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FERTILITY IN SOUTH DUBLIN A CENTURY AGO: A FIRST LOOK

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Fertility in South Dublin a Century Ago: A First Look

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ABSTRACT

Ireland's relatively late and feeble fertility transition remains poorly-understood. The leading explanations stress the role of Catholicism and a conservative social ethos. This paper reports the first results from a project that uses new samples from the 1911 census of Ireland to study fertility in Dublin and Belfast. Our larger project aims to use the extensive literature on the fertility transition elsewhere in Europe to refine and test leading hypotheses in their Irish context. The present paper uses a sample from the Dublin suburb of Pembroke to take a first look at the questions, data, and methods. This sample is much larger than those used in previous studies of Irish fertility, and is the first from an urban area. We find considerable support for the role of religion, networks, and other factors stressed in the literature on the fertility transition, but the data also show a role for the social-class effects downplayed in recent discussions.

Keywords: Ireland, Fertility, Demography

JEL classifications: J1, N3

Ireland's sluggish participation in the European fertility transition is well-known. In the late 1950s Irish marital fertility had fallen only to where Italian, Dutch, Portuguese, and Greek fertility had been in the 1920s, and German and English in the 1910s. Yet there is evidence of a decline, though limited, in Irish fertility before the Great War. The decline was uneven both in terms of geography and religion. The demand for family limitation in the early twentieth century seems to have been disproportionately an upper- and middle-class one (Coale and Treadway, 1985; David and Sanderson, 1988; Ó Gráda, 1985; 1991; Ó Gráda and Duffy, 1995a, 1995b; Guinnane, 1997).[1] But the analysis of this fertility decline and closely-related issues such as infant mortality has not gone far.

This paper is a study of the determinants of marital fertility in urban Ireland a century or so ago. Our focus is on Pembroke, a single suburb, and our aim is to get a first look at Dublin's fertility as part of a larger study of Ireland's fertility transition. We organize our discussion and investigation around the four main explanations of the fertility transition current in the literature today: religion, class, migration, and networks. Religion has long bulked large in the analysis of Irish fertility. Roman Catholicism, the religion of the majority of the Irish population, tends to be associated with later and more modest fertility transitions in most European studies. In Ireland class and religion were correlated, but by no means perfectly, so the influence of class on the fertility transition deserves separate treatment. An examination of Irish fertility in the early twentieth century must also consider the impact of the tremendous population movements of the period. The fertility of migrants may differ from that of both their sending populations and the

[1] On the fertility transition outside Ireland see e.g. Anderson, 1998; Brown and Guinnane, 2002; Garrett *et al*., 2001; Gillis, Tilly, and Levine, 1992; Szreter, 1997; van Poppel, 1985.

populations into which they assimilate. Finally, in line with a more recent line of research, we consider how social networks, captured by the characteristics of the neighborhoods in which couples lived, influenced fertility choices.

Part 1 of this paper describes its setting in Pembroke before the Great War. Part 2 describes the data and some of its possible limitations. Part 3 presents some cross-tabulations and Part 4 some econometric results. Part 5 concludes.

1. *THE SETTING*

In the early eighteenth century Roman Catholics were in the minority in Dublin. Their share rose thereafter, from about half in the mid-eighteenth century to about four-fifths a century later. In 1911 83.1 per cent of those living within the official city were Catholics. This takes no account, however, of suburban areas which remained separate from the city for mainly fiscal reasons. In the Greater Dublin area that included the suburban townships of Pembroke and Rathmines and Rathgar, the Catholic share was somewhat less (78.2 per cent). Members of the Episcopalian Church of Ireland accounted for a further 16.7 per cent of the population of this greater metropolitan area, Presbyterians 1.9 per cent, Methodists 1.2 per cent, and others (mainly other non-conformists) 2.1 per cent (Dickson, 1989; British Parliamentary Papers, 1912-3: 6049-I, vii, 6049-II, vii). The focus of this study is the suburb of Pembroke. Pembroke township, located immediately to the south and south-east of the city, was created by an act of Parliament in 1863 (26 and 27 Victoria Cap 72). Its creation was one aspect of what Prunty describes as 'the withdrawal of the old Protestant ascendancy into virtual self-government', thereby denying the old city of 'the contribution, both financially and morally, which it could be expected the wealthiest would make' (Cullen, 1992; Prunty, 1998: 14-5). Supporters of a separate Pembroke township referred to savings in the provision of lighting, water, sewage, and so on for the several villages in 'a large populous and improving district', though in fact the township district was not large (1,600 acres). The population of Pembroke rose from 20,982 in 1871 to 24,269 in 1891 and 29,294 in 1911 (Vaughan and Fitzpatrick, 1978: 29).

Although controlled by a property-owning elite, the township was quite heterogeneous both economically and confessionally. Pembroke contained leafy streets such as Ailesbury Road and Shrewsbury Road, now and then among the most exclusive in Dublin, and the opulent Sandymount district. The township also included some working-class neighbourhoods, particularly in and around Ringsend, that were characterized by overcrowding and poverty. The wealthier streets contained high proportions of Protestant households and household heads born outside Dublin. In the poorer streets, households were almost exclusively Catholic and household heads were much more likely to be Dublin-born. Households in the poorer areas were also more likely to live in tenements or to be lodgers (see Bowen, 1942; Cullen, 1992).

A century ago Dublin was notorious for its poor housing (Daly, 1984; O'Brien, 1982; Aalen, 1992; Prunty, 1998). In this respect Pembroke fared much better than the city proper, although it did contain many tenement dwellings and one-room apartments. Pembroke's housing quality in 1911 was closer to its rival township of Rathmines than to Dublin proper (Appendix Table A1). Pembroke's occupational distribution was also closer to Rathmines than to the old city (Appendix Table A2). Socially and economically our township was more mixed and more industrial than Rathmines. Nearly one third of its labour force were unskilled workers, including several dockers, fishermen, and seamen. The main industrial plant in Pembroke, the Irish Glass Bottle Company, employed over three hundred men at the time.

2. THE SAMPLE

The manuscript enumeration forms of the Irish population census of 1911 provide our database. The Irish census forms for this year are open to the public, in contrast to their British counterparts. The 1911 census provides details on age, religion, place of birth, and literacy for all members of enumerated households. The census also includes socioeconomic information such as occupation, proxies for housing quality, street address, and the number of live-in servants and boarders. The 1911 census asked a set of questions that make it uniquely valuable for the study of fertility. Each currently-married woman was asked how long she had been married, how many children had been born to the marriage, and how many of those children survived. From this information we can construct estimates of age at marriage, fertility, and infant and child mortality. The database used in this papers consists of every married couple in which the wife was less than 50 years old living in Pembroke township in 1911. This amounts to 2688 couples in all.

The decennial census in Ireland was the responsibility of the Registrar General. Ireland's police force acted as the enumerators. The police were accustomed to this kind of duty, as they were also responsible for collecting agricultural statistics. Their diligence and that of the Registrar General's office ensured a reliable end-product that was delivered at speed. Throughout the United Kingdom the census of 1911 was held on the night of 2/3 April 1911. In Ireland a preliminary report was forwarded to the government on 18 May 1911.

Irish censuses are in general deemed to be reliable and accurate. But the 1911 census is well known to be problematic in one respect. A glance at its age distributions reveals an implausibly large increase in the numbers of men and women in their sixties and seventies. Comparing cohort survival rates between 1901 and 1911 with those for earlier decades in the published census highlights the extent of the problem for Ireland as a whole (Table 1). Note the modest increases in the survival rates up to 1901 and the massive jump thereafter.

