ABORTION AS INSURANCE

February 2002

Phillip B. Levine
Department of Economics
Wellesley College
Wellesley, MA 02481
(781) 283-2162
plevine@wellesley.edu
and
National Bureau of Economic Research

Douglas Staiger
Department of Economics
Dartmouth College
Hanover, NH
(603) 643-2979
Douglas.O.Staiger@dartmouth.edu
and
National Bureau of Economic Research

We would like to thank Brian Lavoie for research assistance, Jenny Hunt and Tori Velkoff for their assistance in collecting data for this project, Ann Velenchik for comments, and seminar participants at the National Bureau of Economic Research Summer Institute Children's Program Meeting, Princeton University, the University of Pennsylvania, the Harris School at the University of Chicago, Syracuse University, and Baruch College.

ABSTRACT

This paper views abortion access as an insurance policy that protects women from unwanted pregnancies. Within this framework, we present a theoretical model where greater access provides value in the form of insurance against unwanted births and also reduces the incentive to avoid pregnancy. This model predicts that legalized abortion should lead to a reduction in the likelihood of giving birth. It also predicts that if abortion access becomes relatively inexpensive (including both monetary and psychic costs), then pregnancies would rise and births would remain unchanged or may even rise as well. We review the evidence on the impact of changes in abortion policy mainly from the United States and find support for both predictions. Then we test these hypotheses using recent changes in abortion policy in several Eastern European countries. We find that countries which changed from very restrictive to liberal abortion laws experienced a large reduction in births, highlighting the insurance value. Changes from modest restrictions to abortion available upon request, however, led to no such change in births despite large increases in abortions, indicating that pregnancies rose as well. These findings are consistent with the incentive effect implications of our model.

Phillip B. Levine
Department of Economics
Wellesley College
Wellesley, MA 02481
(781) 283-2162
and NBER
plevine@wellesley.edu

Douglas Staiger
Department of Economics
Dartmouth College
Hanover, NH
(603) 643-2979
and NBER
Douglas.O.Staiger@dartmouth.edu

I. INTRODUCTION

The debate about abortion typically involves issues of philosophy, religion, ethics, and feminism. When does life begin? Does a fetus have rights? Do women have the right to control their own reproductive functions? These issues are clearly crucial in determining one's position over the sets of policies that regulate the access and availability of abortion. Rarely, if ever, does the debate regarding abortion policy focus on the results of economic analysis. Yet the application to this issue of standard economic models of decision-making under uncertainty yields interesting predictions regarding women's behavior.

The purpose of this paper is to use the tools of economic analysis to examine the impact on fertility-related behavior of changes in abortion access. We first present a theoretical model that treats abortion availability analogously to bankruptcy or fire and flood insurance; it provides protection from the downside risk of an action, but may also alter individual's incentives to take that action. In this context, the downside risk represents unwanted births and the incentive effect take the form of additional pregnancies and, potentially, additional births.[1] This model has similar implications to Peltzman (1975), who argues that mandated seat belt use leads to more accidents because belted drivers are less careful. Our model does not share all features with a standard treatment of insurance in that it does not rely on risk aversion and there is no direct "seller" of insurance that faces higher costs because of the incentive effects, among other things. Nevertheless,

[1]Incentive effects such as these are traditionally labeled "moral hazard," indicating that the presence of the insurance increases the likelihood of the event being insured against. It is our understanding that this expression originated among actuaries decades ago and clearly reflects the social mores of an earlier era. Although the behavior we describe in this paper is substantively comparable, it is not our intention to provide such judgements to that behavior.

the features that it does share with insurance will help us evaluate abortion access within a conceptual framework that enhances our interpretation of its impact.

The remainder of the paper examines whether this model is consistent with empirical evidence on abortion restrictions. In the second part of the paper, we review the existing empirical evidence that has largely examined experiences in the United States. We find that this evidence, on the whole, supports our theoretical model. The final part of the paper provides an empirical analysis of the changes in abortion access that have taken place in Eastern Europe over the past two decades. These countries provide a valuable environment for examining the impact of changes in abortion policy because changes in this region have been both extensive and varied. We distinguish between highly restrictive, moderately restrictive, and largely unrestrictive policies and examine the impact of changes in these policies on legal abortions, maternal deaths (as an indicator of illegal abortion), fertility, and pregnancies.

The results of this analysis provide support for our theoretical model. First, we find that abortion does provide a significant insurance component in preventing unwanted births. Evidence for this is found in the reduction of births and maternal deaths that occur when abortion is no longer highly restricted. On the other hand, in countries with moderate restrictions in place that subsequently make abortion available upon request, we find no evidence of a reduction in births and strong evidence of an increase in pregnancies and abortions. These findings are consistent with the incentive effect implications of our model.

II. THEORY

In this section we develop a simple model of decision-making under uncertainty, closely related to Kane and Staiger (1997), and use the model to analyze how the availability of abortion affects a woman's choices about pregnancy risk, abortion, and birth. The use of such a model

follows Becker and others in assuming that fertility decisions are the result of a rational decision-making process in which a woman's actions are influenced by the expected costs and benefits of the choices she makes.[2]

A. Overview

Our model has three key features. First, women are able to take actions that reduce the risk of pregnancy, but these actions are increasingly costly at the margin as one tries to further reduce the risk of pregnancy. Second, decisions are made sequentially; actions are first taken that influence the risk of pregnancy, then pregnancy occurs (or not), and then after some time has elapsed a decision is made whether to abort or give birth. Third, women obtain better information over time, and so are better informed about the consequences of a birth at the time of choosing an abortion than at the time of becoming pregnant.[3] Thus, in our model, abortion differs from other methods of avoiding a birth (e.g., contraception or abstinence) because the abortion decision can be made with more complete information.

Within this simple structure, the key role of abortion is in providing insurance. A woman faces uncertainty both about becoming pregnant and the consequences of a birth. Abortion provides insurance by limiting the down-side risk; a woman can choose ex-post to have an abortion if the cost of giving birth is high. Abortion availability will also change incentives, potentially altering the initial pregnancy avoidance decision. Like models of fire or medical insurance, better insurance

---

[2]For early examples, see Becker (1960, 1965, 1981), Becker and Lewis (1973), Willis (1973) and Schultz (1973). Montgomery and Trussel (1986) provide a survey of early work in this area.

[3]In fact, there is considerable evidence that information obtained after becoming pregnant (e.g. support from parents or boyfriend, health problems of mother or fetus) is an important determinant of the abortion decision (Bankole, Singh and Haas, 1998;. Torres and Forrest, 1988). In addition, almost 40 percent of women who are unmarried at the time of conception but go on to give birth marry the father of the child in the interim (O'Connell and Rogers, 1984).

results in less precaution against an adverse event (e.g. more pregnancy) and more use of the insured service following an adverse event (e.g. more abortion). In other words, the availability of abortion provides an option that enables women to choose to end a pregnancy if it is too costly. The value of that option may increase a woman's willingness to take the risk.

B. Setup

More formally, we consider the simple model illustrated in figure 1. A woman initially chooses a level of contraceptive intensity, which determines the probability (P) that she avoids getting pregnant. For simplicity, we assume that a woman who practices no contraception (including abstinence) will become pregnant with certainty.[4] The cost of adopting a particular intensity level is defined by the function, C(P), where we assume that $C' > 0$ and $C'' > 0$ (i.e. that the marginal cost of reducing the risk of pregnancy is positive and increasing). A woman then either becomes pregnant with probability,1-P, or not with probability, P.

If she is not pregnant, she receives a payoff normalized to 0. If she is pregnant, she then receives additional information regarding the payoff to a birth; with probability π that information is negative. In that case the baby would be "unwanted" and we define the payoff to a birth to be -1. Alternatively, with probability $1 - \pi$, she is presented with positive information, so that the payoff to giving birth is +1 (a "wanted" birth).[5] Should she decide to have an abortion, she receives a payoff of -A, where A represents the cost (both monetary and psychic) of an abortion and is assumed

[4]A straightforward extension could cap that probability at the biological maximum for women engaging in regular sexual activity without using any contraception.

[5]A straightforward extension of this model would allow for a continuous payoff to giving birth, but the implications of such a model are similar to those presented here.

to be nonnegative.[6] The woman's objective is to maximize her expected payoff net of the cost of pregnancy reduction.

C. Solution

The solution to this model is straightforward, and is derived by working backwards. The decision between abortion and birth is made after becoming pregnant and after learning whether the birth will be wanted or unwanted. A woman for whom a birth will be wanted will always give birth (since $1 > -A$) and receive a payoff of 1. A woman for whom a birth will be unwanted will abort if the cost of abortion is less than the cost of giving birth ($A<1$), and will give birth otherwise. In this case the payoff represents the least costly option; she pays a cost equal to $\min(A,1)$. Therefore, the expected payoff from being pregnant *prior to learning if the birth will be wanted* is simply $E(\text{payoff}|\text{pregnant}) = 1\cdot(1 - \pi) - \min(A,1)\cdot\pi$.

To determine the optimal level of contraceptive intensity, we maximize the expected payoff net of the cost of pregnancy avoidance. That is, we maximize:

(1) $$\text{Expected Payoff} = P\cdot E(\text{payoff}|\text{not pregnant}) + (1-P)\cdot E(\text{payoff}|\text{pregnant}) - C(P).$$

The first order condition yields:

(2) $$C'(P^*) = E(\text{payoff}|\text{not pregnant}) - E(\text{payoff}|\text{pregnant}) = - E(\text{payoff}|\text{pregnant})$$
$$= \min(A,1)\cdot\pi - (1-\pi).$$

In other words, a woman chooses P so that the marginal cost of pregnancy reduction (C') is just equal to the marginal benefit (the gain in expected payoff from avoiding pregnancy).

