Gender Bias in Mortality in Ireland around 1870-1930

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Abstract

Excess female mortality in Ireland emerged after the famine of the late 1840's to the highest level observed in Europe, while it began to fall in other European countries. This exceptionally high excess female mortality persisted in some age groups even until the mid twentieth century. In this paper, we examine the determinants of this female disadvantage in Ireland with county data from the Irish censuses from 1871 to 1926. We find that the pattern of determinants is similar to the pattern found in England at around the same time. In particular, women's mortality improves with a higher labor market participation. But due to poor working conditions, a higher female participation in sectors such as the industrial sector is associated with worse relative mortality conditions. Furthermore, the high emigration rates of women and the high share of the agricultural sector are associated with higher relative female mortality.

Comparing Ireland to England and Wales, we find that the unusually high excess female mortality in Ireland is linked to a larger agricultural sector, high emigration rates, and a different effect of poor relief on excess female mortality.

Key Words: Ireland, Relative female mortality. *JEL*:

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1 Introduction

Gender inequality in mortality is a pervasive phenomenon in parts of the developing world, including South and East Asia. According to Klasen and Wink (2003), the cumulative impact of gender bias in mortality adds up to more than 100 million 'missing females' at the start of this decade. As shown in a large literature examining this, this inequality is largely related to access to food and health care within the household.[1]

These findings have prompted demographers and economic historians to examine gender bias in survival during European economic development in the 18th and 19th centuries. In a historical European context, Ireland stands out as a country with a particularly large disadvantage in mortality for women from late 19th to mid 20th century (Coleman, 1992; Klasen, 1999; Kennedy, 1973). But other countries also suffered from excess female mortality, for example Klasen (1998) shows that excess female mortality was high among adults in Germany from 1740 to 1860. Humphries (1991) and McNay, Humphries, and Klasen (2005) investigate the excess mortality rates of England and Wales in the 19th century, which existed not only in the adult women group, but also among adolescents.

Two main hypotheses can be extracted from earlier investigations on excess female mortality during Europe's development. One is that agricultural change appears to favor men in many contexts, because the demand for female labor decreases, particularly when agricultural change leads to mechanization and a crop mix usually favoring male labor (e.g. Boserup (1970), Johansson (1991), Klasen (1998)). A second hypothesis is that while improved work opportunities in industrial activities could provide greater direct access to resources to women, the extremely poor working conditions in those activities might actually lead to higher excess female mortality. For example McNay, Humphries, and Klasen (2005) find that in England and Wales in the late 19th century, both factors played a role, i.e. higher overall female employment reduced gender bias in mortality, whereas industrial employment increased it.

In this paper we study determinants of gender bias in mortality in Ireland from 1870 to 1930 using county-level data and multivariate regression analysis. We find that the pattern of determinants is similar to the pattern found in England at around the same time. In particular, women's mortality

[1] See, for example, Dreze and Sen (2001), Klasen and Wink (2003) and Asfaw, Lamanna, and Klasen (2007), among many contributions.

improves with a higher labor market participation. But due to poor working conditions, a higher female participation in sectors such as the industrial sector is associated with worse relative mortality conditions. Furthermore, the high emigration rates of women and the high share of the agricultural sector are associated with higher relative female mortality. Comparing Ireland to England and Wales, we find that the unusually high excess female mortality in Ireland is linked to a larger agricultural sector, high emigration rates, and a different effect of poor relief on excess female mortality.

The remainder of the paper is as follows. In the next chapter, I define excess female mortality, chapter 3 then presents a theoretical framework for explaining excess female mortality in child and adult ages and presents some testable hypotheses. After the description of the data and the econometric framework in Section 4, we present the mortality and explanatory variables in chapters 5, 6 and 7. Finally, chapter 8 shows the regression results from explaining excess female mortality and in chapter 9, we draw conclusions.

2 Definition of Excess female mortality

While it is straight-forward to document gender differentials in mortality, it is harder to claim that such inequalities should be called 'excess female mortality' in the sense that they are due to inequalities in access to survival-related goods and opportunities.

The definition of excess female mortality must be based on an assumption of how large the female relative to male mortality rates should be in the absence of discrimination. Klasen (1999) argues that we cannot use a benchmark of a society with complete equity between the sexes because it does not exist. Furthermore, mortality rates can differ for reasons different from resource allocation. For example, today's female mortality advantage in rich countries is to a considerable extent due to different behavioral patterns, particularly with regard to smoking, drinking and risky behavior (Waldron, 1993).

Nevertheless, there are different ways to standardize actual mortality rates. For example, McNay, Humphries, and Klasen (1998) use the diagonal regression method of Preston (1976) to standardise English mortality rates. The method calculates the expected mortality rates by regressing male on female mortality. The regression line is then taken as the expected mortality rate and a positive deviation of the observed female mortality from the

line is then defined as excessive.

Another way to standardise mortality rates is to take model life tables as suggested by Coale (1991) and Klasen (1994). The life tables we use to normalise the mortality rates were developed by Coale, Demeny, and Vaughan (1983). They are based on different, mainly European, regions in the late 19th and early 20th century. As the West tables are based mainly on England, we use these as a benchmark for the Irish mortality rates. We can then see if Irish excess female mortality is higher than the standard in this region and to this time. The reasons to choose this approach is that the normalisation to the surrounding region at the same time period appears to be a reasonable indicator to study the peculiarity of the Irish mortality experience at the time.

We normalise the actual mortality rates using the following equation:

$$efm = \frac{fm_a/mm_a}{fm_n/mm_n}, \tag{1}$$

where efm = excess female mortality, fm = female mortality, mm=male mortality, the subscript a refers to the actual and n to the normal value.female mortality

3 Theoretical framework

Since excess female mortality is understood as an outcome of inequalities in access of resources and opportunities between the sexes, theories explaining excess female mortality focus on the intrahousehold inequality in the allocation of survival-related goods. As we will explain both excess female mortality of children and of adults, we will divide the theoretical considerations into explanations for girls' and women's excess mortality.

Distribution between adult men and women is normally addressed in the framework of bargaining models of marriage (McElroy and Horney, 1981; Klasen, 1998). The important concept in bargaining models is the threat point which plays a decisive role for the intra-household resource allocation. Specialization of labor and public goods related to the household bring gains of marriage, but the share of resources that each household member gets is subject to a bargaining process. The bargaining strength of the partner is influenced by outside option of both partners. The outside option is deter-

mined by the earnings opportunities of both partners, the relative position in the marriage or remarriage market and other indicators that could affect the well-being of both partners after divorce. Thomas (1990)).

In these bargaining models, the state can also influence gender bias in mortality by providing survival-related goods to specific individuals or households. For example, poor relief or subsidized health access can influence gender bias in mortality by affecting the costs survival-related goods.

The theories provide several testable hypotheses on the power of women in the household even in the case when only macro data are available. [2]

In particular, we hypothesize that women's bargaining power will be affected by their position in the marriage market (see Klasen (1998) for results for Germany), by the education and employment opportunities of females, by the general poverty of households, and by sex-specific access to state resources, particularly poor relief.

