The Role of Culture in Contraception Demand

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Abstract

This paper studies the effect of culture on the demand for a new technology, the birth control pill in Sweden. Historical factors are economically significant determinants of demand for the pill. Localities with higher out-of-wedlock births or less favorable marriage market conditions for women at the turn of the century have higher demand for the pill six decades later, while localities where the age of first marriage was lower have relatively lower demand for the pill. These findings are robust to controlling for contemporaneous economic, demographic, and epidemiological factors as well as alternative historical factors such as women's level of literacy and religious composition.

1 Introduction

We examine if culture influences demand for the pill in the years just after its introduction in Sweden. Our results suggest that cultural norms regarding marriage and out-of-wedlock births influence demand for new contraceptive technologies. The effects of culture are quantitatively important. Differences in norms that result in differences in historical behavior can have a sizable impact on the adoption of a new contraceptive technology decades later.

Norms about sex and reproduction are difficult to elicit. We proxy for differences in attitudes across communities by using measures of behavior, such

as out-of-wedlock births at the turn of the century. We find that past experiences with out-of-wedlock births and the relative excess of women in the local marriage market at the turn of the century are positive and significant determinants of demand for the birth control pill, and areas where women married younger have lower demand for the pill six decades later.

The advent of the birth control pill has affected birth rates as well as the nature of women's career choices and human capital accumulation decisions. Many studies have argued that increases in women's employment and education can be attributed in large part to innovations in contraception such as the birth control pill (Katz and Goldin, 2002). Others have argued that innovations in contraception resulted in a substantial shift in the balance of power between women and men (Chiappori and Orrefice, 2008). The pill and other contraceptive innovations altered allocations between spouses (Orrefice, 2007) as well as outcomes and customs in local marriage markets especially in regard to shotgun marriages and the incidence of out-of-wedlock births (Akerlof, Yellen and Katz, 1996). Still others have analyzed how this contraceptive revolution changed the cost of sex and in turn attitudes regarding premarital sex (Greenwood and Guner, 2010). Here we reverse the question and ask how differences in beliefs regarding out-of-wedlock births, marriage and the relative power of women in the marriage market influence the take up of a new contraceptive technology.

Cultural norms regarding marriage and out-of-wedlock births may have long lived effects on many choices women make, not the least of which is their use of contraceptives. Differences in cultural attitudes and beliefs about sex instilled

by parents and others in the community may influence women's decisions to adopt the pill. The social and economic impact of the introduction of the pill may depend in part on the social institutions that are in place when the new technology is introduced. We evaluate to what extent historical experiences influence demand for the birth control pill in Sweden. We find that even after controlling for contemporaneous economic, demographic and epidemiological factors, as well as supply side controls, historical conditions such as the rate of out-of-wedlock births at the turn of the century have a significant effect on the demand for the pill six decades later.

The paper proceeds with a brief review of the literature and important institutional features of the drug market in Sweden in the next section. The empirical framework is then described followed by a presentation of the main results. The final section concludes.

2 The Literature and Institutional Setting

This paper closely complements recent papers on the role of culture in women's fertility and employment decisions such as those by Fernandez and Fogli (2006, 2009) and Greenwood and Guner (2010) among others. While Fernandez and Fogli focus on observed fertility, the demand for contraception is a closely related latent variable that determines the discrete fertility outcomes they study. Analyzing the demand for oral contraception directly allows us to quantify how culture and norms work through a specific channnel that in turn influences to-

tal fertility. The focus on the contraception mechanism as a specific channel through which culture affects fertility is unique to this paper.

This paper differs from previous work on culture and fertility with regard to the empirical strategy adopted. First, we look at demand at the local level using unique data on total sales of all oral contraceptives across 70 localities in Sweden in the years just after the pill was approved for sale in Sweden. While Fogli and Fernandez (2006 and 2009) and other papers on culture transmission such as Bisin and Verdier (2000 and 2001) emphasize the joint influence of culture as transmitted by both parents (direct) and the communities in which women reside (oblique) we estimate the composite effect of both forces as proxied for by observed behavior of previous generations of women in that locality.