---

[6]Since the main purpose of this model is to make positive, rather than normative, statements, we do not distinguish between private and social costs or benefits. More generally, one could allow for externalities associated with unwanted births or abortions.

D. Implications

In this model, how the cost of abortion affects pregnancy (and as a result affects abortion and birth) depends on the probability that a birth will be unwanted after a woman learns she is pregnant (π). When the expected payoff to pregnancy is positive a woman will become pregnant with certainty; the right hand side of equation (2) is negative resulting in a corner solution with $P^* = 0$. This is the case when $\pi < 1/(1 + \min(A,1))$. Thus, women facing a low risk that a pregnancy would result in an unwanted birth ($\pi < 1/2$) will always become pregnant. For example, women who really want to start a family still face some risk that, once pregnant, the birth would be unwanted (e.g. from unexpected pregnancy complications), but this will have little effect on their intentions to become pregnant.

In contrast, women who face a higher risk that a pregnancy would result in an unwanted birth ($\pi > 1/2$) will take at least some effort to avoid pregnancy if the cost of abortion is sufficiently high [when $A > (1-\pi)/\pi$]. Women at a very high risk of receiving negative information once pregnant (e.g. $\pi = .9$) will take efforts to avoid a pregnancy unless the cost of abortion is near zero, while women at medium risk (e.g. $\pi = .6$) will engage in pregnancy avoidance only if the cost of abortion is more significant. For example, a teenager planning to go to college faces a high risk that a birth would be unwanted if she got pregnant. As a result, she will use contraception (or abstinence) and only become pregnant in the relatively rare event of contraceptive failure. Alternatively, another woman who becomes pregnant may face a somewhat smaller likelihood that a birth would be unwanted. She may wait until after becoming pregnant to reevaluate her position. Therefore, she will only use contraception if an abortion would be a fairly costly outcome.

Figures 2A-2D plot the predicted effects of abortion costs for the three types: women at low, medium, and high risk that a birth would be unwanted if they became pregnant. Figure 2A plots the

effect of abortion cost on the expected proportion of pregnancies that will end in abortion. When the cost of abortion is higher than the cost of an unwanted birth (A>1) no pregnancies are aborted for any of the three types. When the cost of abortion is below the cost of an unwanted birth (A<1), each type aborts the proportion of pregnancies that are unwanted ex post. Figure 2B plots the impact of abortion costs on pregnancy rates for the three types of women. Abortion cost has no effect on pregnancy for low-risk women (who never contracept), and has little effect on pregnancy rates for high-risk women (who always contracept except when the cost approaches zero). Pregnancy rates for medium risk women, however, will be sensitive to abortion costs since they will only choose to contracept when abortion costs are sufficiently high.

The results of figures 2A and 2B can be used to derive the relationship between abortion costs and the proportion of women that have a birth (figure 2C) or an abortion (figure 2D). The impact of abortion costs on the probability of birth is non-monotonic, with both the magnitude and the direction of the effect depending on a woman's type. Because the likelihood of pregnancy is not very elastic for either low-risk or high-risk women (except at very low costs for high-risk women), abortion costs primarily affect birth and abortion rates for these women through the decision to abort once pregnant: When abortion cost rises above the cost of an unwanted birth (A>1), birth rates rise (and abortion rates fall) as these women give birth to unwanted children rather than aborting. For the low-risk and high-risk women, lower abortion costs largely do not alter the pregnancy decision and act strictly as insurance – providing protection from an otherwise unanticipated, unwanted birth. In contrast, the likelihood of pregnancy for medium risk women is very elastic at moderate levels of abortion cost, so that over this range a rise in abortion cost results in a fall in both birth rates and abortion rates. When abortion costs rise above the cost of an unwanted birth (A>1), abortion rates fall to zero and birth rates rise for these women – but may still lie below birth rates at low levels of

abortion cost because of lower pregnancy rates. Thus, for these medium-risk women, there is an incentive effect as lower costs of abortion (insurance) alter pregnancy decisions.

This model has two unambiguous implications: rates of pregnancy and rates of abortion are (weakly) monotonically decreasing in the cost of abortion for all types of women. Thus, in any population of women, an increase in the cost of abortion should be associated with a fall in pregnancy and abortion. The magnitudes of these effects, however, will depend on the distribution of types (e.g. high, medium and low risk) in the population, the initial cost of abortion faced by women (which will vary in the population because of psychic costs), and the magnitude of the increase. For example, if most women are low risk and the cost of abortion does not rise very high, then there will be little impact on pregnancy or abortion. The only impact will be to make women bear more of the cost of pregnancy risk. In contrast, if most women are high or medium risk, or if the cost of abortion rises from near zero to prohibitive levels, then pregnancy and abortion rates are likely to fall substantially.

Birth rates, however, are not monotonically related to the cost of abortion in our model. Thus, the direction and the magnitude of the effect of an increase in abortion costs on birth rates will depend on both the size of the increase, and on the distribution of risk types and initial abortion costs in the population. For small increases in the cost of abortion, birth rates will only increase for those women whose cost of abortion lies very near the cost of an unwanted birth (A just under 1). Unless these women make up a large share of the population, one would expect that a small increase in the cost of abortion would lead to no change or a decline in birth rates. As the increase in the cost of abortion becomes larger, more women will have their cost of abortion rise above the cost of an unwanted birth, and the overall birth rate will be more likely to rise. Importantly, all of these additional births will be unwanted. In the extreme, when the increase in abortion costs is so large

that no woman has an abortion (e.g. abortion is made illegal), one would expect that higher abortion costs will lead to higher birth rates.[7]

One should also notice that this model indicates that improvements in contraceptive technology are likely to lead to fewer pregnancies. Advances in this technology would indicate that an increase in pregnancy avoidance could come about at a smaller marginal cost. Equating the marginal cost to the marginal benefit of pregnancy avoidance, as stated in equation (2), would require greater use of contraception. Within this model, however, we cannot determine the relative efficacy of higher abortion costs and improvements in contraceptive technology with regard to reducing the likelihood of a pregnancy.

Overall, our model suggests that we may think of abortion as an insurance mechanism. As we increase insurance (by making abortion less costly) we improve the welfare of women by reducing the risk they face. But for some women we also alter decisions if abortion becomes sufficiently low in cost, increasing the pregnancy rate. The effect of this on the pregnancy and abortion rate is unambiguous; lower abortion costs are associated with higher rates of abortion and pregnancy. However, the effect on birth rates is ambiguous depending upon an individual's likelihood of having an unwanted pregnancy outcome and her individual cost of abortion. If the decline in abortion costs is great (as it would be in response to a broad legalization), however, it will lead to a decrease in births, all of which would have been unwanted.

---

[7]Technically, it is possible that higher abortion costs will lead to a reduction in the aggregate birth rate. This would require medium risk women to have fewer births in response to a large increase in abortion costs and for this group to constitute a high fraction of the population, which seems unlikely.

III. PRIOR EVIDENCE

An extensive empirical literature exists that considers the response in women's behavior brought about by changes in abortion access, which can be used to examine some of the theoretical predictions of our model. In this section of the paper, we review this evidence with an emphasis on findings from research examining changes in abortion access in the United States.

Until recently, most research in this area tended to ignore the possibility that changes in abortion policy may alter the likelihood of pregnancy as well as the decision to abort once pregnant.[8] Early research typically examined the impact of abortion legalization in the United States in the early 1970s on the birth rate and, to a lesser extent, the rate of maternal mortality (c.f. Tietze, 1973; Sklar and Berkov, 1974; Baumann et al., 1977; Quick, 1978; Tietze, 1984; and Joyce and Mocan, 1990).[9] More recent research on both the effect on births (Angrist and Evans, 1999; and Levine, et al., 1999) and maternal mortality (Dow and Ronan, 1997) has addressed some of the methodological limitations of earlier work (using the same techniques we employ subsequently), correcting problems like inadequate control groups, measurement error, and the influence of interstate travel. Estimates based on this more recent research indicate that abortion legalization in the United States

---

[8]For instance, Potter (1972) formally argues that 100 additional abortions do not necessarily lead to 100 fewer births because a woman who aborts may get pregnant again relatively quickly. The notion that those abortions may result from pregnancies that would not have occurred otherwise is not addressed. In another example, Trussell, et al. (1980), examine the impact of Medicaid funding restrictions on abortion and birth rates and find that they were associated with a significant decline in abortions, but that births were largely unaffected, which means that pregnancies had to fall. Yet the authors dismiss this possibility out-of-hand, stating: *"Other choices theoretically available to women denied access to Medicaid-funded abortions were avoiding intercourse or improving their contraceptive practice. We believe that neither of these options was of practical significance during the course of the study"* (p. 121).

[9]Abortion was legalized in five states in 1970 as four states (New York, Washington, Alaska, and Hawaii) passed laws and a de facto legalization took place in California about that time. The 1973 Supreme Court decision in Roe v. Wade legalized abortion in the rest of the country.

in the early 1970s led to up to a 10 percent reduction in births and almost a 10 percent reduction in deaths to women of childbearing age. Lower maternal mortality following legalization is an indicator of a decline in unwanted births, to the extent that much of this maternal mortality was the result of illegal abortions and unexpected pregnancy complications. Research from other countries similarly shows that changes in abortion legalization that took place in the 1950s and 1960s also had a dramatic impact on births and maternal mortality, although the magnitude of these effects varies from country to country (c.f. Potts et al.,1977; Coelen and McIntyre, 1978; and Frejka, 1983).