The Registrar General sought to explain this away as a reflection of 'the numerous cases of extreme longevity recorded in the public press from time to time' (Thompson, 1913: 55). But this is wishful thinking; in reality the increase in apparent survival rates was a by-product of the Old Age Pensions Act of 1908 (Guinnane, 1993; Ó Gráda, 2002). That Act had already given rise to considerable welfare fraud based on age mis-reporting in Ireland.[2] In the absence of civil registration before 1864 – and incomplete coverage thereafter – hard evidence of age, particularly in more remote and poorer regions was not always available. Claimants suspected that census declarations of age might be used in processing pension claims, and this suspicion affected the 1911 census. Budd and Guinnane found that the extent of deliberate mis-reporting was positively correlated with rurality and low income. It was also a function of age; the young and the extremely elderly had little incentive to cheat, but those in their fifties and sixties believed that they did.

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[2] Mis-reporting must be distinguished from age-heaping, which is a feature of census enumerations in all backward societies. The 1911 Irish census was less subject to age-heaping than its predecessor, perhaps because the pension legislation made some people more conscious of their true age. On this see Budd and Guinnane, 1992.

The upshot is that careless use of the 1911 data can result in misleading estimates of age at marriage, marital fertility, and life expectation. But severe age-misreporting was mainly confined to rural areas, where true age was more difficult to determine. For urban areas age-misreporting was less of a problem. Pension claimants were fewer and other evidence on age more likely to be forthcoming. But Table 1 shows that Dublin and Belfast were not immune to age-misreporting on a more modest scale. Table 1 also shows that women were more likely to exaggerate their ages than were men, a pattern that carries over from rural areas.

Confining our database to women aged less than fifty years in 1911 reduces the age-misreporting problem, but does not eliminate it, as matched samples from the 1901 and 1911 censuses attest. In Budd and Guinnane's sample from four rural areas of Ireland, women reported in the 41-45 year age-bracket had exaggerated their age by 1.45 years on average; in Ó Gráda's sample of rural Ulsterwomen, women in this age bracket had exaggerated their ages by 2.5 years (Budd and Guinnane, 1992; Ó Gráda, 1985). Such mis-reporting would tend to bias estimates of age-specific fertility based on the 1911 data upwards; a woman who claims to be 45 in 1911, but who is really 41, will have her births attributed to earlier stages of her life. The extent of the problem in Pembroke may be gauged by comparing people's declared ages in 1901 and 1911. A matched 1901-11 sample of the ages of over three hundred men and three hundred women in our database produced an average age increase of 10.20 years for males over the decade and 9.96 years for females. The data revealed little sign of systematic differences by religion, class, or age: in all cross-tabulations the average distortion was merely a few months in either direction. Labourers and labourers' wives 'lost' a month or six weeks over the decade, Catholics were marginally less prone to add on age than members of the Church of Ireland, and so on. These comparisons suggest that age-misreporting was not a problem in the urban areas which are the focus of this study (Budd and Guinnane, 1992; Ó Gráda, 2001). In sum, age-misreporting is unlikely to bias the outcome of the exercise that follows.

The high quality of the data on births and on infant and child deaths in these censuses is now generally taken for granted (Haines, 1985: 888; Watterson, 1988: 292). One concern with retrospective data such as these are that couples may forget to report the birth of a child early in the marriage, especially if the couple has been married a long time and the child has died. Such omissions imply that the census data under-estimate both fertility and mortality. Table 2 below reproduces summary data on infant and child mortality for Ireland as a whole, for Dublin, for all Irish cities and, for a comparative perspective, for England and Wales. The Irish mortality rates are slightly lower than those for England and Wales, but this is consistent with other suggestions that mortality in rural Ireland was quite low. Reported child mortality also increased with the duration of marriage even at the longest duration categories, indicating that couples were not more likely to omit children the longer they were married. Also, the mortality rates for Dublin and other Irish cities are unusually high, more evidence that large number of births were not forgotten on census night. In common with previous users of similar sources we feel justified in proceeding on the basis that under- enumeration does not seriously affect the Irish 1911 census.

Another problem is the likelihood of some selection bias from omitting households from a particular cohort absent through migration or death. If, for example, having a large family lowered the life expectation of women then our dataset will underestimate the true fertility of the population. Data on the impact of family size on maternal mortality are lacking, but this effect and the resultant bias are presumably small. Differential migration poses a related problem. Suppose couples who wanted a small family were more likely to migrate from a rural area to an urban area. Under that assumption our estimates will reflect both fertility and migration behavior. For the purposes of this paper we will ignore this type of problem and view our estimates as a reduced form or fine-grained descriptive device. In later efforts we will attempt to estimate models of the joint processes of fertility and these other factors.

For the rest the census information used in this study – that on the birthplaces of the couple, ages of co-resident children, number of children born and still alive, duration of marriage, husband's occupation[3], the presence of servants and or boarders, literacy, knowledge of the Irish language, religion, housing conditions both in terms of size and type (tenement, lodgings, private house), street address and district – are reported fully in the census, very occasionally after correction by the enumerating constable.

3. RELIGION, CLASS, MIGRATION, AND NEIGHBORHOOD:

We consider the effects on marital fertility of four factors: religion, class, migration and networks. Most current discussions of the fertility transition in Europe stress one or more of these factors in explaining both the timing of onset and the pace of fertility decline in a particular population. Religion plays a central role in many discussions and is the starting point for most discussions of Irish fertility. Ireland has been a largely Catholic country since the Dark Ages. The barrier of religion meant that post-reformation settlers from England and Scotland were less likely to integrate with the indigenous population than earlier groups of immigrants or invaders. In the

[3] Since married women in Pembroke rarely reported an occupation in 1911, this category has been omitted here. Such an omission would not be warranted for places like Belfast, where many married women continued to participate in the labor force.

eighteenth century the marital fertility of the Society of Friends was higher in Ireland than in Britain, but ‘the Irish Quakers... would appear to be a population as sharply distinguished from the rest of Irish society as they could have been without living in a separate territory with a self-sufficient economy’ (Vann and Eversley, 1992: 51). In her memoir of middle-class Dublin in the 1910s novelist Elizabeth Bowen described Catholics as ‘simply ‘the others’, whose world lay alongside ours but never touched’ (Bowen, 1942: 44). Religious (and class) divides meant there was little intermarriage. In the Pembroke data, less than three percent of marriages involved a Catholic and a non-Catholic.

Previous research on other confessionally mixed populations in Europe finds that Catholics were relatively reluctant participants in the fertility transition. The decline in their fertility came later and was more modest than that of their Protestant (or Jewish) countrymen. In Pembroke, Catholic couples had more children ever born than non-Catholic couples at all marital durations (Table 3; compare Table A4). Childlessness was also less common among Catholics.

The differences between the fertility of Catholics and non-Catholics in the Pembroke sample may not all be due to differences in religious beliefs or mores. The socio-economic gap between Catholics and non-Catholics in this Dublin suburb was very wide. Catholic couples are 63 per cent of all couples in our database. But these couples account for 95 per cent of all couples living in tenements. Catholic households contained a median of 1.7 people per room, compared to a non-Catholic median of 0.87. Catholic men accounted for 89 per cent of the labourers, 78 per cent of semi-skilled workers, 63 per cent of those in skilled occupations, 43 per cent of the clerks, and 32 per cent of those in professional occupations.

These social-class implications of confession in Ireland suggest that it is very important not to confuse the impact of religion with that of class. Social-class differentials in fertility are another important theme in the historiography of the European fertility transition. But the literature has not come to any consensus. In his analysis of the evidence on the marital fertility in the 1911 census of England and Wales superintendent of statistics T.H.C. Stevenson asserted 'the universality of the decline for all classes and all ages at marriage' (cited in Soloway, 1990: 10). Historical demographer Robert Woods supports Stevenson, noting that in Victorian England all socio-economic groups shared in the reduction. Others, however, have argued for a top-down, diffusionist view of England's fertility decline, which implies a widening of inter-class differentials while the decline was taking place. Michael Haines, for example, argues that 'knowledge of social class or occupational group alone can go a long way to explaining differential fertility and differential rates of fertility decline' (Haines, 1992; Woods, 1987). In Table 4 the occupational categories are a modification of those devised by Stevenson. Class I represents the elite, class II white collar workers, class III skilled workers, and classes IV and V semi- and unskilled workers, respectively. In Pembroke in 1911 the gap between the elite and those at the bottom was large even for couples married 25-29 years suggesting long-standing class differentials in fertility decisions.