The institutional setting of this paper also differ from Fernandez and Fogli, and many other studies of social norms that focus on the behavior of second generation immigrants using measures of behavior in the parents' home country to proxy for social norms. This approach faces a challenge to separate cultural and institutional influences. We avoid this challenge since our localities face the same institutional setting. Our measures of culture, however, vary across localities. Institutions are generally assumed to vary at the national level. This assumption is maintained here. If the influence of institutions is homogenous over the population we can also interpret our results as evidence of culture, though a more specific measure of culture that varies within a given country across localities.

Studies of the impact of different institutions across states in the U.S., such

as the existence of laws prohibiting the sales of birth control pills have found these institutional factors to be important determinants of pill demand (Bailey, 2010). The assumption of uniform institutions may be difficult to support in some settings, but in the context of Sweden this assumption is accurate in both the *de jure* and *de facto* sense. The laws regulating the sales of contraceptives do not differ by jurisdiction and are set by national regulatory bodies. In addition, the medical and retail pharmaceutical sectors in Sweden are highly regulated, and almost entirely operated by public entities that are subject to uniform central administration. Not only are legal institutions uniform, but so too are pharmaceutical distribution and pricing, as well as the provision of medical care and treatment information. In addition to these features of the legal and medical environment, it should also be noted that sex education has been compulsory in Sweden since 1956, and that the guidelines for the sex education curriculum are set at the national level.

We consider the earliest period for which sales data is available following the approval of oral contraceptives for sale in Sweden[1] and before the reform of the sex education curriculum that occurred in 1975. The 1970-1974 time period also preempts the Swedish Abortion Act of 1974 that allowed for women to have access to abortions without being subject to the review and approval of two physicians or a medical board.

This institutional setting offers a unique environment to analyze the impact of culture on demand for the pill. Not only were the legal, medical, and retail

[1] In May of 1964 the Svenska medicinalstyrelsen approved the use of oral contraceptives in Sweden.

pharmaceutical institutions that played a role in the supply of the pill subject to uniform rules during this time period so too was the educational system, a key supplier contraceptive information and sex education. The introduction of the pill in Sweden provides a rare setting where all of the salient institutional features are arguably constant. The supply curve for the pill in Sweden was flat, fixed, and identical in every locality due to the policy environment described above. In this unique setting the differences in sales of oral contraceptives across localities can be argued to be purely demand driven.

3 Data Description and Empirical Framework

The aim of this paper is to analyze what factors explain differences in demand for oral contraceptives in Sweden during the period 1970-1974 with particular attention to three historical factors. We argue these historical factors capture differences in culture that are relevant for women's contraception decisions. Other papers that have studied demand for the pill in the U.S. have focused on institutional differences (Bailey, 2010). We argue that the institutional setting is strikingly uniform across Swedish localities. Differences in demand may be due to current conditions or the set of inherited beliefs that influence women's contraception decisions. We proxy for these beliefs with measures of behavior from six decades earlier.

We aim to explain differences in demand for oral contraception. Our focus is on several proxies for culture such as the rate of out of wedlock births and

average age of first marriage at the turn of the century. We also account for differences in current demographic and economic characteristics, current conditions in the local marriage market, and differences in certain non pecuniary costs of obtaining the pill related to local health care provision, as well as demand shocks that one may argue are unrelated to culture such as the prevalence of venereal diseases. Table 1 presents summary statistics for the variables used in this analysis. The variables are described in the following subsections.

3.1 Demand for the Pill

The Swedish drug market is special, as is the institutional context in which the birth control pill was introduced in Sweden. In this environment we argue that differences in sales of the pill per the fecund female population are demand driven, and hence we use oral contraceptive sales to measure the demand for the pill. Since prices are fixed at the same level across all localities and supply of the pill is not rationed or limited except through required prescription we argue that the supply curve women face in each locality is identical and that differences in quantities sold across localities correspond to differences in demand for the pill.

The dependent variable throughout this analysis will be sales of oral contraceptives in SEK by locality per the fecund female population, chosen to be women between the ages of 15 and 40. We have data on all oral contraceptive sales in Sweden by locality from 1970 onward compiled from the quarterly *Swedish Drug Market* publication from Läkemedelstatistik, AB. This publication presents complete information regarding pill sales in 70 disaggregated local

markets. Prices in each of these markets are set by a central authority and do not vary across localities. Similarly, prescription drugs can only be distributed by a publicly administrated network of pharmacies whose assortment of drugs, staffing, and hours of operation are subject to central public supervision.

