing institution.[14] Before proceeding into the two-sided market analysis, however, it is important to study why this market does not meet basic Coase criterion for producing efficient market outcomes. In his work specifying potential reasons for market inefficiency, Coase (1960) lays out a number of criterion under which a market will move toward efficiency. First, in the market for children, property rights are not clearly established.[15] Contract and property rights law does not exist in the clear-cut and defined nature or transfer of ownership as with other goods. Second, transaction costs do exist. Transaction costs, both of the economic and noneconomic variety, exist abundantly.

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[13]This author could find only two papers Landes and Posner (1978) and Bitler and Zavodny (2002) that explicitly linked abortion and adoption. The theoretical findings of this paper come to somewhat different conclusions than Landes and Posner, but the empirical results of Bitler and Zavodny support the conclusions of this paper.

[14]It should be noted that this section will borrow heavily from Rochet and Tirole (2004a, 2004b) writings on two-sided markets. The concept of the two-sided market will not be revisited other than its use in the model at hand. The reader is encouraged to read the Rochet and Tirole papers that provide technical and readable summaries of both the definition and survey of two-sided markets.

[15]For a more complete overview of the difficulty in establishing property rights and other related issues, please see Spar (2006).

These can range from simple economic costs associated with being approved to take possession of the good to costs associated with locating the good. Third, asymmetric information does exist. Goods in this market are heterogeneous with buyers and sellers seeking detailed information about the good and the transacting party. In short, three primary concepts that would move a market toward efficiency are violated in this specific market.

The first necessity is to demonstrate that there exists benefit that would accrue to the buyer and the seller through exchange. Borrowing from Equations 1 and 4, it is evident that economic benefit will only accrue to buyer and seller if and only if

$$d_j - s_i > 0 \rightarrow [V_j - B_j - R_{j,t+n} - X_j - N_j] - [V_i - B_i - R_{i,t+n} - X_i - N_i] > 0. \tag{6}$$

This equation provides the total net economic surplus if exchange takes place between the producer i and consumer j. Rearranging this equation into its distinct parts provides

$$(V_j - V_i) + [(N_i - N_j - R_{j,t+n} - X_j)] > 0. \tag{6'}$$

There are a number of points about the decomposition of the net benefit equation. First, the value, V, side of the equation implies that there is a difference in the implied value of the child between player j and i. It may be inconvenient to think of human life in terms of expected utilitarian value accrued to heterogeneous agents, but there is a distinct difference in the value assigned to a given human life by players i and j. This difference in values is not an irrelevant amount, specifically when Equation 4' is taken into account. Second, B_i and B_j disappear from the equation because we can expect over the population that the cost of giving birth would equalize between all mothers, $B_i = B_j$, and would equal zero when subtracted out. Third, due to the existence of an exchange transaction the variables $C_{i,t+n}$ and X_i, for player i, go to zero because externalities and direct costs of raising the child are now borne by player j rather than player i. In fact, if all cost and benefit variables were identical for producer and supplier in this market, there would be no possibility of exchange and no unwanted children. Fourth, the possibility of exchange for player i has altered the decision rule from its original form in Equation 1, to the reduced form

$$\begin{aligned} &s_i = V_i - N_i, \\ &s_i = 1 \text{ iff } s_i \geq 0 \rightarrow V_i \geq N_i, \\ &s_i = 0 \text{ iff } s_i < 0 \rightarrow V_i < N_i. \end{aligned} \tag{1''}$$

The implication of this reduced form supply decision leads to the first proposition.