An important limitation of this research is its failure to consider the impact of abortion legalization on the probability of becoming pregnant. Yet, based upon an estimate of the reduction in fertility of 10 percent following legalization in the United States (and assuming little or no change in the rate of spontaneous abortion), if one could determine the increase in the frequency of abortion the impact on pregnancies could be estimated. Unfortunately, the number of illegal abortions performed prior to legalization is a statistic that, for obvious reasons, can never be determined with any degree of accuracy. For example, if one assumes that pregnancies are unaffected (as done by Tietze, 1973, and Quick, 1978), then a 10 percent reduction in births following legalization (about 300,000 fewer births per year in the mid 1970s) combined with the approximately 1.3 million legal abortions being performed in the U.S. at that time implies that nearly 1 million illegal abortions were being performed prior to legalization. At the other extreme, if one assumes that no illegal abortions were performed prior to legalization, then the implication is that pregnancies increased by 25 percent following legalization of abortion.[10] A potentially more reasonable middle ground position would

[10]This calculation is based upon the assumption that roughly 4 million pregnancies are required to result in roughly 3 million births.

suggest that perhaps half a million illegal abortions were being performed and that pregnancies increased by, say, 10 to 15 percent.

In fact, earlier evidence from Eastern Europe suggests that pregnancies may be very responsive to abortion legalization (Frejka, 1983). In Romania, following a surprise policy change in October 1966 that made abortion illegal (after ten years of liberal availability), birthrates rose by more than 50 percent in 1967, the first year following the change. However, by 1970 birthrates fell by about 25 percent relative to 1967. This indicates that either women were able to incorporate this change into their behavior, lowering their pregnancy rates, or that an extensive market for illegal abortions developed very rapidly.

Recent research has begun to formally address the question of whether or not changes in abortion policy affect the likelihood of becoming pregnant. Although data on pregnancies is typically unavailable in a source that is of sufficient size and quality to test this hypothesis, researchers have relied upon a combination of birth and abortion data. Assuming that spontaneous abortions are unaffected by access to induced abortion, changes in the sum of births and abortions may be attributed to changes in pregnancies.

Studies in this area typically involves women's responses to relatively moderate changes in abortion access, like Medicaid abortion funding restrictions and parental consent laws. Moderate changes in abortion access are not believed to lead to large numbers of illegal abortions, so that the impact on abortions, births and pregnancies (the sum of the first two) can be estimated. In response to Medicaid funding restrictions, in particular, a large body of evidence indicates that these sorts of changes significantly reduced the number of abortions performed (c.f. Trussell, 1980; Joyce, 1988; Lundberg and Plotnick, 1990 and 1995; Blank, et al., 1996, Cook, et al., 1999; Currie, et al., 1996; and Haas-Wilson, 1996). A common finding across papers is that Medicaid funding restrictions

lowered the abortion rate by about 3 to 5 percent. The evidence regarding parental involvement laws and abortion demand is less robust across papers and model specifications (c.f. Cartoof and Klerman, 1988; Haas-Wilson, 1996; and Joyce and Kaestner, 1996)

Recent research has extended this literature by including births as an outcome as well, so that implications regarding pregnancies may be drawn. The results from these analyses provide evidence that these changes in abortion access may affect women's sexual activity and/or contraception behavior. Regarding Medicaid funding restrictions, these papers continue to find that abortions are reduced when restrictions are imposed, but they also find no corresponding increase in births (c.f. Matthews, et al. 1996; and Levine, Trainor, and Zimmerman, 1996). In fact, some evidence appears to indicate that births also fell in response to these policies. These findings imply that fewer women became pregnant after the restriction was imposed. One important exception to these results is Cook et al. (1999), who find that unexpected short-term limitations of Medicaid abortion funding in North Carolina were associated with a decline in abortions and a rise in births. However, unlike other studies of Medicaid funding, the reductions in Medicaid funding in North Carolina were unexpected at the time that women became pregnant. Thus, the North Carolina results emphasize the importance of the pregnancy decision in determining the impact of abortion availability on birth rates.

Other studies of how birth rates were affected by modest restrictions on abortion come to similar conclusions. In those studies that found that parental involvement policies reduced abortions (Rogers, et al., 1991; Ohsfeldt and Gohmann, 1994; and some specifications in Matthews, et al., 1996), birthrates are estimated to either fall or remain constant, again indicating that pregnancies fell. Joyce, et al. (1997) show that a mandated waiting period reduced abortion rates, but found no strong evidence of an increase in births. Kane and Staiger (1996) find that Medicaid funding

restrictions, parental involvement laws, and increases in travel distance to the county of the nearest abortion provider did not increase teen births and, if anything, reduced them. Taken collectively, none of these studies find much evidence of opposite effects on abortions and births brought about by changes in abortion access, which would be required if pregnancies were not affected by the policy change.

In summary, the available evidence provides several insights regarding the impact of changes in abortion access on women's fertility-related behavior. First, the effect of limits to abortion access appears to depend upon the extent of the limitation. When abortion is legalized, births decline substantially. Unfortunately, it is difficult to accurately assess the impact on pregnancies from such a policy change because the number of illegal abortions performed prior to legalization can never be known with any degree of accuracy. Nevertheless, a reasonable reading of the data suggests that either pregnancy rates increased substantially or there was a massive market in illegal abortion prior to legalization. The fact that birth rates fall substantially following legalization suggests that at least some of the additional abortions prevented unwanted births, and recent evidence suggesting that the marginal child would have been born into worse living circumstances is consistent with this view (Gruber, Levine and Staiger, 1999). On the other hand, in response to more modest restrictions to abortion access (like Medicaid funding restrictions), the bulk of the evidence indicates that abortion demand is reduced, but that births do not rise and may even fall. These facts imply that women may increase their use of contraception or reduce their sexual activity in response to moderate abortion restrictions.

IV. NEW EVIDENCE FROM EASTERN EUROPE

To provide an additional empirical test of the abortion as pregnancy insurance hypothesis, we consider the impact of changes in abortion policy in Eastern Europe.[11] Recent history in this region provides a great resource for further examination of this hypothesis because several countries instituted dramatic changes in laws regulating abortion availability. This experience is particularly useful in that countries which imposed restrictions strongly enforced them and liberalization was clearly brought about by political change. This section of the paper will present an empirical analysis of the impact of those changes, focusing on the 1980 through 1997 period.

A. Description of Abortion Laws

Eastern European countries have had in place a wide variety of laws regarding abortion access in the recent past, ranging from countries like Romania prior to 1990, where abortion was virtually completely outlawed, to countries like Russia, where abortion was available on request with few, if any, barriers throughout the period. Table 1 presents a brief summary of laws in each country, noting the changes that have taken place since 1980. The Data Appendix provides a list of the sources we used to compile this table. Here, and in the remainder of the analysis, throughout

[11] A handful of changes in abortion policies in Western Europe also took place over the past two decades. In particular, the Netherlands (1981), Greece (1985), and Belgium (1991) made abortion available upon request when it had been officially severely restricted in the past (although enforcement activity was minimal and apparently practiced openly). Portugal (1984) and Spain (1985) eased access slightly from laws that had been very restrictive. The former Federal Republic of Germany (1993) made abortion available upon request when moderate restrictions used to be imposed. Unfortunately, no reliable abortion data exists in those countries that had strongly restricted abortion access, making it impossible to estimate the impact of changes in these laws on abortions and pregnancies.

the period we consider the former German Democratic Republic as well as the Czech and Slovak Republics as separate countries.[12]

We provide a main classification of the legal status of abortion in each country at a point in time and break it into three separate categories.[13] These categories include: (1) "Life/Medical" in which abortion is only available to save the life of the mother or for those with specific, narrow medical conditions only; (2) "Medical/Social" in which an abortion is available to those with medical problems, including mental health, or those for whom the birth of a child would present some hardship; and (3) "On Request" in which an abortion is available if a woman asks for one.[14] We also include a set of classifications describing additional regulations regarding abortion access among those countries/years in which abortion is generally available (i.e. either Medical/Social or On Request). These include the presence of a waiting period and/or counseling before an abortion may be performed, whether the procedure is subsidized by the government, and whether parental consent is required for minors.

---

[12]We have chosen not to include the new countries that emerged from the former Yugoslavia, partly because of limited data availability and partly because of the conditions of war that persisted over much of this region in the 1990s.

[13]These classifications largely follow those used by the Alan Guttmacher Institute in their summary of world abortion laws (Henshaw, 1990; and Rahman, et al., 1998). It is important to note that abortion access can vary greatly even within the category. For instance, in Russia, a woman seeking an abortion faces virtually no obstacles in obtaining one. In the former German Democratic Republic after 1993 abortion is also available "on request," but a woman seeking an abortion is required to be counseled towards giving birth and must wait three days before the procedure can be performed. Nevertheless, if she persists in her request to obtain an abortion, she can get one, which is why we code this country as "on request."

[14]We do not separately categorize those countries with restrictive policies in which abortion is available in cases of rape/incest or fetal defects, but these exceptions are noted in the brief narrative description for each country.