Regarding the sex-specific resource allocation among children, investment models are usually used (e.g. (Hill and King, 1993; Behrman, 1998)). Sex-specific investments in children will depend on the perceived costs and benefits to the parents which in turn, will depend on their potential economic contributions to the household, either now or later. Thus we would expect that improved economic opportunities for women would not only increase their bargaining power but raise the 'investment value' of daughters.

In addition to these economic determinants of resource allocation, it will be important to control for other factors that could influence the mortality environment by sex. In particular, demographic factors such as overall morality, fertility levels, and population density could affect sex-specific mortality rates in a county, as has been found by McNay, Humphries, and Klasen (2005) in England and Wales.

More important in the Irish context would be sex-specific emigration rates which, given the large rates of Irish emigration, affect the selection of the population left behind. If, for example, healthy females are much more likely to have emigrated than less healthy ones and if this selection effect is weaker among males, then this could have a serious impact on sex-specific mortality rates among the population remaining.

[2] While the theoretical household models at hand try to explain what factors drive the allocation of resources between the sexes, we will analyze the county-wide sex-specific mortality rate. The mortality rate could be defined as a kind of relative female health status and thus as an outcome of the distribution of resources in families. The explanatory variables in the household models are proxied with aggregate county variables.

4 Econometric Framework and Data

The theoretical considerations provide a framework for examining determinants of excess female mortality the county level. We will focus on analyzing excess female mortality rates in three age groups, 5 to 9, 10 to 19 and 25 to 44 with the explanatory variables coming from theory and earlier empirical investigations.[3]

The model will be as follows:

$$\begin{aligned} EFM_{it} \;=\; & f(Overall\ Mortality_{it},\ Economic\ Structure_{it}, \\ & Female\ Employment_{it},\ Living\ conditions_{it}, \\ & remarriage\ market_{it},\ emigration_{it}, \\ & agricultural\ change_{it},\ education_{it},\ births_{it}) \end{aligned} \tag{2}$$

where the subscripts i and t refer to county and year. The explanatory variables will be defined in Section 7 below.

The time period of my investigation is 1871 to 1926, with observations for 1871, 1881, 1891, 1901 and 1926. These are the years when a census was conducted by the British government or, in the case of the 1926 census, by the Irish government (and thus excluding Northern Ireland). There exists another census of 1911 which we decided not to use due to problems with the age classification.[4] The observed period is situated after the Irish famine of 1845 to 1850 and ends when Ireland had just become independent.

Mortality data of Ireland are published on county level in the Annual Reports on Vital Statistics (Registrar General for Ireland, several years). The data exist on a yearly basis, but we have only taken the census years, because only then explanatory variables are available.

[3] We did examine the 0-4 age group but our models are not very successful in explaining sex-specific patterns of mortality in that age group. We suspect that measurement error in infant mortality as well as the lack of covariates proxying for biological determinants of early infant mortality are responsible for the poor fit. We do report on some significant results below and full results are available on request.

[4] As Budd and Guinnane (1991) document with the help of a linked census sample containing the censuses of 1901 and 1911, the introduction of an old age pension system in 1908 led the people to lie about their ages. To give an earlier birth date could help to receive a pension; this was possible because exact birth dates were only registered from 1864. Budd and Guinnane (1991) find in their estimation results that people from the age of 30 onward would exaggerate their ages, with women exaggerating more than men.

The data set contains observations for the 26 Irish counties and for Ulster (Northern Ireland). We could not use the counties of Ulster separately because the division of the cities over the counties changed over time, so proper population numbers and numbers of deaths could not be derived. For the 26 counties, we observe 5 years, for Ulster only 4 (with 1926 missing).

5 Excess Female Mortality in Ireland

The starting point of our investigation lies after the time of the Irish Famine of 1845-1850. In famines, mortality rates of women are often observed to be lower than that of men (Dreze and Sen, 1989, p. 55), and it is argued that this is due to the greater resilience of women to nutritional deprivation and associated diseases. Also in Ireland, women had a lower death ratio than men during the famine (O Grada, 1993, p.180) and (Boyle and O Grada, 1986). Demographic projections by O'Grada suggest, however, that prior to the famine, women only had the same life expectancy as men (38.3 years on average in 1821-41) and had higher mortality rates from ages 1-45 (Boyle and O Grada, 1986). This would suggest that prior to the Great Irish Famine, gender bias in mortality in Ireland was also the highest in Europe (everywhere else women had a 1-2 year survival advantage), which is also consistent with data on relative heights of females and males from that time period (Nicholas and Oxley, 1993). As we do not have information on the covariates of our model from that time, we cannot perform the analysis for the pre-famine period.

But also in our observation period (1860-1926) life expectancy of women in Ireland is low relative to men and relative to the European standard at this time.[5] The life expectancy both for women and men increases from the middle of the nineteenth century to the middle of the twentieth as in other European countries.

Figure 1 shows that it is only in around 1900 that life expectancy rises at all; it shows, too, that it is only in the 1930's that women have significantly

[5]As discussed above, calculating excess female mortality requires the normalisation of mortality rates with respect to the life tables. Life table mortality rates are calculated for different life expectancies of females and the respective expectancies of males. We use the male life expectancy as the normal, unbiased case and take the respective female mortality rates for the same level of the life table. We could have taken the female life expectancy as the unbiased case, but as we are concerned about an abnormally high female mortality, we prefer the first variant.

higher life expectancy than men. This phenomenon happened much earlier in other European countries. Taking the male life expectancy as the norm, life table female life expectancy is included in the Figure and lies some five years higher than the actual female expectancy. From the 1930's onwards, life expectancy is further split into urban and rural with a 5 year higher expectancy of urban females than males. Rural life expectancies are not shown, but were higher than urban. This is possible due to the bad housing conditions and the hard work in industry in the urban areas[6]

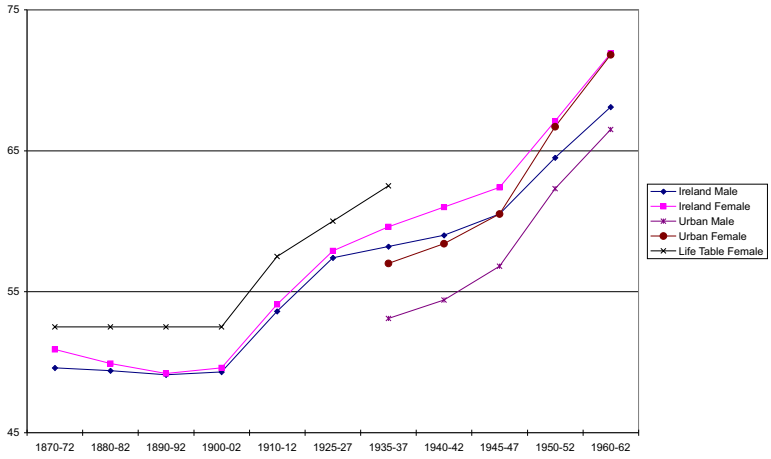

Figure 1: Life expectancy in Ireland and life tables

Having found a low life expectancy of women relative to men, we now turn to the age specific excess female mortality rates. To see if they are also high relative to the life table rates or internationally, we will compare them with both.