PROPOSITION 1: *With the presence of consumers offering a price to the seller at or above the suppliers marginal cost of production, the exogenous preferences of the producer are the reason for supply constraints in the adoption market.*

If an exchange occurs and the economic cost burden transfers from the seller to the buyer, the only remaining costs are the assigned value relative to the noneconomic exogenous cost. The seller economically needs to be compensated for the opportunity cost of lost wages and other factors or carrying the pregnancy to term for the consumer. This finding has two implications. First, economic variables play a small role in the decision by the suppliers to produce the good. In other words, if all economic costs can be transferred to the consuming party, the reasons for production constraints are the value assigned by the producer and exogenous preferences. For economic incentives to matter, the financial incentives provided to producers by consumers must exceed the value assigned to the pregnancy by the producer minus the value of the exogenous preferences of the producer. Financial incentives have proven successful on the consumer side for special needs foster children. One author specifically notes "we find that the size of the adoption assistance payment is the only policy variable that is clearly and positively correlated with success in achieving adoption for waiting children (Hansen and Bradley 2005)." Financial incentives provided to potential producers in a systematic manner removed in market information asymmetries may induce additional production. Second, exogenous preference formation is the dominant factor in sellers deciding to bring their product to the market.[16] For the market to function efficiently where economic costs flow through to the buyer, the platform must work to change the exogenous preferences of the seller. In other words, in the shadow of families unable to conceive a child willing to cover all pregnancy-related costs and provide financial incentives to producers, the primary reason for an abortion is the preference of the parents or woman seeking the abortion. While financial incentives may bring some additional product to market, the producer's exogenous preference is the primary production constraint (Medoff 2008).

It is important to turn now to the use of the two-sided market and the related implications. A two-sided market is "roughly defined as markets in which one or several platforms enable interactions between end users, and try to get the two (or multiple) sides 'on board' by appropriately charging each side. . ..that is, platforms court each side while attempting to make, or at least not lose, money overall."[17] A two-sided market must act as an intermediary or "platform," which works to attract both buyers and sellers into a market promoting interaction. Many examples have been used when studying

[16]It is worth noting and emphasizing that one of the notable asymmetries of this market is that suppliers have the unique option of producing the good and then deciding whether to bring it to market or withholding it. Most sellers in most markets do not have or utilize this option.

[17]Please see Rochet and Tirole (2004a) for an excellent paper defining two-sided markets.

two-sided markets and their unique characteristics, such as shopping malls, night clubs, and video game consoles. One example that is specifically useful to our example is the real estate agent seeking out buyers and sellers.

A key factor in analyzing the market and specifically the relevance of the two-sided market is the cost segmentation of the platform. The cost of the platform and its pricing policy can have significant impact on the volume of transactions. A few important points are needed about pricing in a two-sided market. First, as is noted in a two-sided market, it is important that the cost of the platform does not simply adjust the overall price of the good. Rochet and Tirole argue that a condition of a two-sided market is if "the market for interactions between the two sides is one sided if the volume V of transaction realized on the platform depends only on the aggregate price level." The adoption market is two sided for a few reasons. First, buyers are relatively price insensitive. Consumers in the adoption market do not change their aggregate volume purchases based upon price. Second, limited supply is the largest constraint to the market not price. There are simply too many buyers and not enough producers.[18] Product availability is the primary constraint on volume not price. Third, platform cost and revenue allocation between buyer and seller significantly impacts volume traded. In other words, whereas one side of this market is price insensitive, the other is extremely price sensitive impacting total available supply. The two-sided market analysis demonstrates that transaction costs are neutral when allocating costs between buyer and seller as all costs associated with the transaction are passed on to the buyer. This can be represented by the following equation:

$$P = C/(1 - \pi_p). \tag{8}$$

Where P is the price of the good, C is the cost equation of the supplier, and π_p is the percentage profit margin earned by the platform as a percentage between 0 and 1. The allocation of platform cost can then be represented as follows between buyer and seller:

$$\pi = p_B + p_S. \tag{8'}$$

In the adoption market, generally speaking, $\pi = p_B$ with no assignment of costs to the seller. These agency costs or platform costs are significant and can run upward of $30,000.[19] It is customary under the current "platform" that the adopting parents cover all costs related to the adoption. This provides us, when incorporating the demand equation, the clearing price for adoptions when facilitated by an intermediary. This equation can be represented as

$$d_j = g_j(V_j/1 - \alpha) - P. \tag{8''}$$

[18]Please see Appendix A for detailed mathematics of why supply is structurally beneath demand.