Over the 18 year period we examine, a number of changes in the primary legal status of abortion are observed in these countries. In Eastern European countries that were not part of the former Soviet Union, most instituted fundamental changes to their laws governing abortion. Some, but not all, of these changes (Albania in 1991, Bulgaria in 1990, and Romania in 1990) coincided with the transition from communism to democracy as strong pro-natalist policies previously enacted in these countries were abandoned. In the Czech and Slovak Republics, requirements that an abortion request be approved on the basis of a medical or social condition were dropped in 1987 and abortion became available upon request. This change took place 6 years before the two republics split apart and 3 years before the collapse of the Soviet Union. Hungary made a similar change in policy in 1993. The only example in all of Europe of a significant tightening of abortion availability during this period is Poland. After Soviet domination ended, the strong influence of the Catholic church led to the imposition of strict regulations in 1993, allowing abortion only in limited circumstances. In the European republics of the former Soviet Union, abortion was available on request both before and after the break-up.

B. Methodology and Data

To examine the impact of changes in abortion policy on fertility-related behavior, we estimated regression models of each outcome considered as a function of the legal status of abortion, macroeconomic conditions, specific age composition among all women of childbearing age, country and year fixed effects, and, in some models, country-specific trends. The outcomes we consider are the abortion rate (abortions per 1,000 women age 15 to 44), the rate of deaths to women of childbearing age relative to that for men (the ratio of the number of deaths per 100,000 women in this age group to the comparable statistic for men), birth rates, and the "pregnancy rate" (the sum of births and abortions per 1,000 women age 15 to 44).

Models of the abortion rate are estimated to provide an indication that abortion access is, in fact, changing when its legal status changes. We consider the relative female death rate to provide an indication of the extent of illegal abortions performed in a country. If a pregnant woman has a strong preference against giving birth and a legal abortion is not available, she may turn to an illegal abortion, which may pose a health risk to the mother. Following Dow and Ronan (1997), we normalize the rate of death to women of childbearing age using the analogous measure for men to control for other possible changes taking place over time in the health care delivery system of each country.

The analysis of births and pregnancies provide perhaps the closest test of our theoretical model. If increased abortion access reduces births then outlawing abortion would lead to unwanted births (insurance value). On the other hand, if increased access had little impact on, or even an increase in, births, then any increase in abortions would have been the result of additional pregnancies (incentive effect).

We control for macroeconomic conditions in these models as well because they may also influence our outcome measures and be related to the timing of changes in abortion law. Particularly in Eastern Europe and the former republics of the Soviet Union, the decline and collapse of the Soviet empire led to dramatic economic contractions and rampant inflation in many countries. To the extent that these economic developments are correlated with the political developments that led to changes in abortion policy, it is important to control for them. Therefore, our models include measures of gross domestic product per capita and the level of inflation.

In the model, country fixed effects are included to control for long-term, country-specific differences in outcomes that may be attributed to differences in history, culture, other institutional arrangements, and the like. Time fixed effects are added to control for trends occurring over time

that are common to each country. For instance, the timing of the decline and fall of the Soviet Empire certainly had important influences on all these countries. In some specifications, we also include time trends that are allowed to vary across countries. This approach provides the advantage of capturing any factor within a country that is changing over time and is also different from that occurring in other countries. On the other hand, some worry that such models result in "over-fitting" the data, significantly reducing the power of the analysis (c.f. Blank, 2000). We present our results both with and without these trends to examine the sensitivity to their inclusion. In models without country-specific trends, identification is provided by those countries that changed their abortion laws over the period. In models with the trends, identification is based upon the discrete nature of the change in abortion laws and the change in outcomes right around the time of the change of the abortion law.

To estimate these models, we have compiled a dataset comprised of abortions, births, deaths by sex and age, and population size by sex and age for countries in Eastern Europe and the former Soviet Republics in Europe. Data on each outcome is available for each country except Albania in most, but not all, years in our sample period of 1980 to 1997. Our data sources are presented in the Data Appendix. Briefly, we obtained the majority of our data from various international compilations from the United Nations, the World Health Organization, and the Council of Europe.[15] It is important to recognize that reporting problems often lead to counts of abortion data that are understated. In our analysis of abortion rates (as well as pregnancy rates), we will separately

[15]The main complications arose in the former German Democratic Republic and the Czech and Slovak Republics, because of German reunification and the break up of Czechoslovakia in the middle of our sample period. To acquire data for the eastern region of German following reunification and for the two Czechoslovak Republics prior to their separation required additional data from the united countries' statistical yearbooks and direct communications with their national statistical offices.

estimate models using all available data as well as for those countries that have been determined by the Alan Guttmacher Institute to have virtually complete abortion counts.[16] These countries include: Belarus, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, and the Slovak Republic.

In addition to these demographic data, we have also collected information on macroeconomic conditions in each of the countries in our analysis. The specific measures we include are the natural log of per capita gross domestic product (GDP), and a set of dummy variables representing different levels of inflation (less than 5 percent, between 5 and 25 percent, between 25 and 100 percent, and greater than 100 percent). Following the collapse of the Soviet empire, these data were largely available from the World Bank.[17] But during the communist era, the available macroeconomic data was obtained from estimates made by the Central Intelligence Agency, for which the quality is unknown.[18]

---

[16]Another potential problem with the available abortion data is that in the former Soviet Republics, through the late 1980s abortion counts included spontaneous abortions. We do not believe that this presents a serious limitation for our analysis for two reasons. First, most spontaneous abortions occur relatively soon after the start of the pregnancy and it would seem unlikely that the majority of them would be counted. Second, no noticeable deviation from trend is apparent in these republics at the time of the change in definitions.

[17]The former German Democratic Republic and the former Czechoslovakia present additional problems since macroeconomic data are difficult to obtain for separate regions within a country. For Germany, we were able to obtain separate estimates for the eastern regions of the level of GDP starting in 1991. For previous years, we calculated the level of GDP using the more recent data combined with CIA estimates of GDP growth rates in earlier years. We also have inflation data from the German Statistical Office beginning in 1992 and CIA estimates through 1989, but we were unable to locate data for 1990 and 1991. For the Czech and Slovak Republics, the World Bank reports separate GDP data going back to 1984. Before that we assigned the GDP growth rates from the combined Czechoslavakia to the 1984 levels of GDP to project backwards. We also assumed that inflation rates in the two halves of the country were the same before they separated.

[18]Even using the CIA estimates, some countries and years still have missing data for these macroeconomic variables. To include these countries in our analysis, we have added dummy variables for both the GDP and inflation measures indicating whether or not these data are missing.

C. Descriptive Analysis

Before presenting the results of our regression analysis, we first present a descriptive analysis that is intended to characterize the data and to highlight some of the econometric issues that will arise subsequently. We begin by reporting Table 2, which presents mean values of our outcome measures in Eastern Europe, and the republics of the former Soviet Union, weighted by the relevant population measure in each country, in 1980 and 1995.[19] We also report statistics for Western Europe and the United States for purposes of comparison.

The first row of the table provides estimates of the reported abortion rate and provides evidence of huge disparities across regions. In 1980, about 13 women per 1,000 of childbearing age aborted in Western Europe, but in Eastern Europe the comparable level was more than three times greater and in the European republics of the former Soviet Union, the level was about 10 times greater. Those relative comparisons do not change much by 1995 in that all regions experienced at least a 25 percent reduction in abortion rates and the former Soviet republics still exhibit an abortion rate 8 times greater than that in Western Europe. But that masks the absolute magnitude of the decline in the Soviet Union, which declined from a level of 127.4 to 75.9.

Regarding female mortality, we see that across the age spectrum and across regions women in these age ranges experience levels of mortality that are one quarter to one half those of men. This excessive risk of death among men is particularly apparent in the former Soviet Republics. These ratios have fallen over time most notably in Eastern Europe and somewhat in Western Europe among non-teens.

---

[19]The latter year was chosen because the problem of missing data becomes somewhat greater for 1996 and 1997.

Perhaps the most notable change over time in these data is the dramatic decline in births in all of Europe (but not in the United States). The total fertility rate, which represents the number of children a woman can expect to have over all her childbearing years based on present age-specific birth rates, stood at roughly two (or replacement level) in all regions of Europe in 1980. By 1995, that rate was below 1.5 in all regions. In fact, in the former German Democratic Republic (East Germany), the level has fallen below unity and has remained there since 1991. With declining rates of abortion and birth, our constructed pregnancy rate declines as well. The striking statistic here is that almost two-thirds of these constructed pregnancies are represented by abortions in the former republics of the Soviet Union.

Figure 3 presents the complete time series in total fertility rates over our sample period for Eastern Europe, the former Soviet Republics, and western European countries for comparison. It shows a slow gradual downward trend in western Europe, but a dramatic decline beginning in 1988 or 1989 in the East. Although total fertility rates began somewhat higher in these eastern regions compared to Western Europe, by 1993 this was reversed. The timing of this decline corresponds well with the political and economic uncertainties brought about by the decline and dissolution of the Soviet Union. This figure illustrates the importance of including year fixed effects in our econometric analysis and also suggests that the republics of the former Soviet Union make a legitimate control group for other Eastern European countries.

D. Econometric Results

Table 3 reports the results of our econometric analysis.[20] In all specifications, the omitted legal status is available on request so that all coefficients for those types of abortion laws included should be interpreted relative to an on-request legal regime. For each outcome, odd-numbered columns do not include state-specific trends and even-numbered columns do include them.