Previous studies have relied on retrospective surveys to determine whether and which types of contraception women had used at different points in time. These individual level surveys are useful in eliciting information on which types of birth control methods women have had experience with, but this information on the extensive margin is an incomplete picture of women's demand for the pill. We take a different approach to measuring demand for the pill by using actual sales data to construct a measure of demand for the pill that we argue is more complete. Our measure of pill demand captures both the extensive margin of pill demand, more and more women opt to try the pill, as well as the intensive margin that women continue to take the pill. Demanded quantity of the pill has not been analyzed in earlier studies.

3.2 Proxies for Culture

We are interested in evaluating to what extent culture, in this case differences in attitudes and norms about out-of-wedlock birth, marriage and women's power in the marriage market determine demand for a new contraceptive technology. We construct proxies for these cultural characteristics based on measures of women's behavior from previous generations, in this case from six decades earlier. We use measures of past behavior to proxy for differences in culture.

3.2.1 Out-of-Wedlock Births in 1910

The first culture proxy that we consider is the number of out-of-wedlock births per 100 live births in 1910. This variable reflects several features of the culture that existed in 1910. Higher rates of out-of-wedlock births may reflect that premarital sex was a more common behavior. Alternatively, it may reflect that contraception among unmarried women in a given locality was more restricted or less effective, indicating a relatively poor culture of contraception or low level of common knowledge and experience among unmarried women and their sex partners. High levels of out of wedlock births may also indicate weak norms or weak institutions for enforcing promises of commitment in the case of pregnancy (shotgun marriages). All of these interpretations would indicate that for the average woman premarital sex was more common or more costly in these localities. If the these features of local culture are persistent this may lead to sex being more common and or more costly in these localities six decades later, and in turn the demand for a new contraceptive technology may be greater.[2]

3.2.2 Average Age of First Marriage in 1910

Women's average age of first marriage in 1910 may be thought of as the converse of the out-of-wedlock birth measure. The lower is the age of first marriage the less common is premarital sex and out-of-wedlock births in the population, and the more likely promises of commitment in the case of pregnancy have

[2] An alternative interpretation would be that the more common occurance of out-of-wedlock births would indicate that the stigma associated with such outcomes was low. If out-of-wedlock births were less costly we would expect couples to demand less contraception to avoid such outcomes. In this case we may think that demand for contraception would be lower in such communities. The data will speak against this hypothesis.

been enforced, two forces that would make sex without contraception for the representative woman less costly. Social conventions that promote marriage at an early age can be seen as a way of reducing the cost of sex, namely the occurance of out of wedlock births, and in turn this may reduce demand for contraception.

3.2.3 Sex Ratio in 1910

This summary statistic characterizes the local marriage market at the turn of the century. In regions where women were relatively more abundant they may have enjoyed a less favorable bargaining position in the marriage market and in turn they would be penalized with lower transfers of resources within the household (Chiappori, Fortin and Lacroix, 2002). This sex imbalance and weaker bargaining position for women may make it easier for their partners to demand and obtain sex outside of marriage. When sex outside of marriage is more common, and out-of-wedlock births are costly, the demand for contraception would be greater. As premarital sex becomes more common community norms may reinforce this behavior leading to increased demand for contraception by the average woman in the community many decades later.

The sex ratio for 1910 is computed from historical data from Statistisk Central Byran (SCB) for the population aged 15-64 in 1910. The particular choice of time period is relevant here. By 1910 the mass emmigration of the late 1800s had largely ended. This emmigration had profound effects on local populations and marriage markets.

3.3 Other Historical Factors

Other historical factors may also contribute the evolution of local norms about contraception and in turn influence women's demand for the pill. In particular, differences in religious beliefs may influence demand for the pill. The vast majority of Swedes are members of the Church of Sweden (Svenska Kyrkan), but there are several other Protestant denominations that have been prevalent to differing degrees in Swedish localities. In 1930 the largest religious minority in Sweden was the Swedish Mission Church, which claimed 2.4 percent of the population as members.[3] The next largest religious minorities were the Baptists and Pentecostals with 1.3 and 0.7 percent of the population respectively. We account for the influence that these three largest religious minorities may have had on local norms by including a measure of the share of the local population that was a member of each faith in 1930. This corresponds roughly to the religious beliefs to which parents of the 1970 fecal females were exposed.