Table 1 shows the life table mortality rates and the mortality rates of Ireland and in the last row the excess female mortality in Ireland. We look at different age groups, from 10 to 14 and 15 to 19 as the age groups of adolescents, and 20 to 24 and 25 to 44 as the age groups of adults. The ratios between female and male mortality are higher for the Irish rates than for the life table, with one exception, in the age group 20 to 24. The highest excess female mortality exists in the age group 10 to 14, but significant EFM is also visible from 15-19, and from 25-44.

Figures 2 and 3 present international excess female mortality for the age

[6]Still at the end of the seventies, Walsh and Walsh (1978) discuss the relative low female life expectancy in Ireland compared to other European countries which they attribute a greater sensitivity of female mortality to economic conditions.

Table 1: Life table and Irish mortality

Age group	Life table West			Mortality rates Ireland			Norm
	$m(x)_f$	$m(x)_m$	$\frac{fm_n}{mm_n}$	$m(x)_f$	$m(x)_m$	$\frac{fm_a}{mm_a}$	EFM
10 to14	2.88	2.67	1.08	3.35	2.54	1.32	1.22
15 to 19	4.09	3.99	1.03	5.12	4.33	1.18	1.15
20 to 24	5.32	5.69	0.93	6.06	6.77	0.90	0.96
10 to 19	3.48	3.32	1.05	4.22	3.4	1.24	1.19
25 to 44	7.28	8.07	0.90	8.33	8.12	1.03	1.14

Life table mortality Level 14 is valid for 1871 to 1901 (1926 is Level 16
Irish mortality rates are averages over all available years 1871 to 1926

groups 5 to 10 and 20 to 25 from Klasen (1999) and Klasen (2003). The excess female mortality rates come from Ireland, Sweden, UK and Italy and refer to the nearest date to the date on the axis.

Excess female mortality in Ireland is internationally the highest in the 5 to 15 age group over all years except in 1850 which was the end of the famine. In the 20 to 45 age group, Ireland shows an excess female mortality ratio below one between 1870 and 1900. Other countries showed higher values during this period. Up to 1850 and from 1910 onwards, Ireland shows, as expected, the highest excess female mortality among the countries.

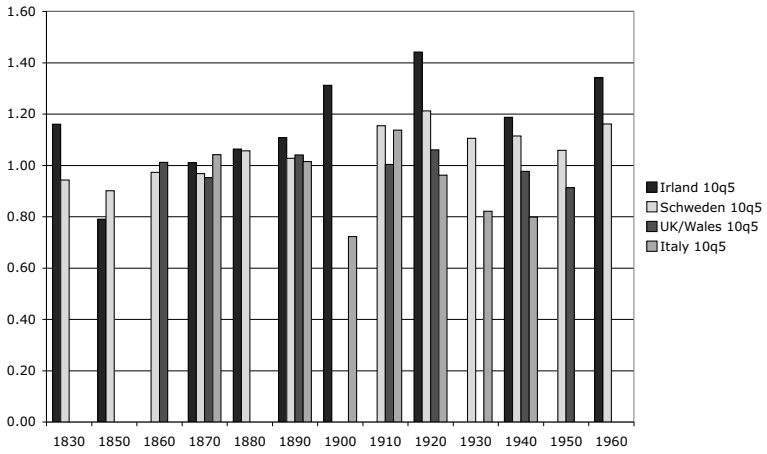

Figure 2: International normalised excess female mortality age 5 to 10

In the following, mortality rates over time and space in Ireland are presented. Figure 4 shows EFM rates by age groups in Ireland from 1864 to 1967. The development of female relative to male mortality shows quite high differences looking at different regions, age groups and times. With the ex-

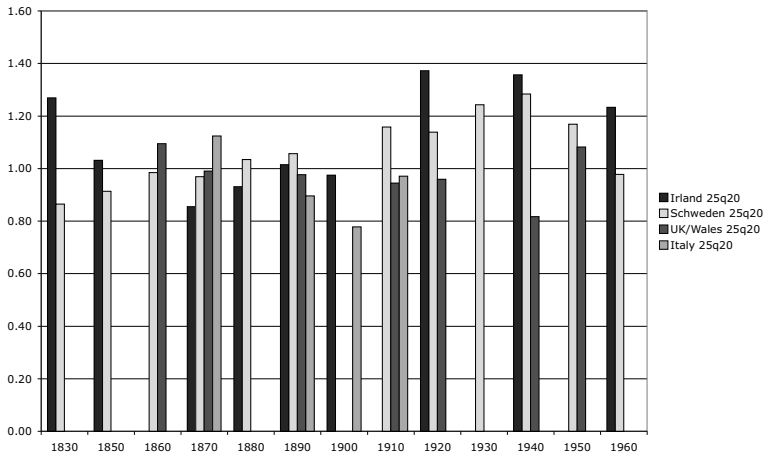

Figure 3: International normalised excess female mortality age 20 to 25

ception of the age groups 15-19 in 1864-1871, and the 20-24 and 25-44 age groups throughout the late 19th century, the EFM index is above one for all other age groups throughout the period.

Figures 67 and 8 show the excess mortality rates for the age groups 5 to 9, 10 to 19 and 25 to 44 at the province level. The mortality rates of these age groups, at the county level, are examined in a multivariate model in the remainder of the paper. Excess female mortality in the four age groups is increasing over the observed time span in most provinces. At the province level, they oscillate quite a lot. In the youngest age group, they are particularly high in Ulster around 1900. In the older age groups, the highest increase occurs in Connaught in both age groups while in Leinster the ratios do not increase (in the age group 25 to 44), or only slightly.

On the county level, the following maps (Figure 9 and 10) show the development of the age groups 10 to 19 and 25 to 44 for the counties in the first year and the last two years (1871, 1901 and 1926). The two age groups stand for girls and adult women. The darker the counties are shaded, the higher the relative female mortality in the presented age groups is.[7]

There exist two statistics to test the null hypothesis of no spatial autocorrelation, assuming that x is normally distributed. Both tests for spatial autocorrelation, Moran's I and Geary's c, show for all years and age groups that the null hypothesis of no autocorrelation cannot be rejected. The agglomeration areas of Ireland Dublin and Belfast show a relatively positive

[7]Maps for the 5-9 age group are available on request.