Migration and differential fertility by migration status is another important theme in many studies. Migration can affect fertility in several ways. The act of migration itself may interrupt labor-market and other activities, forcing young people to delay marriage and family. More intriguing is the possibility, noted above, that migrants may differ from either their sending population or the population into which they move in ways that are correlated with their family-size desires. Irish cities had large numbers of migrants at the turn of the twentieth century. In Pembroke township as a whole 38.3 per cent of the population aged twenty years and over were born outside Dublin. Another 10.6 per cent had been born outside Ireland, mainly in Great Britain (see Table A3). Over two-fifths of the men and women in our database had been born outside Dublin. Cross-tabulations by place of birth (Table 5) indicate that at each duration Irish-born parents were less likely to be childless and had larger families. This raises the interesting possibility that the Irish fertility transition, such as it was, was in part the product of immigration. But was place of birth merely a proxy for religion or class? We return to this issue in Part 4.

The final factor we consider is the role of networks in fertility choices. This line of inquiry is an extension of Susan Watkins' stress on communication networks or 'who talks to whom' (Watkins and Danzi, 1995; Rutenberg and Watkins, 1997). A fundamental question that lies at the heart of the literature on fertility transitions is how ideas and mores spread through the population. Watkins has stressed that the fertility transition may reflect the spread of a new set of ideas (new, at least, to the relevant population) about technology of contraception or the desirability of smaller families. To the extent this is true, the mechanisms by which such ideas are transmitted are crucial. In this preliminary analysis, we consider how a couple's fertility decision was influenced by the proportion of non-Catholics on their street. There was tremendous *de facto* religious segregation in Pembroke in 1911. Most Catholics lived on streets which were disproportionately Catholic. Catholic couples lived on streets where an average of only 23 percent of residents were not Catholics. Non-Catholics lived on streets where an average of 55 percent of residents were not Catholics. If attitudes towards fertility control were shaped by interactions with one's neighbors, we may expect couples living on 'non-Catholic' streets to have lower fertility than those living on ‘Catholic’ streets. Testing for this type of effect is a tricky business, but we report a rough estimate in part 4 below.

4. A MULTIVARIATE MODEL

These several hypotheses require a multivariate model to perform an adequate *ceteris paribus* test. For example, we noted that Catholics were on average poorer than Protestants. If we really want to know the pure effect of Catholicism, we need to use some econometric structure that will “hold constant” the effect of social class while estimating the effect of religion. Our database is rich, but using it requires contending with some econometric traps. The number of children ever born to a couple – the information on fertility provided in the census data – is a non-negative integer or ‘count’ variable. Ordinary least-squares (OLS) models do not respect the character of such data; OLS models are heteroskedastic and often yield nonsensical predictions such as -1.45 children ever born. Another problem stems from the likely endogeneity of infant mortality. The first problem has straightforward solutions; the second, unfortunately, does not.

4.1. Count data

The most commonly-used alternative to OLS for count models is to assume a parametric (conditional) distribution for the counts and estimate the model by maximum likelihood (ML). We employ a version of that strategy here. For each observation in the count representation the contribution to the likelihood function is P(CEB=k,|X) where CEB is the number of children born, k is an integer, X is the vector of covariates. These models are consistent with duration analysis, which is more widespread in the demography literature. Corresponding to any distribution of counts is a distribution describing the waiting-times between births. The total count of births after N years is just a different way of representing the same information as would be contained in the hazard rate for a birth in each interval since her marriage. The key difference is a loss of information: the hazard rate might have been higher or lower in the first interval than in the second. The count models assume, implicitly, that the hazard rate was the same (for a given duration) across all intervals. Count models are in fact the closest analogue to hazards or event-history models possible given the census data.

The most commonly-used parametric distribution for count-data models is the Poisson distribution. The probability that CEB takes on a given value k is given under the Poisson distribution by:

$$P(CEB = k) = \frac{m^{k} e^{-m}}{k!}$$

where F is the Poisson parameter to estimate. In most studies the covariates are introduced and the parameter ensured positive by the functional form

$$\ln F = Xß$$

The likelihood function is maximized with respect to the ßs.

The Poisson distribution, however, has the unfortunate feature that its (conditional) mean is equal to its (conditional) variance:

$$E(CEB) = Var(CEB) = m$$

This assumption amounts to a strong restriction on the data. In the hazard representation it amounts to assuming that hazard rates do not depend on duration; in the count representation, it amounts to a condition rarely satisfied. The number of children ever-born in Pembroke, like most other data on family size, suffer from *overdispersion*: the variance is nearly 9 while the mean is about 3.4.

Researchers have taken several approaches to contending with overdispersion. One is to use an alternative distribution that allows for more flexibility. The negative binomial distribution is popular in part because the Poisson model is nested within it. For the negative binomial distribution, the relationship between the mean and variance is a function of a parameter that itself is estimated:

$$E(CEB) = \mu$$

$$Var(CEB) = (1 + a)\mu$$

When a is equal to zero, the negative binomial simply collapses to the Poisson distribution. Testing whether a equals zero is, therefore, a straightforward test of the assumption that the data are distributed according to the Poisson distribution.

Another approach to dealing with overdispersion is to deal with mass points in the sample distribution. Overdispersion in most fertility data is due to excess zeros. In the Pembroke sample, if we ignore couples with zero children the mean number of children born is about 4.2 and the variance is 7.7. These figures still violate the assumptions of the Poisson model, but the violation is less severe. The econometrics literature has developed two, parallel approaches to contending with excess zeros: the hurdle model and the splitting model. The two models view the source of the overdispersion differently. The hurdle model assumes that the excess zeros arise because there is some fixed cost associated with the activity that is counted. The splitting regime model assumes that the data are drawn from two different regimes. In one regime the outcome is always zero and cannot be otherwise. In the other regime it may or may not be zero.

We believe that in the context of fertility decisions, the splitting model is more appropriate. Due to biological reasons, some couples will not be able to have children and will therefore be in the 'always-zero' regime.[4] We cannot identify on an individual basis which couples are in which regime, but with some structure we can estimate the probability that a couple is in the always-zero regime, and thus the probability that a couple is not in the always-zero regime. Once we have the probability that a couple is not in the always-zero regime we can estimate the probability that they have k children following a distribution such as the negative binomial. In our model we assume that there is a process that determines whether a couple must always have zero children, and another process that determines, for those who are not in the always-zero regime, how many children. For the remainder of our discussion we will refer to the two regimes as the 'always zero' regime and the 'kernel' regime.

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[4] There may also be fixed costs to childbearing (Guinnane 1997, in fact, stressed these as an explanation for Ireland's late fertility transition). Fixed costs to childbearing would imply a relatively small number of women at all of the low parities. We find, in contrast, large numbers of women with no children, but very few at the other lower parities.

It is important to note that even in the kernel regime, some couples will have zero children. There are two types of childless couples in this model: those that cannot have children due to biological reasons and those who choose not to have children. Identification of the two types of childless couples arises from functional form assumptions, choice of covariates, or both. It is important to recall (both as econometrician and as reader) that these models are sensitive to many specification decisions. We cannot claim, in particular, to know whether any couple was in the always-zero regime, we can only estimate this probability as a function of observable characteristics. In the empirical work below, we use two variables to identify couples in the always-zero regime: an indicator for whether the wife was older than 30 at marriage and the number of years by which the husband's age exceeds the wife's.

The great benefit of this approach is that it allows us greater flexibility; it is implausible that any simple distribution would fit the observed empirical distribution with all the zeros included, but by making this zero-inflation modification we are in a position to fit more precisely a distribution that has fewer zeros. By combining the splitting-regime approach with a negative binomial distribution we are applying two distinct solutions for the excess-dispersion problem noted in connection with the Poisson distribution. Our splitting model focuses on the excess-zeros problem, while the negative binomial allows for excess dispersion above and beyond the excess zeros. In our discussion below we report ways of testing for the importance of each.