Norms regarding women's education may influence women's demand for the pill. Goldin and Katz (2002) have argued that the pill allowed women who wanted to pursue advanced education the opportunity to do so at lower personal cost and with greater expected return. If demand for advanced education was a primary determinant of demand for the pill then we should also account for historical factors that may influence women's decisions regarding education attainment. We do this in two ways. First, we account for local differences in women's literacy in these same communities in 1930, roughly speaking the

[3] Though it should be noted that some members of dissenting religions were also members of the Swedish Church.

literacy environment in which the mothers of the fecund females of the 1970s grew up. Literacy is a prerequisite to advanced study.[4] Second, to get at local norms regarding women's advanced educational attainment, we also use the share of women who have a high school degree in 1930 as an alternative proxy for local norms about female human capital investment, that may in turn drive demand for the pill.

3.4 Contemporaneous Controls

As argued before with respect to the historical factors the local sex ratio is a proxy for the relative power of women in the local marriage market. Women who reside in localities where they are in excess may have less power in the marriage market and in turn they may be less likely to marry, more likely to engage in premarital sex, and less likely to be able to enforce promises of commitment in the case of pregnancy. This makes sex without contraception a more costly undertaking and hence increases demand for the pill. In addition to the local sex ratio for the population aged 15 to 40 we also include controls for population density for this same group. Where the population density is low finding and meeting a prospective romantic partner may be costly, lessening the likelihood of sex and in turn the demand for contraception. We include linear and quadratic terms to allow for non-linear effects. Other community characteristics we account for include the share of individuals who are are foreign born, as well as the average age of females between 15 and 40. We also control

[4] The literacy (småskolan) education corresponds to less than an elementary education.

for factors that determine the budget set of the average household and hence demand for children. Average labor income for the 16-64 population in each locality/year cell is computed from the LINDA data set from SCB. Supply side controls regarding the number of pharmacies and pharmacists in each locality are also included.

Demand shocks for other forms of contraception such as condoms may have an adverse effect on the demand for oral contraceptives. One type of demand shock that we can measure is the relative frequency of venereal disease among the 15-40 year old population. The more common venereal disease the greater the demand for condoms, and in turn the lower the demand for alternative forms of contraception like the pill. Data on venereal diseases comes from the publication "Allmän Hälso- och Sjukvård" published by Socialstyrelsen.

4 Results

The results reported here are estimated by pooled OLS regression and share a common linear specification where $Pill_{jt}$ represents demand for the pill per fecund female in locality j at time t and covariates X_{jt} represent the contemporaneous factors that affect demand for the pill and that vary over locality and time. $Cult_j$ represents the culture measure for locality j

$$Pill_{jt} = X_{jt}\beta + Cult_j\alpha + \gamma_t + \varepsilon_{jt}.$$

Culture may evolve slowly, but within the five years we consider we assume that the cultural beliefs women were exposed during their upbringing by their families and communities are fixed. Culture as a fixed characteristic is consistent with previous studies such as Guiso, Sapienza, and Zingales (2006). We consider specifications with time fixed effects to capture aggregate trends in demand for the pill, but omitting these fixed effects has little impact on the estimated coefficient on culture. Similarly, estimating the model for each year instead of by pooled OLS yields similar estimates with regard to the influences of culture. Standard errors are clustered by county since this is the level at which we observe culture proxies. In the sections that follow we consider the impact of each of the culture measures on demand for the pill.

4.1 Out-of-Wedlock Births in 1910 and Pill Demand

Localities with higher rates of out-of-wedlock births in 1910 have higher demand for the pill six decades later. Table 2 presents results for several models that include alternative sets of contemporaneous controls. The first column presents results for the case where only the historical rate of out-of-wedlock births and the year fixed effects are included. The coefficient on the out-of-wedlock birth rate is 0.40 and significant at the 0.1 percent level. The second column includes marriage market controls such as the current sex ratio, as well as economic and demographic factors. When these contemporaneous controls are included the estimated coefficient on out-of-wedlock births increases to 0.84, remaining highly significant.