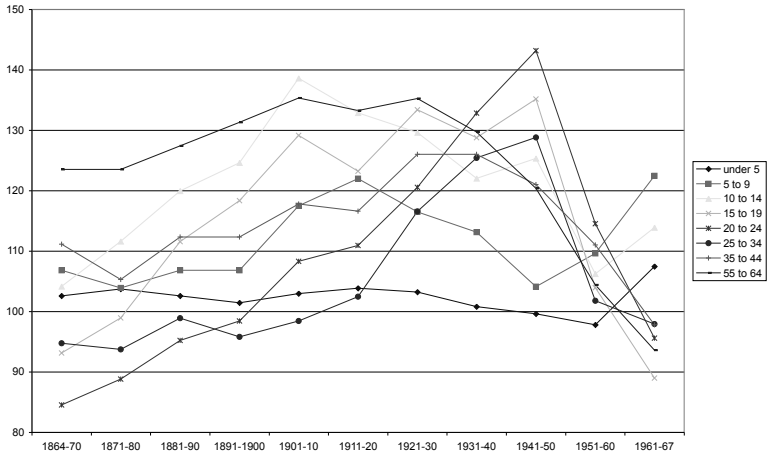

Figure 4: Excess female mortality rates Ireland (Kennedy, 1973)

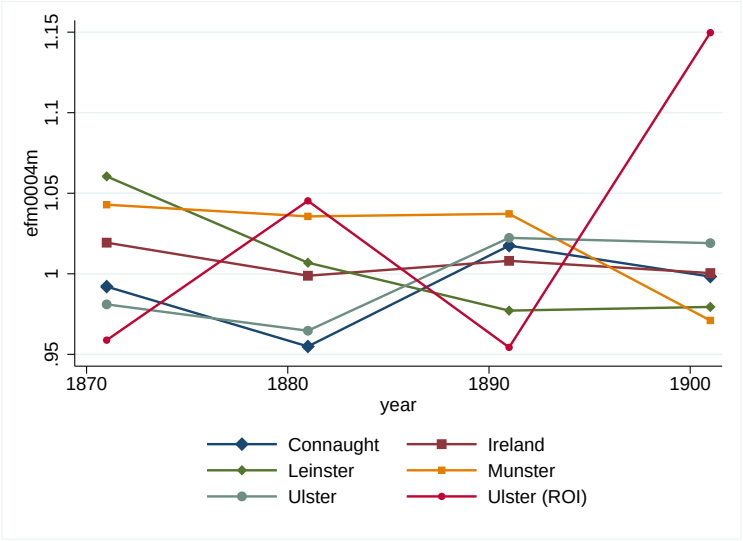

Figure 5: Excess female mortality rates age 0 to 4

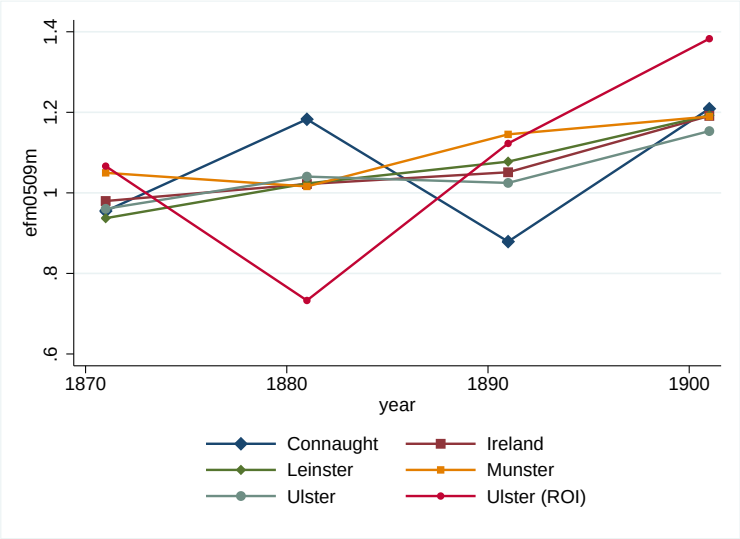

Figure 6: Excess female mortality rates age 5 to 9

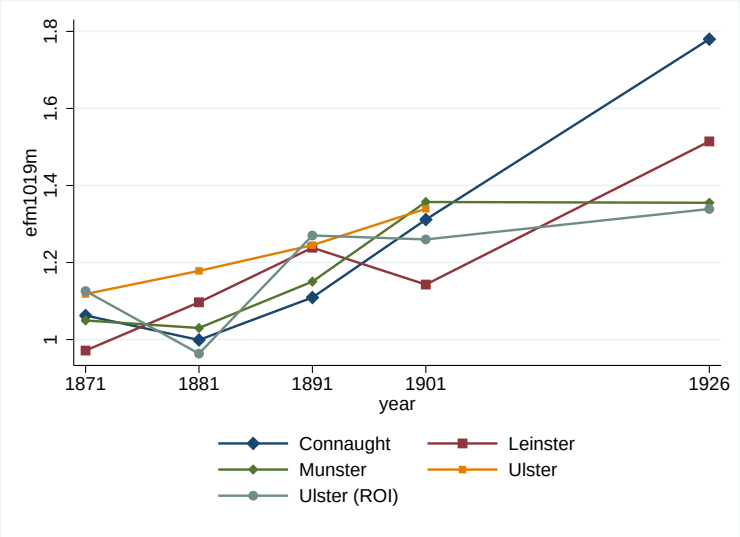

Figure 7: Excess female mortality rates age 10 to 19

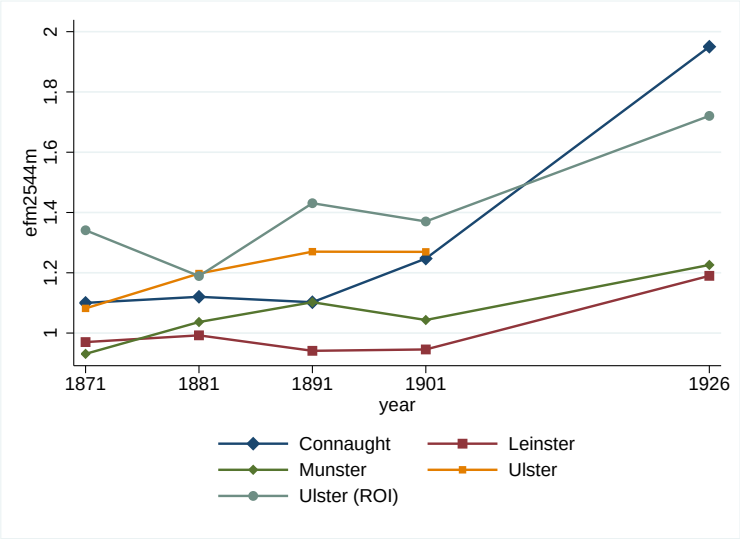

Figure 8: Excess female mortality rates age 25 to 44

picture for women, while there is no consistent picture regarding the worst areas. It seems that high excess female mortality is not directly related to the backwardness of the area. We also cannot see a pattern like a west-east division that is sometimes postulated because of the backwardness of the west (Kennedy, 1973).