1. The Abortion Rate

The first four columns of this table display our estimates for models of the abortion rate, differentiating between estimates from models using all available abortion data and from models only using those countries whose abortion data is considered to be of high quality. The results provide strong evidence that the status of abortion laws has a large impact on the abortion rate. For instance, based on all available abortion data, countries in which abortion is only legal to save the mother's life or for specific medical reasons have abortion rates that are only about 5 percent of the level observed in countries in which abortion is legal upon request.[21] Unfortunately, we cannot identify this parameter in models with the more limited, complete abortion data.

Those countries/years in which abortion is available for medical and social reasons are also found to have a significantly lower abortion rate compared to those countries/years in which abortion is available upon request. In particular, when we only use those countries with complete

[20]In all specifications, reported standard errors are corrected for heteroskedasticity and an arbitrary covariance structure between time periods within countries, as suggested by Bertrand, et al. (2001).

[21]With the dependent variable measured in logs and parameter estimates this large in absolute value, one cannot simply interpret the coefficients as an approximation of a percentage change. The impact is obtained by taking the number e raised to the power of the coefficient (i.e. $e^{-3.1} = 0.045$, so that countries where abortion is only available to save the mother's life or for specific medical reasons have abortion rates that are 4.5 percent the level observed in countries and years where abortion is available on demand).

abortion data (Columns 3 and 4), we find a robust estimate of about a 25 percent reduction in the abortion rate when these moderate restrictions are imposed.

2. Relative Female Death Rate

Columns 5 and 6 present estimates from models where the dependent variable is the log of the ratio of female-to-male death rates for those aged 15 to 44. In the model without country-specific trends, estimates indicate that the relative female death rate is 10 percent higher in countries where abortion is only available to save a mother's life or for other specific medical reasons compared to countries in which abortion is available upon request. The introduction of country-specific trends, however, lowers this estimate and increases its standard error to the point where it is no longer statistically significant. The ambiguity in these findings makes it difficult to draw strong conclusions regarding the impact of strong abortion restrictions on maternal deaths and, hence, illegal abortion.

On the other hand, we find no evidence that countries with weaker abortion restrictions (i.e. those where abortion is available for medical or social reasons) experience any difference in relative female death rates. Point estimates are wrong-signed and statistically insignificant. This finding is important because it provides evidence that illegal abortion is probably not a tremendous problem in countries with these weaker restrictions compared to those in which abortion is available on request. It still may take place, but it seems unlikely that it is extensive or terribly risky. This conclusion will play an important role in our subsequent analysis of pregnancy behavior.

3. Birth Rates

Estimates from our analysis of the responsiveness of fertility to changes in abortion policy are reported in Columns 7 and 8.[22] Here, we see evidence of the insurance value of abortion. Restrictive abortion laws in which abortion is available only to save the mother's life or for other specific medical reasons increases the birth rate by 9 to 17 percent relative to that in a regime where abortion is available upon request. This finding is statistically significant in the model without country specific trends, but with these trends imprecision in the estimate would lead us to fail to reject the null hypothesis despite a very large point estimate. One could infer from these findings that legalizing abortion is likely to result in a significant drop in the birth rate, which represents the insurance value of greater abortion access.

We also begin to see evidence regarding the incentive effect. When abortion is made available for medical or social reasons, point estimates of the impact on births are relatively small and they are not statistically significant. Based on our earlier evidence indicating that these policies did have a rather large impact on abortion rates, the combination of these findings suggests that pregnancies are lower in this policy environment compared to one where abortion is available upon request.

4. Pregnancies

Estimates from models of the pregnancy rate (or the sum of abortions and births per 1,000 women age 15 to 44) are reported in Columns 9 through 12. Using all the available abortion data

[22]We have also estimated analogous models where the dependent variable is the total fertility rate. The results from these models were very similar to those reported here. This makes sense because the main difference between this birth rate and the total fertility rate is the specific age composition of women of childbearing age. But these models control for age composition. We chose to report models of the birth rate because they are easier to interpret in the context of an analysis of abortion and pregnancy behavior.

(Columns 9 and 10), estimates indicate that pregnancies fall by 27 to 45 percent when abortion moves from available upon request to available only in serious medical circumstances. This estimate may be inaccurate, however, in that it fails to include counts of pregnancies that result in illegal abortions when restrictions are severe. The results from Columns 5 and 6 provide some evidence for this in that maternal mortality rises when abortion is severely restricted (in the model without country-specific trends), indicating that at least some illegal abortions are performed. This problem is identical to the one described earlier regarding the impact on pregnancies of abortion legalization in the United States. Without additional information, we cannot draw strong conclusions regarding the pregnancy impact of such a policy change.

On the other hand, we are on safer ground drawing strong conclusions regarding the impact of more moderate abortion restrictions. In Columns 5 and 6 we found no evidence that maternal mortality rises when abortion is made available for medical or social reasons compared to when it is available upon request. This suggests that illegal abortions are probably not a huge problem under these circumstances. We do not conclude from this that they do not occur, only that they are not that prevalent.

This is important because we also see that the pregnancy rate is estimated to fall by about 25 percent in response to these more moderate restrictions when we use all available abortion data and by roughly 10 percent when we restrict the analysis to those countries with complete abortion data. If illegal abortions are performed only infrequently in locations that have imposed these more moderate restrictions, then these estimates probably are at least close approximations of the true pregnancy effect. Based on this evidence, we conclude that pregnancies are meaningfully reduced when moderate abortion restrictions are imposed, supporting the existence of an incentive effect.

5. Summary of Evidence from Eastern Europe

The evidence we have presented for Eastern Europe is consistent with a growing body of recent evidence from the United States that similarly compares regions with changed abortion access to regions where it has been stable. We find that strict limits on abortion access are associated with large increases in the birth rate, on the order of 10 percent or more. Based on all available abortion numbers in these countries, we estimate that pregnancies fall by 27 to 45 percent when abortion access was very restricted (although this is most likely an over-estimate because it does not count illegal abortions). These results are somewhat larger in magnitude than estimates of the impact of abortion legalization in the United States, but consistent with earlier evidence from Romania suggesting that pregnancy rates fell about 25 percent after abortion was made illegal.

In contrast, we find that modest restrictions on abortion access have no significant effects on birth rates, but do reduce abortion rates and, by implication, pregnancy rates by a substantial amount. Estimates indicate that modest restrictions on abortion access reduced abortions by about 25 percent and pregnancies by about 10 to 25 percent. Moreover, we find no evidence of a rise in maternal mortality associated with these modest restrictions, which suggests that this decline in pregnancy was not offset by any substantial rise in illegal abortions.

V. CONCLUSIONS

Our results add to the growing evidence that *both* pregnancy rates and the use of abortion react to changes in abortion access. If abortion access is viewed as a form of insurance, it naturally provides insurance value (in the form of avoiding unwanted births) and incentive effects (in the form of less pregnancy avoidance). Our findings suggest that both exist, and should be acknowledged in the design of abortion policy.

However, our results say nothing specific about the optimal level of abortion access. In a standard treatment of insurance, we would balance the benefits of insurance against the costs brought about by poor incentives. The incentive effect leads to an inefficiency as the insured values the cost of his/her actions differently than the true social cost. In such cases the principles of optimal insurance suggest that some form of partial insurance is optimal.

In the present context of abortion, however, it is unclear whether there is a gap between private and social costs, or even the direction of such a gap if it exists. Aside from the medical costs of an abortion, which are relatively small, the existence of such a gap would depend upon the extent to which abortion creates an externality. One could imagine a world in which abortion is strictly a private decision and, regardless of what a woman decides, it would have no impact on others in any way. Under these conditions, the incentive effects brought about by liberal abortion policies would create no inefficiency and abortion should be unrestricted. Women would get the advantage of obtaining the additional information that would present itself between conception and the abortion decision and no one would be hurt by this. Moreover, some could argue that society benefits by enabling women to make these more informed choices, suggesting that the social cost of abortion is less than the private cost. This would suggest that abortion should be subsidized.

Alternatively, one could view the increased likelihood of pregnancy and subsequent abortion as a negative externality. Public discontent about such behavior would be indicative of this. In this case, the social cost to abortion would be greater than the private cost and we would revert to the standard prescriptions of an insurance model – i.e. that women should face some cost of abortion that is greater than zero (perfect insurance) but less than the social cost (perfect incentives). Thus, in the case of negative externalities from abortion, the optimal policy is likely to be one of modest restrictions on abortion rather than one of making abortion illegal. Moreover, the optimal policy in

this case would target such restrictions on women whose pregnancy avoidance is most responsive to incentives. In fact, most countries that restrict abortion access do exempt certain groups of women whose pregnancy decisions are not likely to be effected by abortion access (e.g. rape or incest, serious health risks).

Of course, as in the public debate, disagreement over the social costs of an abortion will lead to disagreement over the optimal abortion policy. Nonetheless, we believe that this conceptual framework provides a useful starting point for a more objective analysis of abortion policy.

REFERENCES

Alan Guttmacher Institute. *Sharing Responsibility: Women, Society, and Abortion Worldwide*. New York: Alan Guttmacher Institute. 1999.

Angrist, Joshua D. and William N. Evans. "Schooling and Labor Market Consequences of the 1970 State Abortion Reforms." *Research in Labor Economics*. Volume 18 (1999). pp. 75-114.