The third column includes the number of pharmacies, normalized by the geographic area of the locality. Demand for the pill may be lower in areas where pharmacies are more dispersed. This measure of pharmacy density has the expected positive sign. In areas where there are more pharmacies in close proximity demand for the pill is greater. The coefficient estimate on the culture variable remains highly significant.

The final specification includes a measure of the percent of the population that has a venereal disease[5](VD) per the population aged 15-40 to capture the prevalence of VD in the locality. Increase in the prevalence of VD has a significant negative effect on demand for the pill as would be expected as individuals shift into other forms of contraception, such as the condom.[6] The effect of culture is positive and highly significant in this specification. We argue that this is consistent with the view that cultural attitudes regarding sex before marriage and out-of-wedlock births have a significant effect on women's demand for a new contraceptive technology.

The point estimate in the last specification suggest that a one standard deviation increase in the rate of out-of-wedlock births in a locality at the turn of the century would result in an increase of a one half standard deviation in demand for the pill six decades later. The mechanism through which this effect is transmitted is the common cultural attitudes toward sex and contraception to which women are exposed. Although our proxies for culture are not prices, but instead represent cultural norms that influence women's choices with regard to

[5] A venereal disease case includes the diagnosis of one or more of the following: congenital or acquired syphilis, gonorrhea, or cancroid.

[6] The results are similar if we use the number of VD cases lagged one year.

sex, it is still informative to compute elasticities of pill demand. The elasticity of pill demand to the out-of-wedlock birth rate at the turn of the century is approximately 0.22. A one percent increase in the rate of out-of-wedlock births and the difference in culture associated with this would translates into a 0.22 percent higher demand for the pill six decades later.

4.1.1 Alternative Historical Factors

Here we consider religion and education norms, two factors that have been argued to influence demand for the pill. Out-of-wedlock births in 1910 remain an important factor in explaining demand for the pill in Sweden. The importance of culture is robust to accounting for alternative historical factors such as the prevalence of dissenting religious denominations and women's historical education attainment patterns.

Religion The overwhelming majority of Swedes are members of the Church of Sweden (Svenska Kyrkan), but there are several other Protestant denominations that have been prevalent that we take into account. Column 1 of Table 3 presents the results of the baseline model, where we control for the full set of contemporaneous factors. In column 2 we introduce an additional control for the share of the local population that is a member of a Pentecostal Church in 1930. The coefficient estimate on the Pentecostal share is negative and significant at the one percent level suggesting that the more prevalent the Pentecostal church was in a locality the lower the demand for the pill among women in this locality four decades later. Accounting for historical differences in the religious make-

up of a community has little effect on the coefficient on out-of-wedlock births in 1910. The Pentecostal population was the only religious group among the three largest dissenting denominations that had a significant marginal effect, though all three had a negligible impact on the coefficient on out-of-wedlock births.[7] Accounting for the Pentecostals also makes the estimated impact of out-of-wedlock births more precise.

Women's Education Differences in norms regarding women's education may also play a role in pill demand. We evaluate to what extent accounting for differences in women's historical education behavior affects our results in the last two columns of Table 3. We consider two alternative measures, women's literacy rate and women's high school attainment rate, both measured in 1930. These measures reflect the education environment of the mothers of the fecund females in our study. The women whose literacy and high school attainment we measure are no longer fecund and do not drive demand for the pill directly in these localities, but the cultural and institutional features that shaped their educational decisions may continue to influence future generations of women, and in turn drive demand for the pill decades later.

Local literacy rates have a positive and significant effect on demand for the pill four decades later, as seen in the third column of Table 3. Accounting for the literacy channel reduces the magnitude of the coefficient on out-of-wedlock births in 1910, but the sign and significance of the coefficient are unchanged.

[7] Alternative specifications that take into account the share of the local population that are members of significantly smaller denominations, such as the Catholic Church, do not change our conclusions regarding the importance of local norms as proxied for by out-of-wedlock birth behavior in 1910.