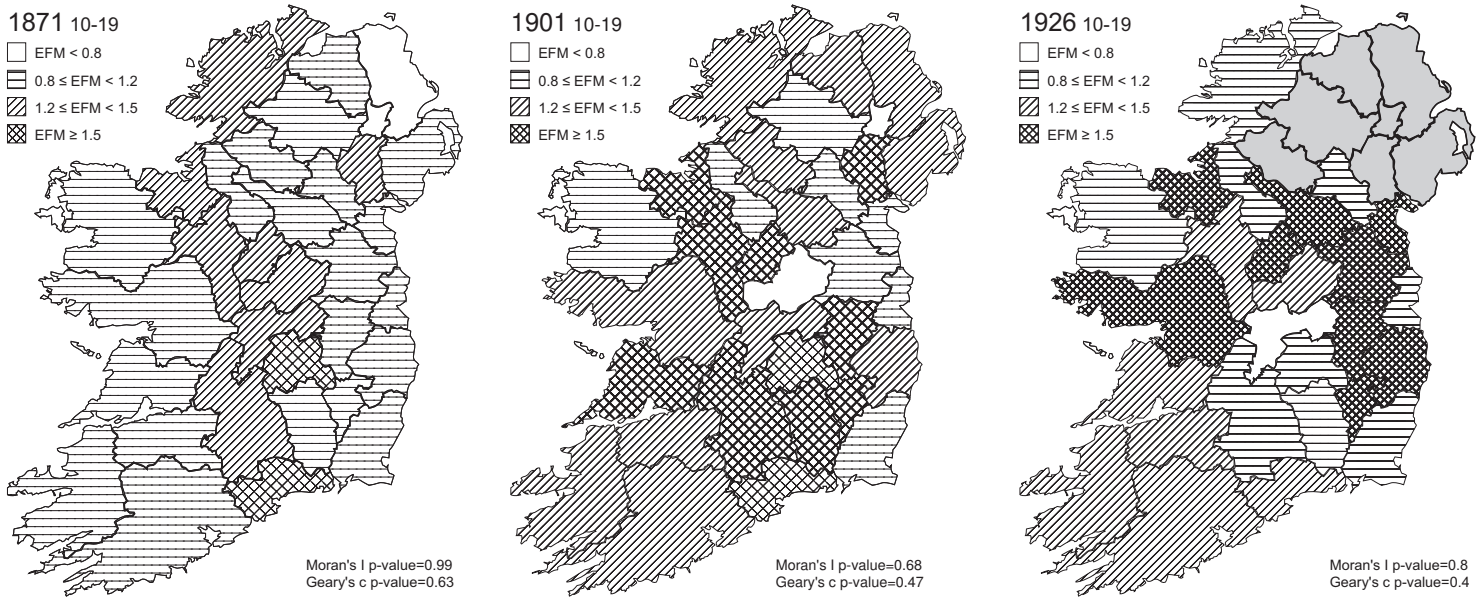

Figure 9: Relative female mortality rates in Counties age group 10 to 19, 1871, 1901 and 1926

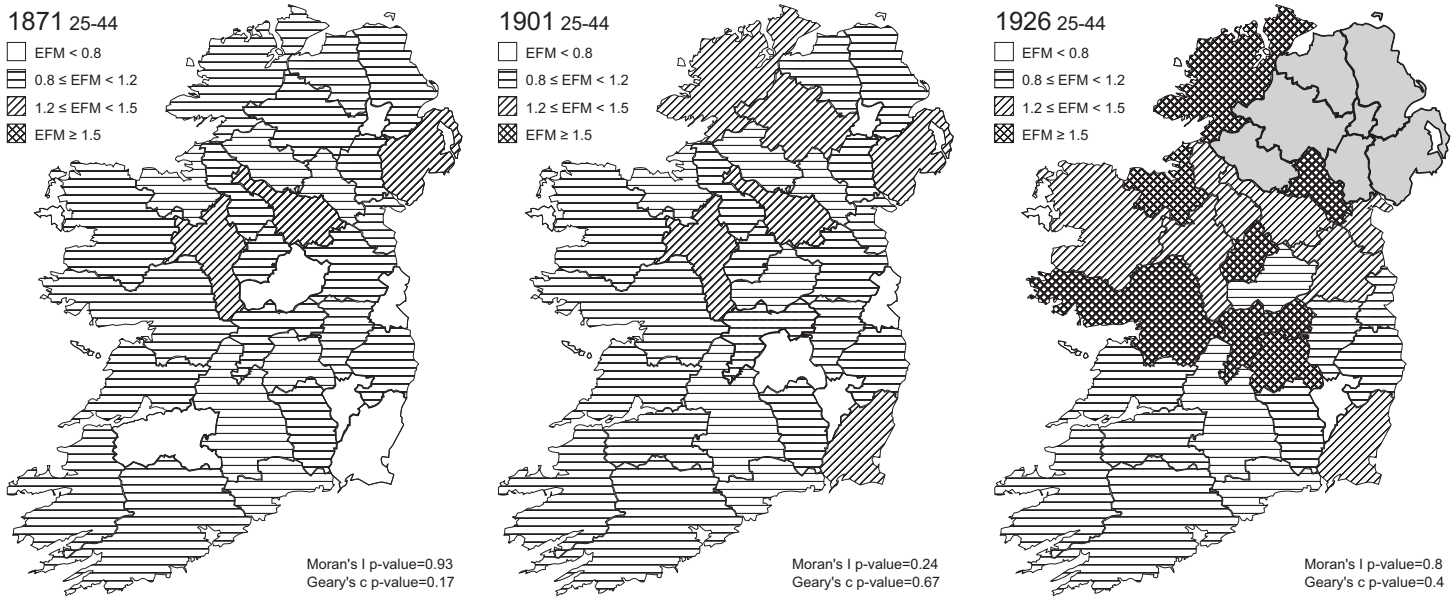

Figure 10: Relative female mortality rates in Counties age group 25 to 44, 1871, 1901 and 1926

6 Mortality from Tuberculosis

Given the prevalence of tuberculosis as a cause of death at the time, we want to briefly examine to what extent sex differentials in mortality are related to tuberculosis.[8]

Tuberculosis was a serious problem in Ireland during the surveyed period. The Tuberculosis epidemic was rising in the 1880's and 1890's and culminated in 1904. It had started after years of relative health in the 1860's and 1870's when the mortality from tuberculosis had even been lower in Ireland than in England, Wales and Scotland (Jones, 2001). The high mortality rates were falling very slowly in the following decades and in the 1940's they were still higher than in many European countries. The reduction of overall mortality rates to European levels coincides with the reduction of tuberculosis mortality.

Mostly youth and young adults were infected by tuberculosis (Jones, 2001). During puberty mostly females died of TB, in older age groups the death rates of TB were more equal between genders. It was more probable for poor people to have TB and urbanisation brought a higher TB rate, men being more affected.