[19]It should be noted that "agency costs" do not include legal costs associated with the transfer in adoption from birth mother to adopting family contributing to transaction costs.

In this equation, the couple or individual will place an increasing value on obtaining a child in the market place in inverse proportion to their probability to conceive on their own, subject to their budget constraint and the price in the market. Allocating nonneutral platform costs to the seller is supply prohibitive. This leads to Proposition Two.

PROPOSITION 2: *Price level and structure with neutral platform costs impact cost level, but they are not a factor determining transaction volume in the market. Supply is constrained by noneconomic factors determined by exogenous preferences of producers limiting total available supply to the market.*

The allocation of platform costs between buyer and seller is neutral in that all costs pass through to the consumer changing only the price level not the volume of transaction. However, there is reason to believe that the transaction and platform costs are in excess of the marginal cost to the operator. If supply and cost are fixed and demand is in excess of available supply, the platform is in the position to exploit information asymmetries and extract rents above the marginal cost to the supplier.[20] However, this increase in the price level has no impact on the volume of transaction as the supply is essentially fixed beneath the demand providing rents to the platform through the exploitation of information asymmetries. In short, adoption agencies benefit by keeping the mother relinquishing the child and the family seeking a child apart. The price level of agencies becomes important if supply increases to meet market demand.

5. A Modest Proposal for a Two-Sided Market Clearing Mechanism

Based upon the analysis so far, despite the market potential, two clear problems are faced: inducing steady supply from producers in spite of current exogenous preferences and rent receiving two-sided market platform benefiting from information asymmetries. Two proposals are made to address these shortcomings which prevent the evolution of an efficient market.

PROPOSITION 3: *Emphasizing noneconomic over economic incentives may increase the total supply of children to the adoption market from women who have previously preferred to terminate the pregnancy reducing supply.*[21]

As demonstrated, the primary obstacle to increasing the supply of children into the adoption market is not economic incentives, but rather the

[20]Please note this is a brief explanation about a rather complex economic issue. I wanted to prevent this side issue from becoming more than that.

[21]It is worth emphasizing this proposal does not claim that it will end supply constraints, only that it will increase total supply. Nor is the intent of this paper political in nature, but rather only seeking to create an efficient market where benefit can be gained by buyer and seller.

exogenous preferences of producers.[22] As noted in Proposition 3, this implies that targeting noneconomic incentives will increase the preference of producers to supply more to the market. To address the purely exogenous preference, which deals more with psychological and mental cost of the decision to abort the fetus or put it up for adoption, it would seem reasonable to increase economic and noneconomics incentives so that couples or women considering whether to abort their fetus may be enticed into supplying their unborn children into the adoption market. This would require the full marketing prowess of the platform and intermediaries to target the exogenous preferences of producers. As with many products, inducing transactions require more than price reduction, but marketing and advertising to convince consumers, or in this case producers, of their need for the product. Adoption intermediaries would need to change the exogenous preferences of producers to bring supply to market.

There are two avenues to change exogenous preference formation. The first is the regulatory option, the second the two-sided market option.[23] Due to the circumstances under which many women considering abortion find themselves, frequently there is little thought given to the option of adoption. Think about a stock market where people hold a stock that was in great demand, but did not tell anyone they owned the stock, and destroyed the stock before putting it on the open market to see what price it might fetch. While it is the owner's right to do with the stock or asset as they please, it would seem reasonable and prudent to encourage the owner of that stock to investigate the possibility of securing the best price possible for the good rather than destroy the stock. American law has enacted statutory waiting periods, license exams, background checks, and testing for a range of issues. It would seem reasonable to enact regulation requiring women contemplating abortion to listen to a platform service provider market their services and economic incentives to produce a child for the market. This may take the form of required counseling, a waiting period, or presentation by adoption service providers among others. It should be noted that the regulatory option should be considered a second best option.