Column four presents results for a specification where we control for norms regarding women's education attaiment using the share of women with a high school education. The coefficient is not significant, and the culture coefficient is relatively stable. Although education norms and institutions may be a significant factor in determining women's demand for the pill, accounting for these factors does not change our conclusions about the importance of local cultures regarding sex and marriage as a determinant of women's demand for the pill.

4.1.2 Alternative Measures of Out-of-Wedlock Birth Norms

Our results regarding the importance of out-of-wedlock birth norms are robust to alternative measures. The point estimate on out-of-wedlock births for the same specification described in column four of Table 2 including the full set of contemporaneous controls for alternative out-of-wedlock birth measures results in similar elasticity estimates with regard to pill demand. Using the average rate of out-of-wedlock births from 1900-1909 results in a positive and significant estimate of the marginal effect of these historical factors and a elasticity estimate of 0.24. Alternatively, using the average rate of out-of-wedlock births from 1936-1940 in the same specification that includes all contemporaneous controls results in a positive and significant point estimate on the historical out-of-wedlock birth rate and an implied elasticity of 0.21. All three measures have positive and significant coefficients and imply pill demand elasticities that range from 0.21 to 0.24 when evaluated at the mean. This suggests that our results are robust to alternative measures and are not particular to the time period we have chosen.

4.2 Age of First Marriage in 1910 and Pill Demand

Social conventions regarding marriage may have served to minimize the occurrence of out-of-wedlock births. Here we consider to what extent these differences in customs influenced demand for the pill six decades later. Strong local institutions that enforced informal promises of marriage may operate as a substitute for contraceptives, mitigating the cost of unplanned pregnancies as argued by Akerlof, Yellen, and Katz (1996). If local conventions regarding marriage persist over time this may result in lower demand for new contraceptive technologies later. Our results are consistent with this conjecture and suggest that norms which reduce the age of first marriage reduce demand for the pill as well.

Local conventions that enforced promises of marriage in the case of pregnancy, or established a norm of early marriage to minimize the incidence of costly out-of-wedlock childbirth will lead to lower average ages of first marriage, ceteris paribus. These local cultures may persist over time mitigating the costly consequences and prevalence of premarital sex and in turn reducing demand for contraceptives. The results reported in Table 4 support this conjecture.

In the first column of Table 4 we estimate a model that includes a piece-wise linear function in the average age of first marriage in 1910 to capture the impact of local marriage conventions on demand for the pill. The only other controls included in column one are year fixed effects and a constant.[8] The coefficient estimates show a positive marginal effect of an increase in the age of first marriage

[8] The pill demand residuals from a regression on a constant and year fixed effects displayed nonlinearity when plotted against the age of first marriage variable. The piecewise nonlinear function fits better, and is easier to interpret, than a polynomial specification. The other cultural factors do not exhibit the same nonlinear relationships.

on demand for the pill in the third of the communities where women married youngest. In the second column of Table 4 we include all of the contemporaneous economic, demographic, and epidemiological controls discussed in Table 2. The coefficient estimate on age of first marriage for the youngest age group declines, while the middle, and oldest marriage age groups remain insignificant. The relatively large, positive and significant coefficient on the youngest group persists, implying an elasticity of 9.6, evaluated at the group mean. This is a large effect and suggests that social settings can have a sizable impact on demand for a new contraceptive technology. This effect is concentrated among the communities with the lowest average age of first marriage as the coefficients on the other two intervals are not significantly different from zero.

4.3 The Sex Ratio in 1910 and Pill Demand

Local marriage market conditions can have long lasting influence on women's decisions, in particular contraception demand. The last two columns of Table 4 presents results for a model where the sex ratio in 1910 is used to proxy for culture. In column three we report results for a specification where year fixed effects are included in addition to the culture measure. The coefficient on the culture proxy is positive and highly significant, indicating that the more women relative to men in a locality the greater is demand per woman for the pill decades later. A one standard deviation increase in the sex ratio results in a third of a standard deviation increase in demand for the pill. The final column of Table 4 introduces the full set of contemporaneous controls and the coefficient is stable

and still significant at the five percent level. The elasticity of pill demand to the historical marriage market measure is 1.6. Marriage market conditions can have long lasting effects on behaviors.[9]

5 Conclusions

When the pill was introduced in Sweden the supply curve consumers faced was flat, fixed, and identical in every locality due to the policy environment described above. In this unique setting differences in sales of oral contraceptives can be argued to be purely demand driven. We argue that demand for the birth control pill reflects women's preferences regarding sex, marriage and fertility. Our results show that culture, in particular community beliefs regarding out-of-wedlock sex, family formation and women's power in the marriage market are significant determinants of women's demand for the pill.