The log-likelihood function for the zero-inflated model is built up as follows. Let B be the probability that a couple is in the always zero regime. This is the part of the model estimated by a binary dependent variable model such as the probit. Couples who have one or more children contribute (1-B)*P(K=k) for k>=1. In words, this is the probability that they are not in the always zero regime times the probability of having k children if they are in the kernel regime. Couples who have zero children contribute [(1-B)*P(K=0)] + [B]. In words, the first part of this expression is the probability of not being sterile times the probability of having zero children from the kernel distribution. The second part, B, is just the chance that the couple is sterile. We build the likelihood in the usual way by combining observations, and can check that this is a proper likelihood by noting that the conditional probabilities sum to one for each individual.[5]

4.2. Endogeneity

The second consideration we face is endogeneity of regressors. It is likely that several of our regressors are endogenous, but the one of most concern is the measure of child mortality. Child mortality is expected to influence fertility decisions in a variety of ways. Perhaps most important is the so-called 'replacement effect'. If couples have a desired family size, we would expect them to 'replace' a deceased child with another birth. Testing for the replacement effect, therefore, is a test of fertility control. Variations in this effect would also be evidence of differences in contraceptive intensity. For example if Catholics had a weaker replacement effect than Protestants, this is evidence, independent of implied family sizes, of less fertility control among Catholics.

Estimating the replacement effect, however, requires dealing with the likely endogeneity of child mortality. There are several economic as well as biological connections between mortality and fertility at the household level that imply that infant and child mortality were likely

[5] Our estimates were performed using Stata's ZINB model. In future work we will experiment with less heavily-parametric forms of the splitting model.

endogenous to fertility outcomes. Cross-tabulating the percentage surviving by number born and socioeconomic class in the Pembroke sample highlights the disadvantage of the unskilled labourer, but the difference between skilled/semiskilled and clerical/professional households was rather small. Similarly, Catholic mortality was higher than non-Catholic at each parity (Table 6). Infant and child mortality in Pembroke was highly concentrated in a small minority of households. Twenty-five percent of couples married 15 years or longer had experience no child deaths, and 50 percent had seen 12.5 percent of their children die. Ten percent of households, though, had lost half or more of their children. Most deaths were in households with lots of children; the median couple married 15 years or longer and who had had 5 or more children had seen 20 percent of them die.

The usual solution to an endogenous variable is an instrumental-variables approach. With the appropriate instruments one can purge the regressor of the component that is endogenous and in effect replace the actual variable with a variable that is only the exogenous component of the original regressor. Here that strategy faces two problems. First, we have not yet located adequate instruments. Finding suitable instruments is always difficult in fertility studies because most variables that affect mortality can also plausibly affect fertility. We are focusing our search on environmental variables that would affect that chances of infant and child death but bear no relationship to fertility. Here, we use information on whether a family lived in a tenement and in which part of Pembroke it lived in 1911. Neither of these instruments is ideal. Neither is obviously exogenous; couples decide, within their economic constraints, on where to live. The main virtue of these instruments for a first look is that they are correlated with mortality. The causal link is exposure to disease. The second problem is econometric. There is an implied constraint between our dependent variable (CEB) and the endogenous variable (the number of children who have died). Any instrumental-variable type approach runs the risk of implying predicted values for the right-hand side variable that violate the constraint; we could, for example, have observations where the first-stage regression implies the couple had eight surviving children, although they only had six births. There are several approaches to dealing with that problem at work in the econometrics literature, but for now we just report a very simple and clearly inadequate specification that relies on a tobit model of the proportion of all children who have died. We estimate the tobit as the first stage, then use the predicted value of the dependent variable (taking into account the censoring at zero) as the regressor in the count-data model. This two-step procedure implies that the standard errors in the count model are not correct, but we have not yet corrected them.

4.3. Results

Tables 7 and 8 report two simple models. The first uses the actual proportion of children who have died as a regressor (*perdead*), while the second uses the predicted value (ystar) from a linear probability model of the proportion of children who have died. In each case we report both the main replacement effect (*perdead*, *ystar*) and this effect interacted with a dummy for not Catholic (*o_perd*, *o_ystar*). The excluded variables in the first stage of the model reported in Table 8 are whether the family lives in a tenement and four dummies for different neighborhoods in Pembroke.

The other regressors include wife's and husband's ages at marriage (*wamar* and *hamar*), social class dummies (*i*, the highest, is omitted, so *ii* - *v* are relative to professionals), house points

(*points*, a measure of real estate wealth), religion dummies for the couple (*catholic* is omitted, so *cofi* is both husband and wife Anglican, *presb* is both presbyterian, *mixed* is catholic plus another, and *othernon* refers to other non-catholics -- mainly other non-conformists). *dur* is duration of marriage as of 1911. This variable is entered as a third-order polynomial with the squared and the cubed terms scaled down by 100. The last regressors pertain to birth places. The omitted couple has a husband and wife born in Dublin. We then control for husband or wife born elsewhere in Ireland (*hirl*, *wirl*) and for husband or wife born outside Ireland (*hfor*, *wfor*). The final variables here (*ethos, c_ethos*) are the proportion of people on the street who are not Catholic, and that variable interacted with a dummy for Catholic. All these variables are in the kernel regime, which is modeled as a negative binomial distribution. The probit equation that predicts whether a couple is in the always zero regime is modeled simply, with indicators for whether the wife was older than 30 at marriage (*wam30*,) and a continuous variable which is the number of years by which the husband's age exceeds the wife's (*agedif*).

The results in both tables indicate that the simple Poisson model does not fit the data, although not in the way we had expected. The results for *a* show that the Poisson *is* appropriate as the kernel distribution. We estimate the model as a negative binominal, but the *a* of zero reported here implies that the negative binomial has collapsed to the nested Poisson. But a Wald test shows that we need the regime splitting model.[6] That is, we can reject the hypothesis that all the zeros are part of the kernel (Poisson) distribution.

[6] This is a test of the null hypothesis that the parameters of the 'always zero' branch are jointly zero.

The models are nonlinear, so the coefficients reported in Tables 7 and 8 do not have straightforward interpretations. We report evaluations below that convey a better sense of the magnitudes of the estimates. Comparing Tables 7 and 8 shows that the rough effort to deal with the endogeneity of child mortality leads to a vastly different estimates of the replacement effect. If we do not instrument for mortality, we have a modest replacement effect (.338) and no significant difference in the replacement rates of Catholics and others (*o_perd*=.06). The instrumental-variable estimates in Table 8 suggest something very different: the replacement effect for Catholics is somewhat smaller (.226) but for non-Catholics the effect is much larger (.226 + 1.07). These estimates, if our rough approach is to be believed, imply that Catholics made much less effort to control their family size.

For the rest of this discussion we focus on Table 8. The rest of the results present some interesting insights into the influences on Irish fertility 1911. We find strong evidence of the effect of religion. In addition to the differential replacement rates already noted, all of the religion variables are negative in sign and some are statistically significant. These effects imply that Catholics had larger families even when their child mortality experience was identical to others. There was also a clear, strong social-class gradient in fertility decisions. The families of professionals (class i) were smaller than the families of men in classes ii-v. Other representations of the occupational data might make this even more precise. Housing quality, here represented by *points*, is precisely estimated but has a small magnitude. But it, too points to class differences in fertility. We also find birthplace effects. Interestingly, only the husband's place of birth seems to have mattered; the husband being born outside Dublin — whether elsewhere in Ireland or outside of Ireland — depressed family size.

The *ethos* effects here are strong and interesting, although the econometrics need additional work on this score as well. *Ethos* is the proportion of couples on a street who were not Catholic. *C_ethos* is *ethos* interacted with a dummy for Catholic. Taken at face value, the effects imply that individuals who lived on a predominantly Protestant street had smaller families. The Catholic interaction term shows that the effect was smaller for Catholics, but not quite zero. That is, Catholics who lived on Protestant streets also had smaller families, but the reduction in family size was smaller for Catholics than for Protestants. A simple interpretation of this would be that one's neighbors influenced family size, but more if they were of the same religion. However, the outcome may also reflect a degree of selection bias: Catholics who opted to live in more Protestant neighborhoods may have been more likely to be controllers. Again, not too much can be made of this result until we sort out other possibilities, but it is interesting nonetheless.