Turning to the two-sided market option, Equation 1' demonstrates that the decision to terminate a pregnancy depends on two variables. In the case that $V - N < 0$ there exists some amount E such that

$$V_i - N_i + E > 0. \tag{1''}$$

E is the amount of money offered to the potential seller i so that it will produce and sell its product to buyer j rather than inhibiting supply. Turning

[22]It is worth reemphasizing that endogenous preferences can be a range of variables from psychological cost to the producer of aborting or putting the child up for adoption to preference for life style.

[23]I will only address the regulatory option at this point. I will cover the two-sided market option later for reasons that will become apparent.

this into marginal price, I rewrite it as a cost percentage form

$$E/(V_i - N_i + E). \tag{1'''}$$

Differentiating and setting to zero to obtain the value at which E is effective in persuading producers to supply the market rather than terminating the production, it becomes apparent that only when $V_i - N_i \to 0$ is E an effective tool of persuasion. In other words, economic incentives in this market are a blunt instrument when persuading those considering abortion to put their fetus or unborn child up for adoption. Economic incentives will only persuade the undecided.

Turning to the importance of the platform, this can be rewritten using the Lerner formula such that the platform price incorporates the elasticity of volume

$$(P_i - E)/P_i = 1/\rho. \tag{9}$$

In formula 9, ρ is the elasticity of volume with respect to total price $\rho \equiv -P\partial V(P)/\partial V(P)$.[24] It is worth noting that it is possible for Equation 9 to be negative as E can theoretically be larger than P, but when differentiating Equation 9

$$\partial[(P - E)/P]/\partial E = -1/P. \tag{9'}$$

In words, this means that changes in E will only have a negative impact on platform profit margins reallocating the buyers cost between the intermediary and producer.[25] If $P > E$, then there is a theoretical economic value at which the supplier can be convinced to supply the good, though as noted above it quickly becomes economically infeasible. This leads to three conclusions. First, previously it became apparent that the bid price offered by the market is greater than the marginal cost of the good to the producer. It is possible that by reallocating the bid price on offer between the platform and the producer, additional volume could be obtained. Second, this means that through no aggregate change in price, merely through reallocation of cost to platform and producer, volume may increase by squeezing margins of the existing intermediary. In other words, the existing system of intermediaries would be required to change from high-margin low-volume to a high-volume low-margin business model enticing producers into the market. Third, in keeping with the first proposition and Equation 9, economic inducements to the supplier act as a dull instrument in trying to persuade the producer to put the child up for adoption. This does not mean that no producers will be moved by economic incentives, only that based upon previous research and the theories presented here one would expect minimal response to purely economic incentives.

[24]The author is indebted to Rochet and Tirole (2004a) for providing clear explanation of the two-sided pricing mechanism.

[25]To revisit briefly, $P - E = \pi$. Assuming that $P > E$, as along as $\pi > 0$ then there is a price at which there is economic benefit for buyer and seller with only the platform cost as further consideration.

PROPOSITION 4: *Resolving the market inefficiencies to match supply and demand requires establishing a two-sided market clearing institution, which clearly establishes property rights, reduces transaction cost, and information asymmetries.*

Rochet and Tirole use the example of the real estate agent and the importance of the pricing mechanism used in a two-sided market platform. They argue that it may be more appropriate for real estate agents to be paid based upon the level of foot traffic generated by the real estate agent into a property that is for sale, rather than a fixed percentage of the sale. Rochet and Tirole concede, however, that this method may not generate the quality commensurate with those interested in purchasing the property.

Extending that reasoning into this market, it is apparent that current market intermediation pays the platform cost based upon price rather than exchange volume.[26] Acting as intermediaries where demand greatly outpaces supply, the platform is able to extract rents arising from the information asymmetry between buyer and seller. To put this idea in perspective, in a market where demand greatly outpaces supply, "agency fees" frequently exceed 50% of the total cost of an adoption.[27] To reform the market requires accepting that the market is two sided and simplifying platform and intermediary pricing will increase volume. For instance, primary suppliers of relinquished children, foster care, and foreign countries, are marked by institutions, policies, and incentives designed to facilitate and promote higher volumes of adoptions. Research demonstrates the significant impact that policies and institutions have on adoption rates in the case of foreign and foster care adoptions (Bernal et al. 2007 and Hansen and Bradley 2005).