We have considered three measures of local sex and marriage cultures and found general support for the significance of these cultural factors on demand for the pill in Sweden. These results are robust to controlling for a host of contemporaneous factors such as access to pharmacies and demand shocks such as the prevalence of venereal disease in a locality. The results are also robust to accounting for alternative historical factors such as the prevalence of certain religious groups or education attainment behavior, as well as alternative measurement of the culture proxies in question. While we cannot rule out that

[9] The inclusion of additional historical factors such as the share of the local population that are members of the Pentecostal church and the rate of high school educational attainment by women in the locality in 1930 have little effect on the historical sex rate coefficient.

omitted variables may drive the historical out-of-wedlock birth, marriage age and sex ratio behavior as well as pill demand six decades later this analysis paints a consitent picture of the importance of culture in determining demand for this new contraceptive technology.

Recent papers, such as Bailey (2010), which have studied demand for the birth contol pill have focused on the institutional setting, in particular how laws restricting the sale of oral contraceptives affected demand for the pill. This paper complements these studies, focusing attention on culture, a complementary factor that shapes demand for contraception and in turn fertility. We have shown that contraception decisions are influenced by historical factors that we argue reflect differences in local cultures that have long-lasting influence. While Fogli and Fernandez (2006) have argued that culture is an important determinant of women's fertility and career decisions we have quantified a specific mechanism through which culture influences fertility, the take up of a new contraceptive technology. Culture matters for contraception decisions. This is a compelling example of how nonmarket interactions can influence economic outcomes.

Our analysis points to the importance of accounting for cultural factors when analyzing questions related to contraception. While we have restricted our attention to norms regarding fertility and family formation, the results above show that other historical factors such as religion, women's literacy, and education experiences may also play a role. The introduction of the birth control pill in Sweden and the detailed data on demand for the pill allow for many possible

extensions to understand the impact of the introduction of this new contraceptive technology on women's fertility, education and career decisions. In future work we hope to more fully develop how differences in pill use generate feedback effects that can amplify shocks and explain differential patterns in individual women's career, employment, and family formation decisions.

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[20] Statistics Central Byran (1910) "Befolkning Statistisk Arsbok 1910."

[21] Statistiska Central Byran (1945) "Statistisk Arsbok 1945."

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Table 1: Summary Statistics

	Mean	Std. Dev.	Min	Max
Pill Demand	9.61	1.70	3.64	14.86
1900-1910 Historical Factors				
Out-of-Wedlock Births 1910	3.17	1.12	1.53	6.62
Average Out-of-Wedlock Births 1900-1909	2.93	1.00	1.58	6.17
Sex Ratio 1910	103	3.57	96	114
Age of First Marriage 1910	25.8	0.67	24.6	27.3
1930-1940 Historical Factors				
Out-of-Wedlock Births 1936-1940	12.5	3.7	7.4	22.6
Women's Literacy 1930	98.6	1.15	94.9	99.6
Women's HS Attainment 1930	0.35	0.23	0.16	1.35
Mission Church Share 1930	2.49	1.51	0.51	4.97
Baptist Church Share 1930	1.39	0.90	0.25	3.66
Pentecostal Church Share 1930	0.76	0.38	0.17	2.02
1970-1974 Contemporaneous Factors				
Mean Labor Income	189	31.1	126	304
Pop Density	5.25	11.8	0.13	83.4
Female Mean Age	26.1	0.85	24.5	28.4
Sex Ratio	93.2	2.80	88	101
Foreign Population	4.00	2.14	0.7	9.9
Pharmacy Density	3.16	3.66	0.19	19.9
Venereal Disease	0.05	0.09	0.01	0.92

Note: Variables are county level measures. Pill demand is per woman aged 15-40 in current SEK. Out-of-wedlock birth measures are per 100 live births. The historical sex ratio of women to men is for the population aged 15-64. Women's literacy refers to the share of women over 15 in a locality who attended, at minimum, a småskolan intended to teach literacy. High School attainment is the share of women over 15 with a high school degree in a locality in 1930. Religion variables report the share of the local population classified as members of the given faith in 1930 multiplied by 1000. This measure is not exclusive, as many are also members of the Swedish Church. Mean income is in 1000s of SEK for those aged 15-64. Population density variables are per square km for those aged 15-40 and density squared is divided by 100. Current sex ratio is the ratio of women to men aged 15-40. Pharmacy density is per 1000 square kilometers. Venereal disease is in percent of the population aged 15-40.