Tuberculosis was regarded as a hereditary disease, so that the infection of children of marriageable age was often not admitted to increase the probability of marriage. Thus, an underenumeration of TB deaths in these age categories occurs. Jones (2001) reports that for example in Dublin, previous to 1879, 10% of the dead were not registered, but showed up in the returns of burials. It often occurred that deaths from TB were related to a harmless cause of death such as bronchitis.

At that time, several explanations spread for the high mortality of tuberculosis. One was that the celtic race was specially prone to an infection with TB. This theory was contradicted by the fact that in the most celtic part of Ireland, in the West, TB was least prevalent. The effects of emigration were controversially discussed. One argument was that the soundest were removed from Ireland and thus mortality (overall and from Tuberculosis) was especially high in the remaining population (Jones, 2001), a topic to which we return below.

The true reasons for the high mortality from tuberculosis and the particular susceptibility of women may have been the same as for excess female

[8]See Haines: Fatal Years and McNayetal05 for a discussion.

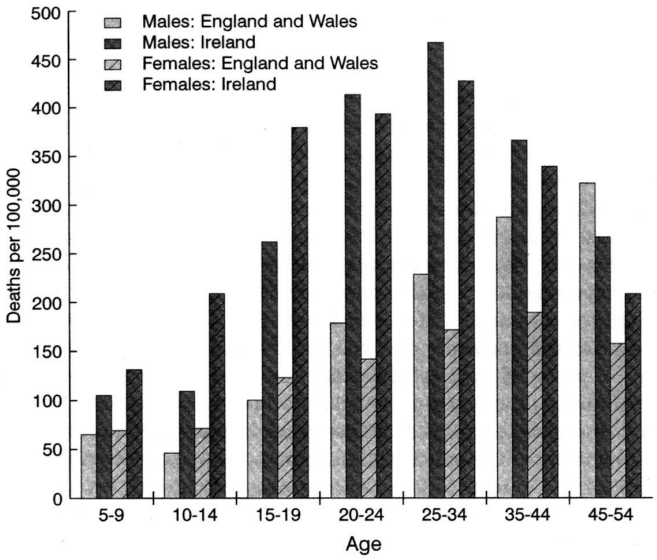

Figure 11: Death rates from tuberculosis by sex in Ireland and in England and Wales in the early twentieth century (Guinnane, 1997, Figure 4.1, p. 115)

mortality: poverty, urbanisation and malnutrition. In 1871 50% of the female workers in the Linen factories of Belfast were aged between 15 and 25 years and hard work and unhealthy environment led to higher mortality rates. Many of them worked at home; the bad housing conditions in urban areas made it easy for the bacillus to spread to women and their daughters who were staying with their mothers while men and their sons worked in the fields. The women who were weakened from the bad living conditions and malnutrition contracted tuberculosis that their body otherwise may have resisted.

In the age groups 10-14 and 15-19, one can see from figure 11 that Irish female mortality from Tuberculosis exceeded mortality in other countries. In the case of 15 to 19 year old girls the percentage difference to the males was even double the mortality in England.

Figures 12 to 14 show the extent of TB mortality relative to overall mortality. Figure 12 shows that the share of TB deaths of all deaths was around 12 % for females and 11% for males in 1871. In 1926, it was still 10% for both genders, there was almost no change.

Figure 13 shows the share of TB deaths of all deaths in age groups for 1871. The highest difference between males and females is in the age group

10 to 14, while the highest shares are in the ages 15 to 24 with a higher share for women than men.

Finally, the regional pattern in 1881 is shown in Figure 14. With four percentage points difference, Ulster shows the highest shares of TB deaths on all deaths (14 and 18 percent for men and women, resypectively) and also the highest difference in genders. Possibly, this result is due to the high industrialisation in Belfast.

The correlation coefficients between TB mortality and overall mortality amounts to 0.98, 0.90 and 0.94 for the three graphs, so it can be argued that TB mortality is driven by the same factors than mortality from all causes.

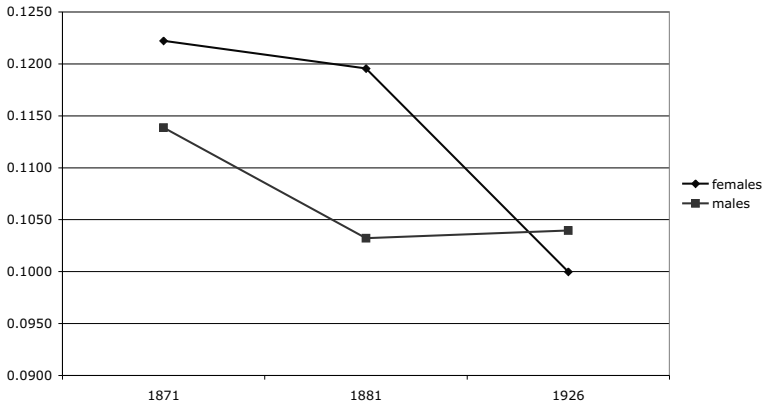

Figure 12: Death rates from TB rel. to all deaths in Ireland over time

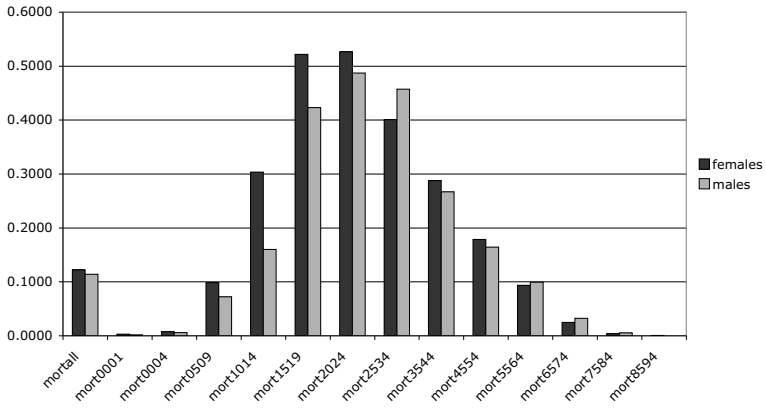

Figure 13: Death rates from TB rel. to all deaths by age groups in Ireland in 1871

We have seen that tuberculosis led to a high number of deaths in teenage

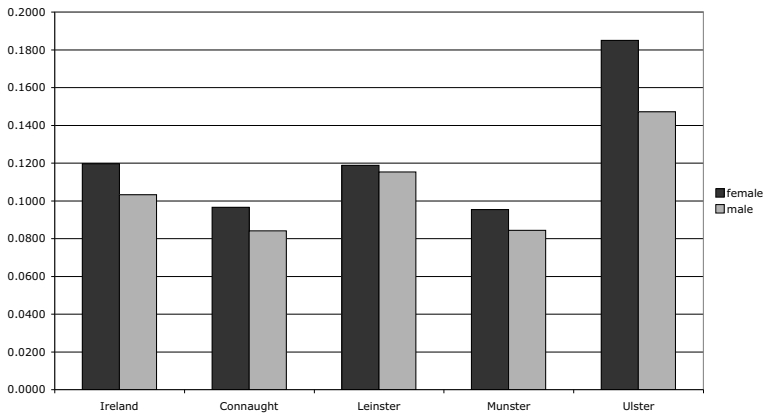

Figure 14: Death rates from TB rel. to all deaths by Province in Ireland in 1881

age which is the age of the highest excess female mortality in Ireland. Underreporting of deaths is a general problem, but if the percentage of underreporting is equal between the sexes, relative female mortality should not be biased. Furthermore, underreporting of deaths from tuberculosis seemed to be more related to higher reported death numbers of other diseases like bronchitis. Jones (2001) does not suspect that there existed a difference in reporting deaths of women and men. If there was slight underreporting in deaths of any gender, it would be female mortality that is higher in reality, so that excess female mortality would also be higher.[9]