First, platform intermediaries should be compensated based upon the volume of transactions. Within this specific issue there are two separate subissues. First, to borrow further from Rochet and Tirole, their utility function depends on the number of users joining the platform on the other side. In other words, the benefit to the potential buyer depends directly on the number of potential buyers and sellers. Currently, agencies are compensated more along the lines of real estate agents on price, but without the strict regulation on commissions. As profit maximizers, agencies are obtaining the highest net profit, based upon margin rather than volume. Using the Rochet and Tirole formulation of a two-sided market, utility is formulated based on the number of members on "the other side." If the platform is forced to sell on volume rather than margin, overall price will move to cover the marginal

[26]It may be argued that current market intermediaries are not compensated on volume because of the quality of exchange, but for many reasons this is a dubious argument at best.

[27]Though it may be argued that adoption agencies are altruistic and helpful, it is difficult to believe that any industry operating as profit maximizer is that altruistic. Furthermore, research and anecdote disagree.

cost of producing a child.[28] Second, platform pricing can either take a fixed usage fee, per transaction, or some combination therein. Currently, it is common for buyers to pay a fixed usage fee regardless of success by the agency and frequently even all costs associated with the search and advertising to find a seller. This provides no incentive to the platform to negotiate a successful exchange between buyer and seller.[29] Fixed transaction fee structures make more sense when usage of the platform will be high, whereas in an instance with a limited number of transactions, it makes more sense to create a pricing structure based upon a transaction percentage.

The current agency price is determined solely by what the market will bear. In other words, there is no limit as to what adoption agencies can charge clients. Building upon the Rochet and Tirole utility function, adoption agencies should be compensated on either a percentage of the money, which flows through to the producer or based upon some industry standard fixed fee. This type of arrangement is relatively common in industries in which intermediation is either required or common. These include, but are not limited to real estate brokers, agents for writers and actors, shopping mall developers, or stock exchanges. If rents are to be extracted from the buyer, the rents should accumulate to the seller rather than the intermediary and may be based upon a fixed percentage of the sale price. Real estate brokers, using the Rochet and Tirole example, do not get to keep the difference between what the seller is willing to sell at and what the buyer is willing to pay by exploiting the informational asymmetries between buyer and seller. The adoption market would benefit from regulating the brokers and agencies as platforms similar to real estate brokers, stock markets, or commercial agents. The adoption market does not benefit from the price and platform cost transparency, which these other markets enjoy. Though difficult to conceptualize the adoption market as a market, it acts like a market and should be regulated accordingly to insure price and intermediary cost transparency.

Returning to Equation 8 that defined the total price of the good as all economic costs divided by one minus the profit of the platform, this provides the value of reducing the platform cost

$$[\partial C/(1-\pi)]/\partial\pi = C/(1-\pi)^2. \tag{8''}$$

Equation 8'' means that a 1% drop in the price of intermediation will result in a 1.6% reallocation of cost either in lower prices to the consumer or additional revenue to the producer.[30] Though supply constraints afflict the adop-

[28]The reader is encouraged to read Rochet and Tirole (2004a) for a complete rendering of the mathematical formulas. The author did not think it necessary to provide a complete recap and used only those necessary to make a point or not presented by Rochet and Tirole.

[29]The Rochet and Tirole formulations on price all differentiate between the fixed fee and the usage transaction.

[30]This occurs because as $0 < \pi < 1$, which is the denominator, a small increase/decrease in π will result in a larger decrease/increase in P.

tion market, platform cost reallocation may induce new supply through two channels. First, platform cost reallocation will increase financial incentives to producers and away from intermediaries exploiting information asymmetries. In short, producers will receive more of the purchase price. Second, platform cost reallocation will require intermediaries to attract more producers and target producers' exogenous preferences. In short, intermediaries will have to market their platform by driving transaction volume and service to producers and target the largest factor of supply constraints. By fixing Equation 9 to a fixed percentage similar to real estate or book agents, this forces adoption agencies to focus on attracting a higher level of supply, or in two-sided market language, improve market utility by increasing the number of agents on each side.