Non-linear models of this sort are difficult to evaluate from the regression coefficients alone. One approach is to compute and plot measures for hypothetical (but realistic) couples, based on the estimates. This we do in Charts 1-5. Chart 1 shows the probability distribution of the number of children ever-born for a laborer and a professional who are otherwise identical. The probability of having zero births in this chart is the sum of the probability of being in the "always-zero" branch and the probability of having zero births conditional on not being in the "always-zero" branch. Chart 1 shows that professionals were more likely to have small families. The probability of having four or more children was only 41 per cent for the professional compared to 51 per cent for the laborer. We do not report standard errors for these measures at this point, although standard errors can be calculated. Some of the differences we discuss in Charts 1-5 may be statistically significant, but some are surely not.

Charts 2-5 report a measure that is more common in the demographic literature, the implied age-specific (marital) fertility rate. These rates represent the proportion of women in a given age group predicted to have a birth in a one-year period.[7] Chart 2 once again illustrates class differences in fertility. At every age, the wives of professionals had lower fertility rates than the wives of laborers. Chart 3 shows the impact of the husband's birthplace. Couples in which the husband was born outside Dublin (but in Ireland) had lower age-specific fertility rates even after controlling for the age at marriage, religion, and class. The effects of husband's place of birth were, in fact, larger than the effects of class, as can be seen by comparing Chart 2 to Chart 3.

Charts 4 and 5 attempt to explore the complicated impact of religion in our models, where religion has both a "direct" effect and an "interaction" effect through the mortality variable (the replacement effect). In Chart 4 we show the direct effect of religion by assuming the couple has not lost any children to mortality. Catholics had larger families, although the difference is not as large as might have been expected. This is a consistent theme of this paper. Chart 5 repeats the exercise by assuming that both couples have lost 20 percent of their children. Here the Protestant couples have slightly more births. The direct effect is that shown in Chart 4, but the stronger replacement effect works in the opposite direction. Chart 5 shows the impact of the stronger Protestant replacement effect: Protestants were more likely to "replace" a child who has died,

[7] These rates were constructed by calculating the change in the predicted number of children ever born between successive ages (i.e., 25 and 26, 26 and 27, etc.) and then averaging over five-year age groups.

because they were exercising more control over their finally family size.[8] This more subtle role of religion is a warning to ourselves as we pursue this research.

5. CONCLUSION

Ireland was a late and slow participant in the European fertility transition. Why this is the case is not well-understood; despite considerable discussion, our understanding of Irish marital fertility at the turn of the twentieth century rests on a weak empirical base. This paper is a first report on a long-term project intended to remedy that deficiency. Using the 1911 census for the Dublin suburb of Pembroke, we have investigated, at a preliminary level, the impacts of religion, class, migration, and neighbors in the Irish fertility transition. Our most consistent finding is that religious differences were considerable but are not the entire story. Only future research will show whether these results generalize to other urban Irish populations.

[8] The mortality rate (20 percent) assumed in Chart 5 is high; the in the sample only about 25 percent of couples married 15 years or more have lost this many of their children. (The means are .19 for Catholics and .14 for Protestants). The effect illustrated in Chart 5, where a stronger replacement effect dominates the direct effect, thus applies to only part of the sample.

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TABLE 1: COHORT SURVIVAL RATIOS (AGES 65-74 TO 55-64)

	Ireland		*Dublin City*		*Belfast*	
Period	Male	Female	Male	Female	Male	Female
1871/1881	0.518	0.489	0.407	0.428	0.483	0.516
1881/1891	0.538	0.513	0.431	0.45	0.549	0.545
1891/1901	0.591	0.553	0.524	0.538	0.587	0.62
1901/1911	0.851	0.935	0.634	0.787	0.694	0.832

TABLE 2: MARRIAGE DURATION AND CHILD MORTALITY
(% of children dead in 1911)

Duration	Ireland	Co. Boroughs	Dublin	E&W
<1	6.9	6.2	6.3	7.2
1	6.1	7.9	7.9	7.8
2	7.9	9.9	9.7	9
3	8.4	11.4	11.3	10.1
4	9.3	13.1	12.2	11
5 to 9	11.2	16.2	16.5	13.8
10 to 14	14	20.3	20.8	17.3
15 to 19	16	22.8	23.9	19.5
20 to 24	17.9	26.5	27.3	21.4
25 to 29	19.6	28.9	29.4	22.7

Source: derived from 1911 Census, Table 165 and 1911 Census of England and Wales.

TABLE 3: CROSS-TABULATIONS BY RELIGION AND MARRIAGE DURATION

Catholic

Duration	N	Childless	%	Children ever born
0-2	221	116	52.5	0.55
3-5	258	38	14.7	1.82
6-10	404	52	12.9	3
11-14	279	32	11.5	4.22
15-19	294	24	8.2	5.48
20-29	297	26	8.7	6.63
Total	1754	288	16.4	3.78

Other Religions

Duration	N	Childless	%	Children ever born
0-2	122	74	60.7	0.43
3-5	127	29	22.8	1.39
6-10	205	40	19.5	2.17
11-14	160	22	13.7	2.99
15-19	153	12	7.8	3.84
20-29	164	16	9.8	5.15
Total	931	193	20.7	2.78

TABLE 4. AVERAGE NUMBER OF CHILDREN BORN BY SOCIAL CLASS IN PEMBROKE: CONTROLLING FOR DURATION OF MARRIAGE

DURATION OF MARRIAGE (YEARS)

Class	36989	37138	37177	15-19	20-24	25-29
I	0.74	1.62	2.96	3.03	3.67	3.76
II	0.69	2	2.95	4.14	5.26	6.28
III	1.03	2.57	4.45	4.64	6.17	7.63
IV	0.93	2.8	4.28	5.56	6.39	9.47
V	1.01	2.9	4.23	5.83	6.13	7.64
Religion						
Catholic	1.01	2.74	4.22	5.48	6.04	7.63
Ch of Ireland	0.75	1.92	2.85	3.95	4.76	5.71

Source: 1911 Pembroke database

TABLE 5: CROSS-TABULATIONS BY PLACE OF BIRTH AND MARITAL DURATION:

Irish-born parents

Duration	*N*	*Childless*	*%*	*Children ever born*
0-2	*260*	*142*	*54.6*	*0.52*
3-5	*297*	*42*	*14.1*	*1.79*
6-10	*483*	*67*	*13.9*	*2.84*
11-14	*342*	*36*	*10.5*	*4.16*
15-19	*368*	*29*	*7.9*	*5.11*
20-24	*360*	*32*	*8.9*	*6.24*
Total	*2111*	*348*	*16.5*	

One or both foreign-born

Duration	*N*	*Childless*	*%*	*Children ever born*
0-2	*83*	*48*	*57.8*	*0.49*
3-5	*88*	*25*	*28.4*	*1.31*
6-10	*126*	*25*	*19.8*	*2.26*
11-14	*97*	*18*	*18.6*	*3*
15-19	*79*	*7*	*8.9*	*4.01*
20-24	*103*	*10*	*9.7*	*5.62*
Total	*576*	*133*	*23.1*	

TABLE 6: PERCENTAGES OF CHILDREN STILL ALIVE IN 1911 (ALL DURATIONS)

Children born	Unskilled	Semi-skilled, skilled	Clerical-Professional	Catholic	Other religion
1	90.7	93.7	93.4	91.9	94.1
2	91	87.4	94.4	90.8	92.5
3	86.8	89.2	88.7	87.9	89.1
4	83.7	84.9	90.3	85.3	88.5
5	81.9	80.4	86.1	81.8	84.2
6	84.1	84.3	82.5	83	85.4
7	74.8	80.6	85.1	78.1	80.6
8	78.6	79.6	81.7	79.6	80.5
9	70.5	76	89.6	76.1	80.3
10+	65.7	71.3	81.9	69.2	76.7