Baban, Adriana. "Romania," in Henry P. David (ed.), *From Abortion to Contraception: A Resource to Public Policies and Reproductive Behavior in Central and Eastern Europe from 1917 to the Present*. Westport, CT: Greenwood Press, 1999.

Bauman, Karl E., Ann E. Anderson, Jean L. Freeman, and Gary G. Koch. "Legal Abortions subsidized Family Planning Services, and the US Birth Dearth." Social Biology. Volume 24, 1977, pp. 183-191.

Becker, Gary S. "An Economic Analysis of Fertility," in Demographic and Economic Change in Developed Countries. Universities-National Bureau Conference Series, no. 11, Princeton, NJ, Princeton University Press, 1960.

Becker, Gary S. "A Theory of the Allocation of Time." Economic Journal. Vol. 75, No. 299 (1965) pp. 493-517.

Becker, Gary S, A Treatise on the Family, (Cambridge, MA: Harvard University Press, 1981).

Becker, Gary S. and H. Gregg Lewis. "On the Interaction Between Quantity and Quality of Children." Journal of Political Economy. Vol. 81, No. 2 (1973). pp. S279-S288.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. "How Much Should We Trust Difference-in-Difference Estimates?" MIT Department of Economics working paper 01-34. October 2001.

Blank, Rebecca M. "What Causes Public Assistance Caseloads to Grow?" University of Michigan, unpublished manuscript. March 2000.

Blank, Rebecca, Christine George, and Rebecca London, "State Abortion Rates: The Impact of Policies, Providers, Politics, Demographics, and Economic Environment," Journal of Health Economics, 15(5), October 1996, 513-553.

Cartoof, V. G. and L.V. Klerman. "Parental Consent for Abortion: Impact of the Massachusetts Law." American Journal of Public Health. April 1986. pp. 397-400.

Coelen, Stephen P. and Robert J. McIntyre. "An Econometric Model of Pronatalist and Abortion Policies." Journal of Political Economy. Vol. 86, No. 6 (1978). pp. 1077-1101.

Cook, Philip J., Allan M. Parnell, Michael J. Moore, and Deanna Pagnini. "The Effects of Short-Term variation in Abortion Funding on Pregnancy Outcomes." Journal of Health Economics, Vol. 18, no. 2 (1999): 241-258.

Currie, Janet, Lucia Nixon, and Nancy Cole, "Restrictions on Medicaid Funding of Abortion: Effects on Pregnancy Resolutions and Birth Weight," Journal of Human Resources, 31(1), Winter 1996, 159-188.

Dorbritz, Jürgen and Jochen Fleishhacker. "The Former German Democratic Republic," in Henry P. David (ed.), *From Abortion to Contraception: A Resource to Public Policies and Reproductive Behavior in Central and Eastern Europe from 1917 to the Present*. Westport, CT: Greenwood Press, 1999.

Dow, William H. and Nick Ronan. "Maternal Mortality Effects of Abortion Legalization." unpublished manuscript, Rand Corporation. March 1997.

Frejka, Tomas. "Induced Abortion and Fertility: A Quarter Century of Experience in Eastern Europe." *Population and Development Review*, Vol. 9, No. 3. (September 1983), pp. 494-520.

Gruber, Jonathan, Phillip B. Levine, and Douglas Staiger. "Abortion Legalization and Child Living Circumstances: Who is the "Marginal Child?" *Quarterly Journal of Economics*. February 1999. pp. 263-292.

Haas-Wilson, Deborah. "The Impact of State Abortion Restrictions on Minor's Demand for Abortions." Journal of Human Resources. Vol. 31, No. 1 (Winter 1996). pp. 140-158.

Henshaw, Stanley K. "Induced Abortion: A World Review, 1990." *Family Planning Perspectives*. Vol. 22, No. 2 (March/April, 1990). pp. 76-89.

Henshaw, Stanley K. and Kathryn Kost. "Abortion Patients in 1994-1995: Characteristics and Contraceptive Use." Family Planning Perspectives. Vol. 28, No. 4 (July/August 1996), pp. 140-147.

Joyce, Theodore, "The Social and Economic Correlates of Pregnancy Resolution Among Adolescents in New York City, by Race and Ethnicity: A Multivariate Analysis," American Journal of Public Health, Vol. 78 (1988). pp. 626-631.

Joyce, Theodore, Stanley Henshaw, and Julia DeClerque Skatrud. "The Impact of Mississippi's Mandatory Delay Law on Abortions and Births." Journal of the American Medical Association. Vol. 278, No. 8 (August 27, 1997). pp. 653-658.

Joyce, Theodore and Robert Kaestner. "State Reproductive Policies and Adolescent Pregnancy Resolution: The Case of Parental Involvement Laws." Journal of Health Economics, Vol. 15 (1996).

Joyce, Theodore J. and Naci H. Mocan. "The Impact of Legalized Abortion on Adolescent Childbearing in New York City." American Journal of Public Health. Volume 80 (3), March 1990, pp. 273-278.

Kane, Thomas and Douglas Staiger, "Teen Motherhood and Abortion Access," Quarterly Journal of Economics, 111(2), May 1996, 467-506.

Levine, Phillip B., Douglas Staiger, Thomas J. Kane, and David J. Zimmerman, "Roe v. Wade and American Fertility," American Journal of Public Health (forthcoming).

Levine, Phillip B., Amy B. Trainor, and David J. Zimmerman, "The Effects of Medicaid Abortion Funding Restrictions on Abortions, Pregnancies, and Births," Journal of Health Economics, 15, 1996, 555-578.

Lundberg, Shelly and Robert D. Plotnick. "Effects of State Welfare, Abortion, and Family Planning Policies on Premarital Childbearing Among White Adolescents." Family Planning Perspectives. Vol. 22, No. 6 (November/December 1990), pp. 246-251.

Lundberg, Shelly and Robert D. Plotnick, "Adolescent Premarital Childbearing: Do Economic Incentives Matter," Journal of Labor Economics, 13(2), April 1995, 177-200.

Matthews, Stephen, David Ribar, and Mark Wilhelm, "The Effects of Economic Conditions and Access to Reproductive Health Services on State Abortion and Birthrates." Family Planning Perspectives, 1996.

Montgomery, Mark and James Trussell. "Models of Marital Status and Childbearing," in Orley Ashenfelter and Richard layard (eds.) Handbook of Labor Economics. Amsterdam: North-Holland. 1986.

O'Connell, Martin and Carolyn C. Rogers. "Out-of-Wedlock Births, Premarital Pregnancies and their Effect on Family Formation and Dissolution." *Family Planning Perspectives*, Vol. 16, No. 4. (July/August, 1984), pp. 157-162.

Ohsfeldt, Robert L. and Stephan F. Gohmann. "Do Parental Involvement Laws Reduce Adolescent Abortion Rates?" Contemporary Economic Policy Vol. 12 (1994), pp. 65-76.

Peltzman, Sam. "The Effects of Safety Regulation." *Journal of Political Economy*. Vol. 83, No. 4 (August, 1975). pp. 677-725.

Potter, R. E. "Additional Births Averted when Abortion is Added to Contraception." *Studies in Family Planning*. Vol. 3 (1972), pp. 53-59.

Potts, Malcolm, Peter Diggory and John Peel. Abortion. New York: Cambridge University Press, 1977.

Quick, JD. "Liberalized Abortion in Oregon: Effects on Fertility, Prematurity, Fetal Death, and Infant Death." American Journal of Public Health. Volume 68, 1978, pp. 1003-1008.

Rahman, Anika, Laura Katzive, and Stanley K. Henshaw. "A Global Review of Laws on Induced Abortion." International Family Planning Perspectives. Vol. 24, No. 2 (June 1998), pp. 56-64.

Rogers, James L., Robert F. Boruch, George B. Stoms, and Dorothy DeMoya. "Impact of the Minnesota Parental Notification Law on Abortion and Birth." American Journal of Public Health. Vol. 81, No. 3 (March 1991). pp. 294-298.

Schultz, T.P. "A Preliminary Survey of The Economic Analysis of Fertility." American Economic Review. Vol. 63, No. 2 (1973). pp. 71-78.

Sklar, June and Beth Berkov. "Abortion, Illegitimacy, and the American Birthrate." Science. Vol. 185 (September 13, 1974), pp. 909-915.

Tietze, Christopher. "Two Years Experience with a Liberal Abortion Law: Its Impact on Fertility Trends in New York City." Family Planning Perspectives. Volume 5, 1973, pp. 36-41.

Tietze, Christopher. "The Public Health Effects of Legal Abortion in the United States." Family Planning Perspectives. Vol. 16, no. 1 (January/February 1984). pp. 26-28.

Titkow, Anna. "Poland," in Henry P. David (ed.), *From Abortion to Contraception: A Resource to Public Policies and Reproductive Behavior in Central and Eastern Europe from 1917 to the Present*. Westport, CT: Greenwood Press, 1999.

Trussell, James T., Jane Menken, Barbara L. Lindheim, and Barbara Vaugh. "The Impact of Restricting Medicaid Funding for Abortion." Family Planning Perspectives. Vol. 12, no. 3 (1980), pp. 120-130.

Willis, Robert J., "A New Economic Approach to the Economic Theory of Fertility Behavior." Journal of Political Economy. Vol. 81, No. 2, Part 2 (1973). pp. S14-S64.

DATA APPENDIX

Sources for Laws:

Childbirth by Choice Trust, *Abortion in Law, History, and Religion*. Toronto, CA: Childbirth by Choice Trust, 1995.