The final point about creating a two-sided market is the need to create a uniform platform. If adoption agencies are similar to real estate brokers, it must be noted that there is not a uniform platform where all agents list the available properties similar to the real estate platform the Multiple Listing Service. This, once again, exploits the information asymmetries between the buyer and the seller allowing the agencies to extract economic rents. If one of the objectives is to increase two-sided market utility and compensate agents and producers in a transparent method, which promotes volume of exchange rather than the exploitation of information asymmetries, it is important to create a standard listing platform, which is used by those on both the buy and sell side of the market. Currently, many brokers act, essentially as platform and broker, by acting as advisor to both buyer and seller, which in addition to creating a conflict of interest, allows the agency to exploit the information asymmetries. This, however, has the perverse incentive of restraining the volume of exchange by increasing search times between buyers and seller.[31] Rather than searching a large number of potential pregnancies, under a common platform, consumers are restricted to the search ability of their current agency or broker.

The last major factor not yet discussed is transaction costs. Transaction costs are a major factor in the overall price of an adoption. They are neither transparent nor frictionless. To simplify transaction costs, it should be standardized like the related costs of a real estate transaction. By standardizing the official adoption procedures and reducing the costs, this will bring the final price to the consumer closer to the marginal cost of the producer plus the platform cost. For instance, costs related to purchase real estate

[31]Imagine a stock market, with no market and buyers, had to hope that their broker knew someone who wanted to sell. Returning the Rochet and Tirole utility function, by increasing the number of agents on the other side this will increase total utility. With a standard platform, like a stock exchange, brokers can search out the best price through the increase in market liquidity. The objection may be raised that large stock brokers keep the transaction in house. In some cases, this may be appropriate and give the buyer the best price and the seller the best liquidity, however, it is not a universal solution.

include appraisal, escrow fees, and title insurance with no legal counsel.[32] To put this in perspective, real estate transaction costs will typically amount to roughly 1% of the price of the purchase. If that same formula were to hold, typical transaction costs would amount to $250 per adoption.[33] In fact, many of the transaction costs associated with real estate either required to facilitate exchange, such as escrow, or are similar in nature, such as home inspection and title search. Just as real estate and book agents have legally binding industry standards, which have facilitated transaction between end users, greater transparency in the adoption market will increase trading volume.[34]

Though as noted previously that this paper will refrain from exploring the moral and ethical implications of this research, a few points require discussion. First, all behavior and recommendations made based upon the theoretical implications of the research are legal in the United States. There is no behavior, legislative, or regulatory change advocated that would make legal actions illegal or vice versa. The research presented here focuses on market inefficiencies resulting from unique factors of this specific market, how this market fails to meet Coasian requirements for efficient markets, and how to improve market efficiency. Second, no proposal or research implication presented here attempts to legislate or regulate human behavior or choice with regard to pregnancy, adoption, or abortion. The only regulatory or legislative proposals made, aim to improve transparency and choice in the adoption market to provide potential producers and consumers the highest level of information possible. As noted here, the adoption market suffers from a lack of transparency on children, price, and platform cost. Rather than pretending that the adoption market is not a market, these proposals seek to regulate it as a market.

Third, the proposals presented here seek to provide producers and consumers with greater information to make decisions. The implications of this research may prove troubling for some in some instances. First, what if some women become pregnant to give the child up for adoption because of the markets increased efficiency and potential profit to the mother? As surrogacy

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[32]It is worth noting that previously real estate transactions required lawyers, though now it is rare, except in unique circumstances, that either transacting party will utilize legal counsel.

[33]This figure should not be considered representative of what actual transaction costs should amount to, but act only as a comparison.