Table 2: Out-of-Wedlock Births in 1910 and Pill Demand

Unwed Birth 1910	0.40***	0.84**	0.70**	0.69**
	(0.10)	(0.27)	(0.23)	(0.23)
Mean Labor Income		-0.03	-0.05**	-0.05**
		(0.02)	(0.02)	(0.02)
Population Density		0.10	0.06	0.03
		(0.06)	(0.05)	(0.05)
Pop Density Squared		-0.13	-0.11	-0.11
		(0.07)	(0.06)	(0.06)
Women's Average Age		-0.30	0.03	0.10
		(0.21)	(0.18)	(0.18)
Foreign Share		0.05	0.05	0.03
		(0.15)	(0.12)	(0.11)
Sex Ratio		0.26**	0.28**	0.26**
		(0.08)	(0.08)	(0.08)
Pharmacy Density			0.24***	0.33***
			(0.06)	(0.07)
Venereal Disease Cases				-5.16*
				(2.12)
Constant	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.22	0.53	0.57	0.57
Clusters	24	24	24	24
N	350	350	350	350

Note: Pill demand per woman 15-40 is the dependent variable. Standard errors clustered on county reported in brackets. Unwed births per 100 live births in 1910. Mean income in 1000s SEK for those aged 15-64. Population density variables are per square km for those aged 15-40 and population density squared is divided by 100. Sex ratio is the ratio of women to men aged 15-40. Pharmacy density is per 1000 square kilometers. Venereal disease is per population aged 15-40.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 3: The Role of Alternative Historical Factors on Out-of-Wedlock Birth Norms and Pill Demand

Unwed Birth 1910	0.69**	0.68***	0.54**	0.59**
	(0.23)	(0.16)	(0.15)	(0.16)
		Historical Controls		
Pentecostal Share 1930		-0.16**	-0.18***	-0.14**
		(0.05)	(0.04)	(0.05)
Women's Literacy 1930			0.04*	
			(0.02)	
Women's HS Attainment 1930				0.26
				(0.17)
r2	0.57	0.63	0.66	0.64
Clusters	24	24	24	24
N	350	350	350	350

Note: Pill demand per woman 15-40 is the dependent variable. Standard errors clustered on county reported in brackets. All specifications include the full set of contemporaneous controls as in Table 2 in addition to year fixed effects. Pentecostal Share refers to the share of the local population that is a member of a Pentecostal Church. Women's literacy is the share of women aged 15 or greater that are literate and women's HS attainment refers to the share with a HS education. * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 4: Age of First Marriage and Sex Ratio in 1910 and Pill Demand

Age of First Marr. 1910 (Youngest)	5.09*	3.70**		
	(2.16)	(1.22)		
Age of First Marr. 1910 (Middle)	-1.68	-1.49		
	(1.35)	(0.85)		
Age of First Marr. 1910 (Oldest)	0.31	-1.26		
	(1.46)	(0.69)		
Sex Ratio 1910			0.16***	0.15*
			(0.04)	(0.06)
Constant	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Contemporaneous Controls	No	Yes	No	Yes
R-Squared	0.28	0.58	0.28	0.54
Clusters	24	24	24	24
N	350	350	350	350

Note: Pill demand per woman 15-40 is the dependent variable.
Standard errors clustered on county reported in brackets.
Age of first marriage is the average for women married in 1910.
Sex ratio is the number of women to men over aged 15 times 100.
Mean labor income in 1000s SEK for the population 15-64.
Sex ratio is the number of women to men aged 15-40 times 100.
Pharmacy density is per 1000 square kilometers.
VD Cases are per the population aged 15-40.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$