David, Henry P. *From Abortion to Contraception: A Resource to Public Policies and Reproductive Behavior in Central and Eastern Europe from 1917 to the Present*. Westport, CT: Greenwood Press, 1999.

Harvard Law School. *Annual Review of Population Law*. Online Database. http://cyber.law.harvard.edu/population/

Henshaw, Stanley K. "Induced Abortion: A World Review, 1990." *Family Planning Perspectives*. Vol. 22, No. 2 (March/April, 1990). pp. 76-89.

International Planned Parenthood Federation. *Abortion Legislation in Europe*. London: International Planned Parenthood Federation European Network, February 1997.

Rahman, Anika, Laura Katzive, and Stanley K. Henshaw. "A Global Review of Laws on Induced Abortion, 1985-1997." *International Family Planning Perspectives*. Vol. 24, No. 2 (June, 1998). pp. 56-64.

Sachdev, Paul (editor). *International Handbook on Abortion*. Westport, CT: Greenwood Press, 1988.

Tietze, Christopher and Stanley Henshaw. *Induced Abortion: A World Review, 1986*. New York: Alan Guttmacher Institute, 1986.

United Nations, Population Division, Department of Economic and Social Affairs. *Abortion Policies: A Global Review. Volume 1: Afghanistan to France*. New York: United Nations. 1992.

United Nations, Population Division, Department of Economic and Social Affairs. *Abortion Policies: A Global Review. Volume 2: Gabon to Norway*. New York: United Nations. 1994.

United Nations, Population Division, Department of Economic and Social Affairs. *Abortion Policies: A Global Review. Volume 3: Oman to Zimbabwe*. New York: United Nations. 1995.

United Nations, Population Division, Department of Economic and Social Affairs. *World Abortion Policies 1999*. New York: United Nations. 1999.

Sources of Data:

Alan Guttmacher Institute. output from "Custom Table Maker," www.agi-usa.org/tablemaker/

Council of Europe. *Recent Demographic Developments in Europe, 1998.* Belgium: Council of Europe Publishing, September 1998.

David, Henry P. (editor). *From Abortion to Contraception: A Resource to Public Policies and Reproductive Behavior in Central and Eastern Europe from 1917 to the Present*. Westport, CT: Greenwood Press, 1999.

Herausgegeban von der Staatlichen Zentralverwaltung für Statistik. *Statistishes Jahrbuch der Deutschen Demokratischen Republik.* Berlin: Staatsverlag der Deutschen Demokratischen Republik, various years.

Ministere de L'Economie et des Finances. *Annuaire Statistique de la France*. Republique Francaise, various years.

Statistisches Bundesamt. *Statistishes Jahrbuch für die Bundesrepublik Deutschland.* Verlag W.Kohlhammer, various years.

Český Statistický Úřad. *Statistická Ročenka České Republiky,* various years.

United Nations, Department of Economic and Social Affairs, Statistics Division. *Demographic Yearbook: Historical Supplement, 1948-1997.* CD-ROM. New York: United Nations. 2000

World Bank. *World Development Indicators, 1999*. CD-ROM. Washington, DC: World Bank Publications. 1999.

World Health Organization. *WHO Mortality Database.* Switzerland: World Health Organization.

Table 1: Brief Description of Abortion Policies in Eastern Europe and Former Soviet Republics, 1980-1997

Country	Years Legalized	Description	Coding: Legal Status of Abortion	Coding: Waiting Period/ Counseling	Coding: Large Cost Subsidy	Coding: Parental Consent
		EASTERN EUROPE				
Albania	before 1991	Legal for limited medical reasons only.	Life/Medical	NA	NA	NA
	1991-present	Legal on request in first 12 weeks of pregnancy	On Request	No	Yes	No
Bulgaria	1973-1989	Legal for medical reasons or on request in the first 10 weeks of pregnancy for certain categories of women, like those with two or more children.	Medical/ Social	Yes	Yes	No
	1990-present	Legal on request in the first 12 weeks of pregnancy.	On Request	No	Yes	No
Czech Republic	1957-1986	Legal for maternal health or social reasons in the first 12 weeks of pregnancy.	Medical/ Social	Yes	Yes	No
	1987-present	Legal in the first 12 weeks of pregnancy upon request and physician approval.	On Request	No	Yes	Yes
Germany (former GDR)	1972-1992	Legal on request in the first 12 weeks of pregnancy.	On Request	No	Yes	No
	1993-present	Legal in the first 12 weeks of pregnancy after mandatory counseling and a 3 day waiting period. Procedure is subsidized in majority of cases.	On Request	Yes	Yes	No

Hungary	1973-1992	Legal for medical reasons or on request in the first 12 weeks of pregnancy for certain categories of women, like those with three or more children.	Medical/ Social	Yes	Yes	No
	1993-present	Legal in the first 12 weeks of pregnancy after counseling and a three day waiting period.	On Request	Yes	Yes	Yes
Poland	1956-1992	Legal in the first 12 weeks of pregnancy for medical and social reasons.	Medical/ Social	Yes	Yes	Yes
	1993-present	Legal only when the pregnancy threatens the mother's life or health, in cases of rape/incest, or in cases of fetal defects.	Life/Medical	NA	NA	NA
Romania	1966-1989	Legal in very limited circumstances (mother's life, rape, very large family, etc.).	Life/Medical	NA	NA	NA
	1990-present	Legal upon request in the first 12 weeks of pregnancy.	On Request	No	Yes	No
Slovak Republic	1957-1986	Legal for maternal health or social reasons in the first 12 weeks of pregnancy.	Medical/ Social	Yes	Yes	No
	1987-present	Legal in the first 12 weeks of pregnancy upon request and physician approval.	On Request	No	Yes	Yes
		FORMER SOVIET REPUBLICS				
Belarus Estonia Latvia Lithuania Moldova Russian Federation Ukraine	1955-present	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences.	On Request	Yes	Yes	No

Table 2: Weighted Average Values of Outcome Measures, by Region

	Eastern Europe		Former Soviet Republics		Western Europe		United States	
	1980	1995	1980	1995	1980	1995	1980	1995
Reported Abortion Rate	41.7	32.4	127.4	75.9	12.9	9.6	29.3	22.9
Relative Female Death Rate, Age 15-44	0.418	0.356	0.273	0.264	0.463	0.436	0.423	0.413
Relative Female Death Rate, Age 15-19	0.421	0.427	0.336	0.354	0.392	0.390	0.376	0.382
Relative Female Death Rate, Age 20-34	0.385	0.334	0.240	0.237	0.418	0.376	0.356	0.363
Relative Female Death Rate, Age 35-44	0.436	0.354	0.283	0.266	0.522	0.498	0.532	0.451
Total Fertility Rate	2.22	1.36	1.93	1.36	1.79	1.47	1.84	2.02
Birth Rate, Women 15-44	79.5	45.4	68.9	42.1	60.7	51.2	68.4	65.5
Birth Rate, Women 15-19	43.8	31.2	50.1	47.0	20.5	12.0	53.0	56.8
Birth Rate, Women 20-34	123.3	82.2	111.6	68.6	101.4	82.0	98.3	100.3
Birth Rate, Women 35-44	14.6	10.1	11.4	6.6	16.6	21.1	12.5	21.1
"Pregnancy Rate," Women 15-44	121.2	77.8	196.7	118.0	69.7	59.1	97.7	88.4

Notes: The relative female death rate for women 15 to 44 is the ratio of female death rate to the male death rate for men and women in that age group. Reported statistics are weighted by the relevant denominator for each rate (e.g. the number of women between the ages of 15 and 44 for the total fertility rate). Countries from the former USSR include Belarus, Latvia, Lithuania, the Republic of Moldova, the Russian Federation, and the Ukraine. The "pregnancy rate" is defined to be the sum of the total number of births and abortions per 1,000 women age 15 to 44. The abortion rate and birth rate for women 15 to 44 do not sum to the pregnancy rate because of missing data on abortions.

Table 3: Effect of Legal Status of Abortion in Eastern Europe

	Abortion Rate				Relative Female Death Rate		Birth Rate		Pregnancy Rate			
	All Data		Complete Data						All Data		Complete Data	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Legal to Save the Mother's Life or for Other Specific Medical Reasons	-3.114 (0.692)	-2.596 (0.300)	---	—	0.100 (0.023)	0.028 (0.031)	0.174 (0.028)	0.093 (0.072)	-0.274 (0.118)	-0.450 (0.225)	---	---
Legal for Medical or Social Reasons	-0.624 (0.293)	-0.196 (0.190)	-0.284 (0.046)	-0.249 (0.057)	-0.038 (0.028)	-0.015 (0.020)	0.011 (0.038)	0.039 (0.035)	-0.239 (0.114)	-0.276 (0.138)	-0.106 (0.015)	-0.081 (0.022)
Log GDP per Capita	-0.463 (0.222)	-0.400 (0.176)	-0.175 (0.132)	-0.431 (0.381)	-0.120 (0.045)	-0.013 (0.100)	-0.239 (0.038)	-0.052 (0.078)	-0.234 (0.039)	0.050 (0.088)	0.082 (0.133)	-0.263 (0.143)
Inflation between 5 and 25 Percent	0.174 (0.086)	0.033 (0.048)	-0.038 (0.015)	-0.014 (0.026)	0.009 (0.016)	-0.005 (0.010)	-0.002 (0.017)	-0.021 (0.016)	0.048 (0.020)	0.026 (0.019)	-0.042 (0.026)	-0.016 (0.011)
Inflation between 25 and 100 Percent	0.160 (0.083)	0.252 (0.101)	0.078 (0.038)	0.098 (0.049)	-0.002 (0.024)	-0.009 (0.017)	0.016 (0.055)	-0.012 (0.030)	0.099 (0.060)	0.052 (0.032)	0.016 (0.036)	0.030 (0.029)
Inflation greater than 100 Percent	0.395 (0.096)	0.342 (0.080)	0.067 (0.035)	0.075 (0.074)	0.012 (0.018)	-0.008 (0.011)	0.004 (0.058)	-0.024 (0.036)	0.091 (0.057)	0.033 (0.032)	0.019 (0.034)	0.014 (0.046)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Specific Trend	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Number of Observations	223	223	115	115	215	215	231	231	213	213	109	109

Notes: The dependent variables in all models are measured in logs. All estimates are obtained from models that also include dummy variables indicating whether GDP and inflation data are missing and the percentage of women between the ages of 15 and 44 in each five year age interval, and that are weighted by the size of the relevant population. Reported standard errors are corrected for heteroskedasticity and an arbitrary covariance structure between time periods within countries.