[34]It may be argued that a child is not the same as a house and should not be judged solely on transaction volume alone, but also on the quality of potential consumer, which is a partially valid argument. It should also be balanced with the realization that in the absence of medical complications, there would be no legal prohibition against the women or couple conceiving children. If licensing requirements are not applied in the primary market, there seems little reason to apply overly strict licensing requirements in the secondary market. This does not mean the absence of quality controls, merely standard, transparent, and reasonable that would qualify most couples or individuals.

is already legal and available to wealthier consumers, improved adoption market efficiency drawing in additional producers for profit or for altruistic reasons provides more consumers with greater choice, product availability, and reducing abortions. This model attempts to bring many of the benefits of the surrogacy market to the broader adoption market: improved financial exchange between parties, search and matching capabilities, property rights, and fees based upon exchange. Second, what if a woman planning on having an abortion chose to relinquish the child because of payment from couples seeking to adopt? The point of increased market efficiency is to provide producers and consumers with greater choice and transparency. If a woman chooses to relinquish a child for money, that would be the definition of greater choice for both producer and consumer. Third, would not providing improved market transparency create price differentiation and submarket for different types of children? The preferences of consumers for types of children, whether by age, race, or health characteristics already exist. For instance, families who adopt special needs foster children receive government subsidies due to their perceived lower value on the adoption market. Conversely, in the fertility market, sperm and eggs from athletic and intellectually gifted men and women receive a significant premium. The only regulatory and legislative suggestion is to treat an implicit market explicitly as a market. Despite well-intentioned arguments that the adoption market is not a market, the adoption market is clearly a market (Hansen and Bradley 2005). Profit-maximizing actors, producer and consumer preferences resulting in price discrimination, obeying the laws of supply and demand resembles a market under any reasonable definition.

6. Conclusion

The two-sided market analysis can lend deep insight into a politically discussed, but theoretically ignored, question of how to manage the question of unwanted pregnancies. The demand for abortion can easily be recast in the light of potential supply of children serving a population that is desperate to obtain children at almost any cost. Though the activists around these issues may have fundamentally divergent opinions, providing women greater choice in their procreative decisions is positive. Hopefully, this paper has provided a theoretical method to begin disentangling highly charged political debates.

Appendix A

Proof that the demand for children could balance potential supply:

(1) $P/(1-\alpha)$ = Total demand for children where P = total pregnancies and α = the infertility rate [0, 1].

(2) $P\ (1-\beta)$ = Total births where β = abortion rate $[0, 1]$.[35]

(3) $(1-\alpha)/(1-\beta)$ = Ratio of potential units produced to total consumers. As $\alpha < \beta$ is empirically observed the ratio potential units produced >1, meaning there is a greater potential supply than demand.

(4) $\gamma\ (1-\alpha)/(1-\beta)$ = Ratio of actual units produced to total demand where γ = the diversionary market pass through rate $[0, 1]$. If $\gamma\ (1-\alpha)/(1-\beta) = 1$, then there is volume equilibrium in the market. If $\gamma\ (1-\alpha)/(1-\beta) < 1$, then consumers outnumber product. If $\gamma\ (1-\alpha)/(1-\beta) > 1$ then product outnumber consumers.

(5) The structural overhang of demand stems from the conclusion that even if $\beta \to 0$, the ratio of consumers to product would collapse to the medical constant state of the infertility rate.

(6) The key variable in attempting to balance the market then becomes the pass through rate or the probability that a change in the abortion rate will divert supply to other consumers rather than be consumed by the producer. Equation $3 > 1$ implies a potential market equilibrium exists. However, as $\gamma \to 0$, as is observed potential supply collapses to actual supply of 0.

(7) Rewriting the equation and setting equal to 1 of market equilibrium provides

$$(\gamma\beta)/\alpha = 1,$$

$$\partial[(\gamma\beta)/\alpha]/\partial\beta = \gamma/\alpha.$$

This has two implications. First, marginal changes in the demand for abortion will depend on the market pass through rate to consumers. Second, based upon empirical estimates the pass through rate need not be large to cause large changes in supply to consumers.

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[35]All other losses of pregnancy are excluded for our purposes here. The reason being that other couples or mothers are otherwise assumed to be able to have children but miscarried. This assumption does not alter any conclusions reached.

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