7 Determinants of relative female mortality

In the descriptive section it became clear that Irish relative female mortality was not only high in international comparison, but also showed differences across the regions. Based on the theoretical discussion above, we will motivate and present several indicators which influence the female mortality rate which could serve as an explanation for the differences among counties. In

[9]To test if relative female mortality from Tuberculosis depends on the same sources as relative female mortality as a whole, mortality from Tuberculosis could be introduced as an alternative dependent variable. But, as TB deaths are aggregated on a much higher level, we do not have enough observations to introduce it into a regression. As could be seen from the correlations between TB mortality and mortality from all causes, the results would show the same picture, only the scale would be different. We will assume in the remainder of the paper that there is no underreporting of female TB deaths relative to males.

the next section, I will then test which of the possible explanations show up to have a significant influence in a panel regression on excess female mortality in different age groups.

Table 4 shows an overview of the variables includes pooled over all counties and years.

7.1 Overall mortality

Studies about 19th century England suggest that women are relatively well off in terms of mortality when the general mortality is high (e.g. Woods (2000) or McNay, Humphries, and Klasen (2005)). Consistent with this finding, female mortality in the Irish famine was relatively low with respect to male mortality. After the famine, overall mortality decreased, but relative female mortality was rising. Accordingly, we expect a negative influence of overall mortality excess female mortality. Figure 15 shows the overall mortality rates in provinces over time.

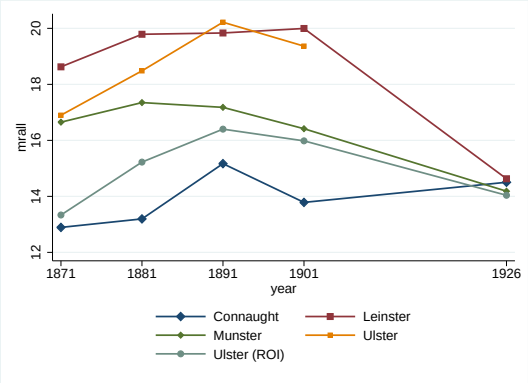

Figure 15: Overall mortality rate (based on census data; own calculation)

7.2 Economic structure

Consistent with the theoretical discussion, we expect that the labor market structure influences relative mortality of males and females. The Irish Census data reports the number of workers in five working categories. The professional class includes general or local government, defence, professional occupations (for example teachers, students, or members of religious communities). The domestic class includes all domestic offices or services. The

commercial class includes commercial occupations, conveyance of men, goods and messages (for example merchants, commercial clerks and coach makers). The agricultural class includes agriculture and animals (as for example farmers, graziers, agricultural laborers and farm servants). The industrial class includes persons working and dealing in books, prints and maps, machines and implements, houses, furniture and decorations, carriages and harness, ships and boats, chemicals and compounds, tobacco and pipes, food and lodgings, etc. (for example lodging house owners, cabinetmakers, millers, greengrocers, dressmakers, tailors, shopkeepers). The last category, the indefinite and non-productive class, includes persons not producing (vagrants, schoolchildren, wives).

We aggregate the commercial and professional sectors into one sector, because neither involves physically hard work as in agriculture or industry. Leinster, with Dublin, shows the highest percentage of workers in the professional sector, while in Connaught and Ulster (ROI), the two most backward areas, the least people work in the professional sector (see figure 19).

The agricultural sector shows the opposite picture to the professional sector (see Figure 20). Now, Leinster is among the provinces with the lowest share of agricultural workers (together with Ulster which is with Dublin one of the agglomeration and industry areas) while Connaught and Ulster (ROI) are the leading agricultural provinces. This pattern persists over the whole observation period and gets even more pronounced at the end of the period.

The percentage of people not working increased until 1901 and remained stable after that. Luddy (1999) tells that the Irish commissioners were told to transfer more and more women over time into the nonproductive sector even if they worked in the domestic sector or in agriculture. The increase in the non-working population shows possibly only the changes in the method of collecting the census data, not a real change in the working behaviou.

7.3 Female employment

As discussed above, participation of women in the labor market strengthens their position in the family, so that the mortality of girls and women relative to men and boys ought to fall with a higher employment rate of women. Women gain more power by receiving wages and are better able to get their share from family resources. This should help them to reduce their probability of dying. Moreover, we would expect that a strengthened position of the woman in the family also raises the status of the girls, as wage-gaining

mothers are generally better able to support their children and especially their daughters.

Figure 22 shows the labor market participation of women relative to men. We argued before that the overall labor market participation went down because the Irish commissioners counted more and more women as non-productive even if they worked in the family business (Luddy, 1999). The full extent of this problem is displayed in Figure 22, showing that the number of women relative to men working diminishes dramatically over the observed period. We will account for the downturn in female employment with an interaction term between female employment in domestic services and the year 1871, because in this sector, the downturn is observed to be highest among all sectors.

Despite this empowering aspect of female employment, as many of the jobs available for women in the surveyed period were very unhealthy, the positive effect of the strengthened position in the family will not necessarily suffice to reduce the mortality risk. Accordingly, we might even observe a negative effect of female labor participation depending on the observed sector. Fahey (2003) suggests in his descriptive investigation that domestic servants will have a lower mortality, because they have better housing possibilities than others. Conversely, industrial employment might be particularly hazardous as was found for England and Wales (McNay, Humphries, and Klasen, 2005).

From 1800 to 1918 women worked mostly in agriculture, domestic service and the textile industry. Already before the famine many women worked in the textile industry, which was one of the main employers of women at the beginning of the 20th century. Industrialization took place mostly in the North East of the country and in a reduced way in the towns of Dublin, Cork, Waterford and Limerick. In the remainder of the country, Ireland remained an agricultural state. Towards the end of the 19th century chances for women in agriculture worsened considerably. The whole agricultural system shifted from tillage to dairying, there was more stock rearing and at the same time more mechanization. All this led to a lower work intensity of the production and a lower demand for a female work force. The extent of the shift in agriculture is shown in the next section.