Figure 1: Contraceptive Intensity and Abortion Decision Tree

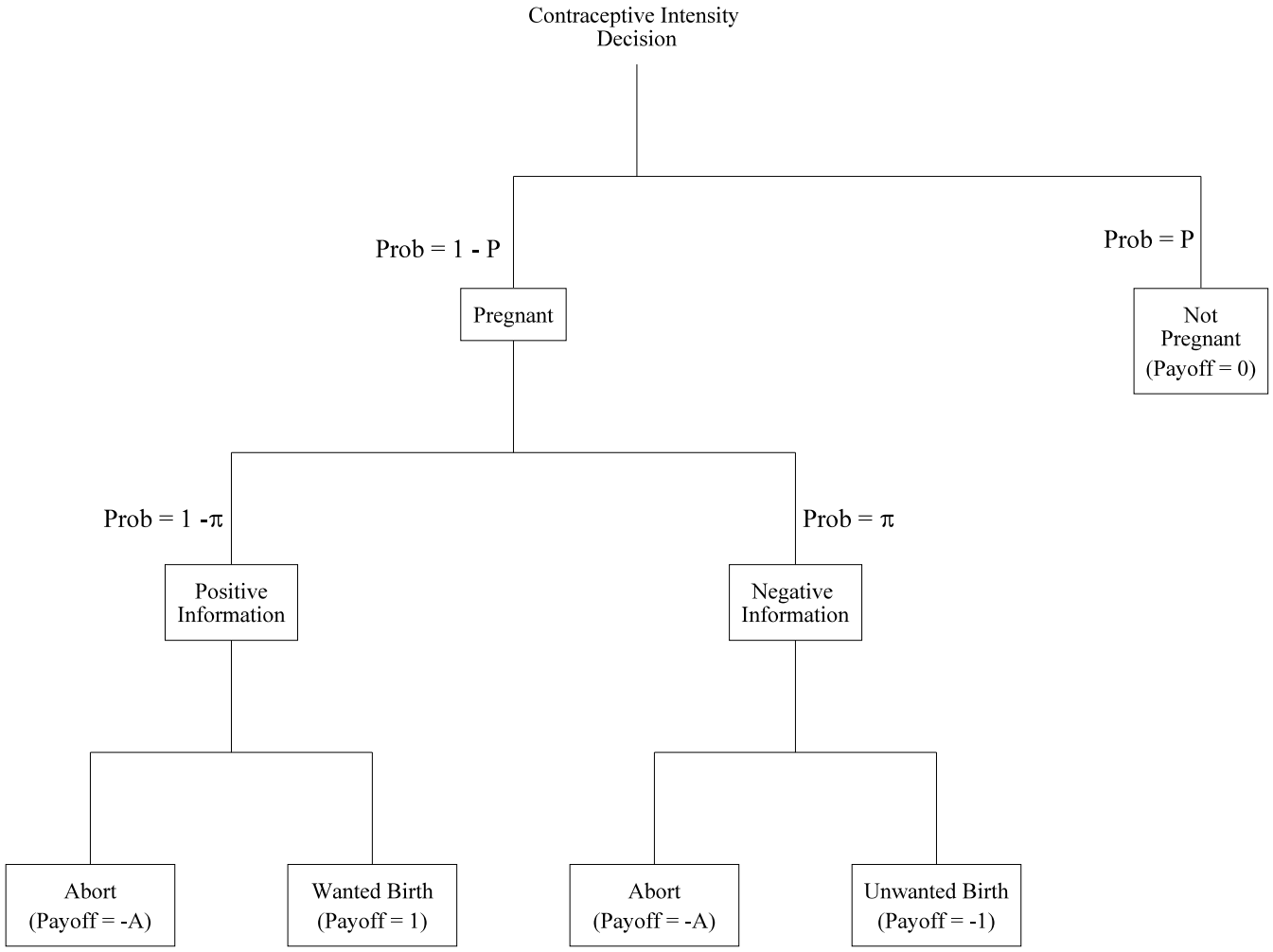

Figure 2A: Impact of Abortion Costs on the Probability of an Abortion Conditional Upon Pregnancy

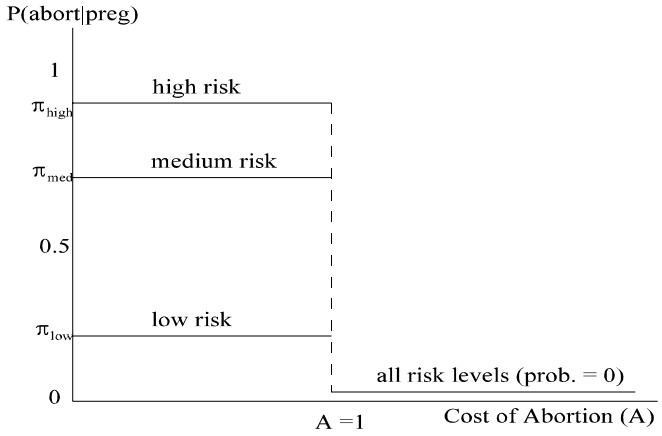

Figure 2B: Impact of Abortion Costs on the Probability of Pregnancy

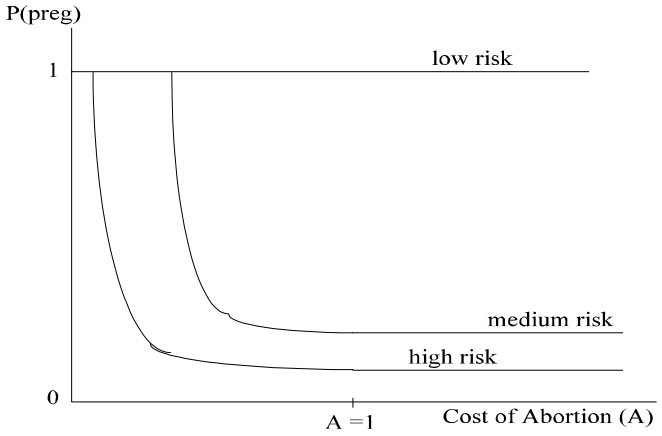

Figure 2C: Impact of Abortion Costs on the Probability of Birth

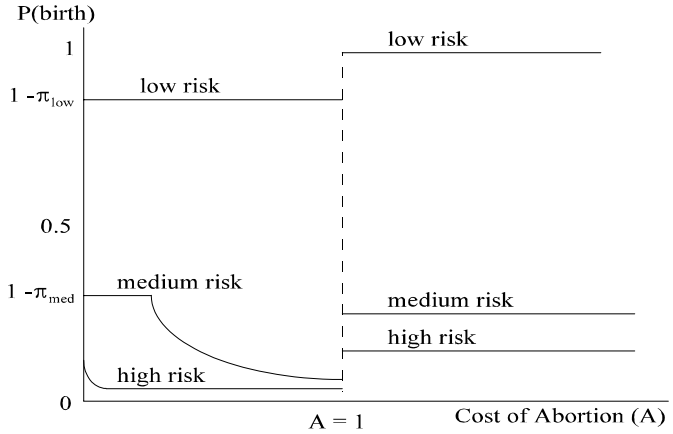

Figure 2D: Impact of Abortion Costs on the Probability of an Abortion

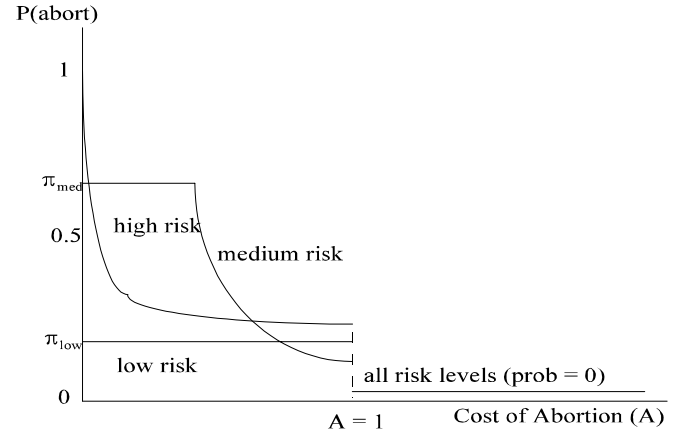

Figure 3: Total Fertility Rates in Europe