TABLE 7: ZERO-INFLATED NEGATIVE BINOMIAL MODEL OF CHILDREN EVER-BORN, PEMBROKE, 1911

Zero-inflated negative binomial regression — Number of obs = 2433; Nonzero obs = 2106; Zero obs = 327

Inflation model = probit — LR chi2(22) = 1557.82

Log likelihood = -4886.656 — Prob > chi2 = 0.0000

ceb	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ceb						
perdead	.3381426	.057973	5.833	0.000	.2245176	.4517676
o_perd	.0606225	.1110035	0.546	0.585	-.1569404	.2781853
hamar	-.0054443	.0023231	-2.344	0.019	-.0099975	-.000891
wamar	-.0196377	.0033926	-5.788	0.000	-.026287	-.0129884
dur	.228772	.0177296	12.903	0.000	.1940226	.2635213
dur2	-.9475956	.118329	-8.008	0.000	-1.179516	-.7156751
dur3	.013983	.0023644	5.914	0.000	.0093488	.0186172
ii	.1257916	.043563	2.888	0.004	.0404098	.2111735
iii	.2617006	.0471708	5.548	0.000	.1692475	.3541537
iv	.2492219	.0474642	5.251	0.000	.1561937	.3422501
v	.2275619	.0474523	4.796	0.000	.1345572	.3205667
points	.0075911	.0033775	2.248	0.025	.0009714	.0142108
cofi	.008461	.0593215	0.143	0.887	-.107807	.1247289
presb	.0516132	.0824481	0.626	0.531	-.1099822	.2132086
mixed	.0764293	.0846568	0.903	0.367	-.089495	.2423535
othernon	-.0018691	.0756661	-0.025	0.980	-.1501719	.1464337
hfor	-.0812512	.0402673	-2.018	0.044	-.1601736	-.0023288
wfor	-.0059279	.042801	-0.138	0.890	-.0898163	.0779605
hirl	-.0603722	.0271151	-2.227	0.026	-.1135169	-.0072275
wirl	.0195412	.0264918	0.738	0.461	-.0323818	.0714642
ethos	-.4708034	.0930352	-5.060	0.000	-.653149	-.2884578
c_ethos	.3473984	.1067649	3.254	0.001	.138143	.5566539
_cons	.259687	.1241386	2.092	0.036	.0163798	.5029942
inflate						
wam30	.9593597	.1223827	7.839	0.000	.719494	1.199225
agedif	.0390353	.0075869	5.145	0.000	.0241652	.0539055
_cons	-1.77085	.0719155	-24.624	0.000	-1.911802	-1.629898
/lnalpha	-14.59475	178.9194	-0.082	0.935	-365.2703	336.0808
alpha	4.59e-07	.0000821			2.3e-159	9.1e+145

Wald test of inflate=0: chi2(3) = 73.66 Prob > chi2 = 0.0000

Note: Infant and child mortality modeled as actual proportion dead. Sample Restricted to couples married 2 years or more.

TABLE 8: ZERO-INFLATED NEGATIVE BINOMIAL MODEL OF CHILDREN EVER-BORN, PEMBROKE, 1911

Zero-inflated negative binomial regression	Number of obs	=	2402
	Nonzero obs	=	2083
	Zero obs	=	319
Inflation model = probit	LR chi2(22)	=	1494.12
Log likelihood = -4855.606	Prob > chi2	=	0.0000

ceb	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ceb						
ystar	.2263647	.5383845	0.420	0.674	-.8288495	1.281579
o_ystar	1.067343	.4156213	2.568	0.010	.2527404	1.881946
hamar	-.0043295	.0025055	-1.728	0.084	-.0092401	.0005812
wamar	-.0185102	.0035286	-5.246	0.000	-.025426	-.0115944
dur	.2287144	.0197352	11.589	0.000	.1900341	.2673948
dur2	-.9598175	.1202751	-7.980	0.000	-1.195552	-.7240826
dur3	.0143288	.0023865	6.004	0.000	.0096513	.0190063
ii	.1131499	.0453548	2.495	0.013	.0242561	.2020438
iii	.2249835	.0614145	3.663	0.000	.1046134	.3453536
iv	.2138717	.0659906	3.241	0.001	.0845325	.3432109
v	.1965269	.0650455	3.021	0.003	.0690401	.3240137
points	.0066352	.0034148	1.943	0.052	-.0000577	.013328
cofi	-.1805489	.0963664	-1.874	0.061	-.3694237	.0083258
presb	-.1339576	.115395	-1.161	0.246	-.3601276	.0922125
mixed	-.1549021	.1266135	-1.223	0.221	-.40306	.0932559
othernon	-.1759762	.1034592	-1.701	0.089	-.3787525	.0268001
hfor	-.0666994	.040475	-1.648	0.099	-.146029	.0126302
wfor	-.0156411	.0438968	-0.356	0.722	-.1016772	.070395
hirl	-.0597569	.0288878	-2.069	0.039	-.1163759	-.0031379
wirl	.0127027	.0304405	0.417	0.676	-.0469596	.0723651
ethos	-.362707	.1104012	-3.285	0.001	-.5790895	-.1463246
c_ethos	.2150657	.1258994	1.708	0.088	-.0316927	.461824
_cons	.2879457	.1267386	2.272	0.023	.0395426	.5363489
inflate						
wam30	.9161918	.1224562	7.482	0.000	.676182	1.156202
agedif	.0385326	.0073973	5.209	0.000	.0240341	.053031
_cons	-1.739206	.0687088	-25.313	0.000	-1.873872	-1.604539
/lnalpha	-13.49571	151.3036	-0.089	0.929	-310.0454	283.054
alpha	1.38e-06	.0002083			2.2e-135	8.5e+122

Wald test of inflate=0: chi2(3) = 70.03 Prob > chi2 = 0.0000

Note: Infant and child mortality modeled as predicted proportion dead. Sample Restricted to couples married 2 years or more.

APPENDIX

MAIN OCCUPATIONS IN OCCUPATIONAL CATEGORIES I-V:

I army officer, brewer, property owner, valuer, engineer, lawyer, director, accountant, rector, scientist, medical practitioner, broker, merchant, senior civil servant

II clerk, cashier, bookkeeper, official, dealer, civil servant, commercial traveller, draper, grocer, journalist, policeman, train inspector

III foreman, smith, building contractor, boilermaker, bootmaker, butcher, bricklayer, carpenter, compositor, electrician, dairy proprietor, master craftsman, plumber, tailor, watchmaker

IV baker, bottleblower, engine driver, fitter, hairdresser, machinist, motor chauffeur, motorman, painter, postman, railway signalman, shipwright, stevedore, tram conductor.

V carter, coachman, fireman, fisherman, gardener, labourer, porter, sailor, seaman, van driver, waiter, watchman

TABLE A2: OCCUPATIONAL BREAKDOWNS, 1911

Occupational Category	Dublin City	%	Pembroke	%	Rathmines & Rathgar	%
I Government	13950	14.8	1789 (*)	22.7	3596	34.2
II Domestic	2636	2.8	308	3.9	293	2.8
III Commercial	20910	22.2	1955	24.8	2891	27.5
IV Agricultural	2152	2.3	265	3.4	137	1.3
V Industrial	54597	57.9	3564	45.2	3596	34.2
Total	94227	100	7881	100	10513	100

(*) includes 220 soldiers

TABLE A3: PLACES OF BIRTH OF PEMBROKE RESIDENTS, 1911

	Aged<20	Aged<20	20+	20+
	Males	Females	Males	Females
Dublin	4392	4709	4092	5493
Rest of Ireland	354	535	2416	4786
England and Wales	181	177	560	770
Scotland	33	45	185	143
British colonies	13	14	29	59
Indian Empire	11	13	30	56
Foreign Parts	13	10	66	99
Total	4997	5513	7378	11406

TABLE A1: Numbers of Tenements of One Room Classified by Number of Occupants in 1911

	Total	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12+*	*Inhabited Houses*
Dublin	21133	3604	5310	3893	3074	2267	1488	854	431	146	45	16	5	35477
Pembroke	637	137	146	109	99	60	40	25	17	3	3	0	1	5225
R&R	924	375	243	137	69	40	38	11	9	1	1	0	0	6533

Source: 1911 Census

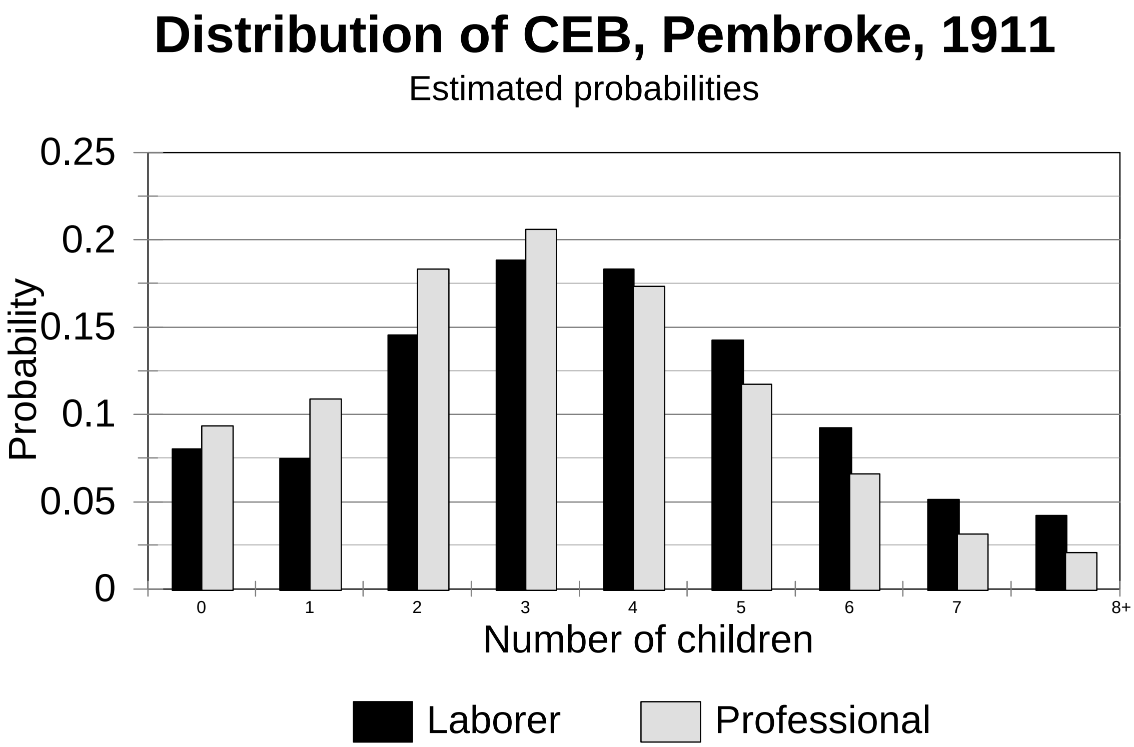
TABLE A4: PERCENTAGE OF COUPLES WITH NO CHILDREN BY DURATION IN 1946

Age at Marriage of Woman

	37000		37158		37010		35-9		40-4		All	
Duration	Cath	Other	Cath	Other	Cath	Other	Cath	Other	Cath	Other	Cath	Other
37177	5.1	9.3	9.7	14.8	17.7	27.6	37.1	51.6	72.3	82.1	13.8	20.4
15-19	5.7	8.5	9.8	15.8	17.6	25	34	47	69.6	77.2	13.8	19.9
20-24	5.9	9.5	9.5	12.8	16.5	24.1	32.8	32.3	61	67.2	13.3	17.2
25-29	5.8	8.3	9.1	13.2	15.9	20.7	25.4	37.8	57.7	68.9	12.1	16.2
30-34	6.2	9.9	8.7	11.9	12.6	17.9	22.8	32.9	50	65.2	11.2	15.2
35-39	6.7	9.9	8.4	11.2	11	21.1	18.7	33.6	48.4	45.8	9.6	13.9
40-44	6.3	9.8	7.9	12.4	10.3	13.9	15.3	29.2	38.5	75	8.3	12.1
45+	7	9	9	14.7	13.2	16.7	13.7	36.4	25.7	0	8.4	11.8

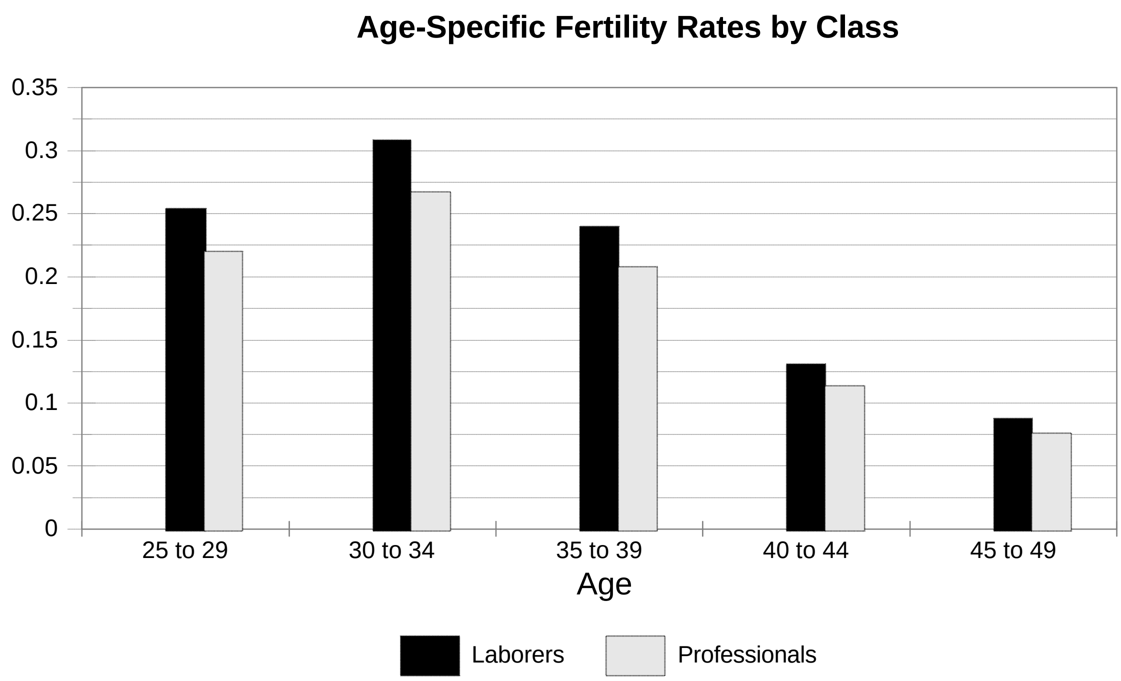
Source: 1946 Census, Part IX, p. 142

Chart 1



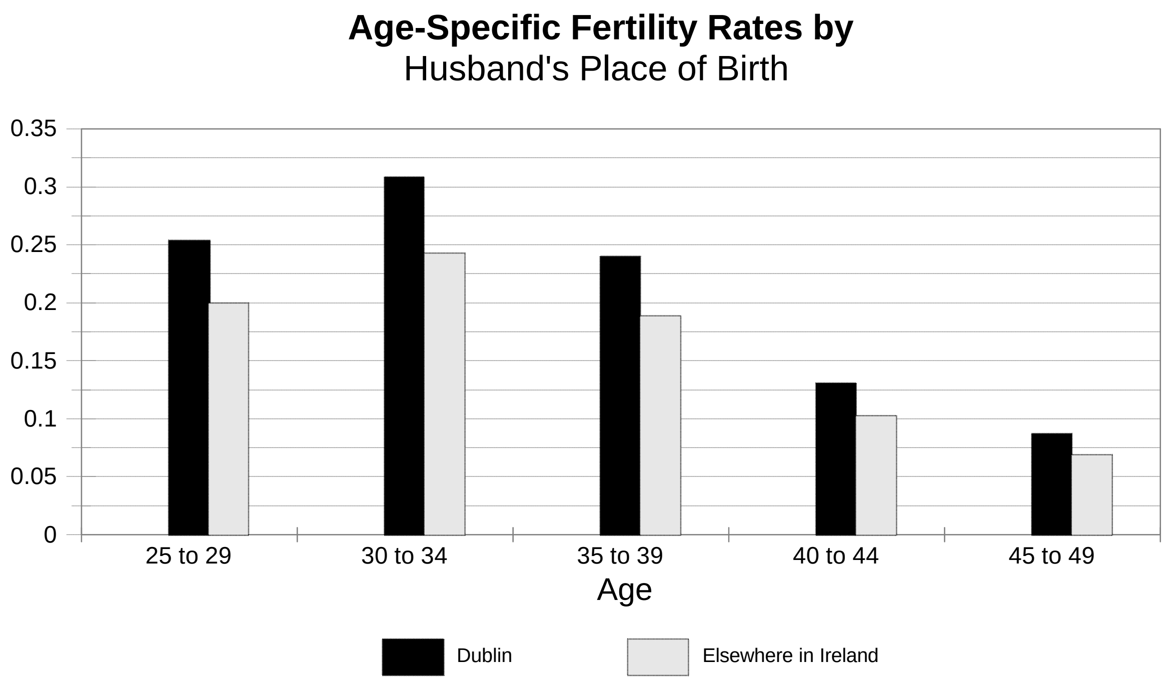
Note: Comparison is occupational class v to class i. House points index set to means for each occupational group (3.7 and 11.7). Assumed age at marriage is 25 for the wife, 30 for the husband, and the couple is assumed to have been married for 10 years. The couple has lost twenty percent of its children to mortality and lives on a street that is 50 percent Catholic. Both spouses are Catholic and born in Dublin. In this example zeros from the "always zero" branch are added to zeros from the kernel branch.

Chart 2



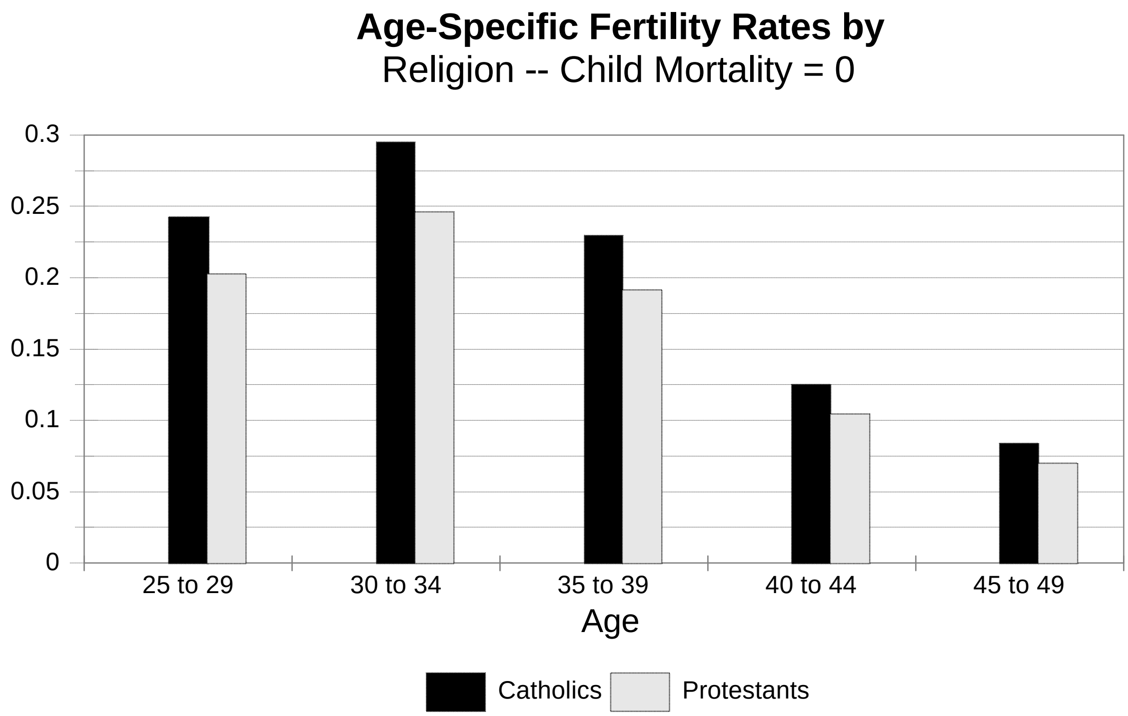
Note: Assumed characteristics are as for Chart 1, except that in this example marital duration changes.

Chart 3



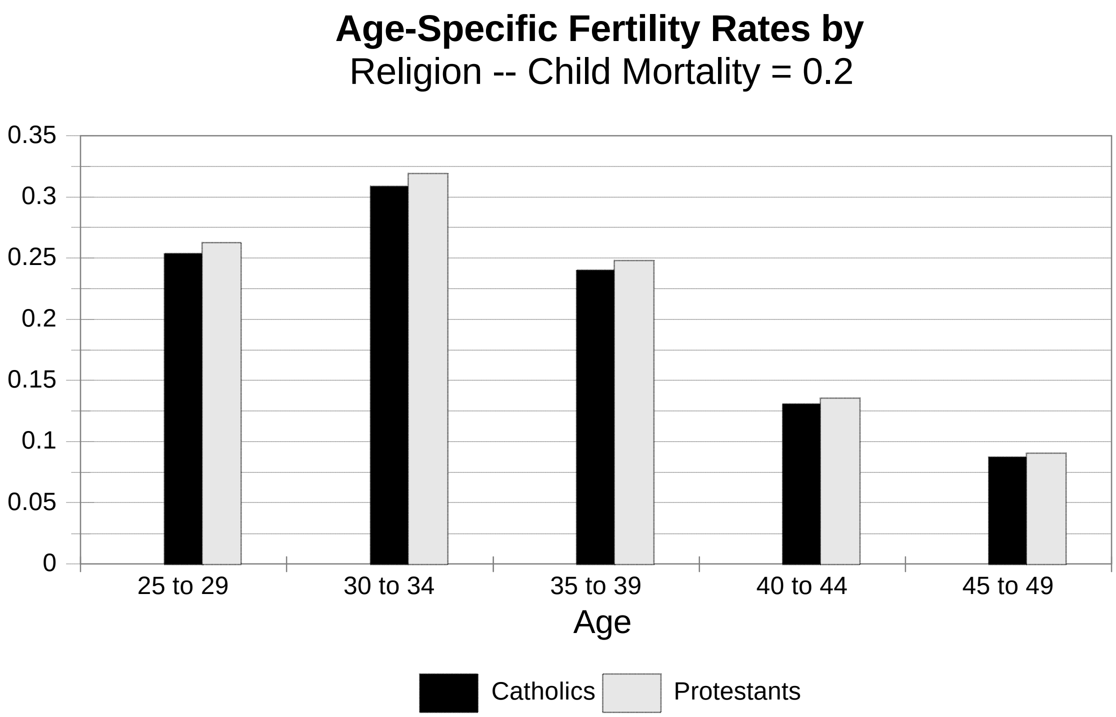
Note: Characteristics assumed to be as in Chart 1, except that the first husband is born in Ireland, the second elsewhere in Ireland. Both wives are born in Dublin.

Chart 4



Note: Characteristics assumed to be as in Chart 1, except that the first couple are both Catholic, and the second Church of Ireland. They have not lost any children to mortality.

Chart 5



Note: Characteristics assumed to be as in Chart 1, except that the first couple are both Catholic, and the second Church of Ireland. They have lost 20 percent of their children to mortality.