The second assumption, that the situation of girls ameliorates when their mothers work, cannot necessarily be applied to Irish circumstances. As there were very many home-based jobs (putting-out system) during early industrialization in Ireland and these jobs were mostly occupied by women, their

daughters had to stay at home together with their mothers. The bad housing conditions may have led to a higher mortality (see section 6 about Tuberculosis). Moreover it was normal in Irish families that men and sons had the privilege to eat first, and that privilege would not change with the standing of the mothers, because it was seen as a tradition (Luddy, 1999).

7.4 Living conditions

Living conditions are proxied by three variables: population density, the share of women in workhouses and the share of families living in fourth class housing. The last two indicate the poverty of the families and women, the first is an indicator for urbanization of the county. Figure 32 shows the population density in Irish regions. Fahey (2003) reports that women died earlier particularly in rural regions. In 1926, the census shows the mortality difference by comparing mortality in the province of Connaught with the four main cities. Female life disadvantage at birth in Connaught amounts to 1.7 years while in the main cities, women had an advantage in life expectancy of 3.1 years at birth.

The relation of women to men in workhouses is shown in Figure 30. The Irish poor law legislation of 1838 was an adaption of the poor law of England and Wales of 1834 and brought a workhouse system for the very poor to Ireland. Figure 30 shows that Ulster with 1.15 women per men in workhouses started with the lowest value, Munster started with the lowest fraction of 1.35. The fraction went down below one until 1901 in most counties; values for 1926 are not included. McNay, Humphries, and Klasen (2005) found that the share of women in workhouses actually was associated with lower female relative mortality suggesting that they were relatively better off in workhouses than in households, the rather harsh conditions of workhouses in Ireland put into question whether this applies to Ireland as well. The bad conditions in Irish workhouses especially for female adolescents is documented by Luddy (1999).

The number of families living in fourth class housing can be seen in Figure 31. 4th class housing is defined as:"Houses built of mud or perishable material, and having only one room and window" (Census of Ireland, several years, p.7). 4th class housing includes also 3rd class housing (one to four rooms and windows) with more than one family, 2nd class housing (five to nine rooms and windows) with four or more families and 1st class housing (houses of a better description than the preceding) inhabited by six or more

families.

Fourth class housing can be taken as an indicator for the poverty of the population, which can have negative effects especially on females who will spend more time in these houses. Accordingly, we hypothesise that in counties with particularly bad housing conditions also the relative female mortality will be particularly high. Poverty can lead to insufficient nutrition especially of the weakest members of the household, furthermore bad housing conditions can lead to a higher female mortality from diseases that are contracted while working in bad conditions at home.

7.5 (Re-)marriage market

In Ireland, a high proportion of men and women never married. Table 2 shows that Ireland's number of spinsters and bachelors is higher than in other countries. Being comparable to other countries until the 1860's, the percentage of people never married increases from then. In Germany, England and Wales, the rates stay approximately stable. The change in inheritance laws towards a single heir might have contributed to the increase as the non-inheriting children faced greater difficulties sustaining a family.

The Irish perspective is demonstrated in table 3 where the differences between the provinces are shown. Connaught, the province with the highest rate of emigration, lowest industry and highest agriculture, shows the lowest rate of non-married, especially for women.

In our data the picture is similar. In Figure 28 the number of spinsters relative to the number of bachelors is shown. The numbers remain relatively stable over the whole period with Ulster having the most spinsters per bachelor (1.2) and with Connaught only having 0.8. As has been found for Germany in Klasen (1998), we would expect that a high share of spinsters relative to bachelors would weaken women's survival as it lower their bargaining position.

7.6 Emigration

Up to the time of the Famine population growth in Ireland was high in relation to other European countries. Exact population growth can only be calculated from 1841 onwards when the first reliable count of the population was published in the census (Guinnane, 1997). Over the period 1750 to 1845,

Table 2: Proportion never married (in percent)

	England and Wales		France		Germany		Ireland	
Year	M	F	M	F	M	F	M	F
1841							10	12
1851	12	12					12	13
1861	10	12	11	13			15	14
1871	10	12	11	12	9	12	17	16
1881	10	12	13	13	8	11	17	17
1891	10	12	12	13	8	10	20	18
1901	11	14	10	11	8	11	24	22
1911	12	16	11	11	9	12	27	25

Notes: Irish and English figures are percentage never married at ages 46-55 for 1841, and 45-54 at later years. French figures average the percentages never married at ages 45-49 and 50-54 for 1871-1911; 1861 is for those 45-54. German figures are for ages 45-54 for 1871-1901 and 50-59 for 1911.
Source: Guinnane (1997, page 96)

Table 3: Proportion never married in the provinces of Ireland (in percent)

	Leinster		Ulster		Munster		Connaught	
Year	M	F	M	F	M	F	M	F
1841	13	14	10	14	9	11	7	8
1851	15	14	13	15	10	10	7	8
1861	19	17	16	16	12	12	10	10
1871	21	19	19	19	13	13	12	12
1881	22	20	19	20	14	13	11	9
1891	25	22	21	23	17	13	14	10
1901	28	25	24	26	20	17	19	14
1911	31	28	26	27	26	21	25	18

Source: Guinnane (1997, page 97)

Guinnane (1997) calculates a yearly growth rate of 1.3 percent per year. In the last years of this period, the growth rate seems to be already lower, as estimates of Mokyr and Grada (1984) suggest only a growth rate of 0.5 to 0.75 percent for the 1830's. Thus, while the high growth rates were lastingly stopped lastingly by the Famine, Guinnane (1997) argues that they would have fallen even without the Famine, though over a longer period. [10]

One would have expected that population numbers would have recovered quickly after the famine. Instead, population began to decrease severely. There were two main factors that accounted for this decrease: During the Famine, a huge migration movement mainly to the U.S., but also to England started, and fertility declined lastingly. In Figure 16, the amount of the population loss can be seen. To take as an example the population of age 0 to 4, the loss is almost 50 percent over 50 years. Also the number of men relative to women reverses in most age groups. For example in the age group 25 to 29, there were significantly more women in 1871, but there are as many as men in 1926.

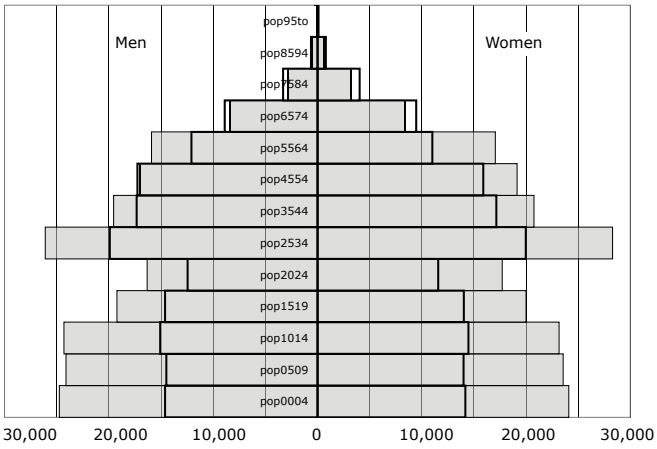

Figure 16: Population loss in Ireland mainly due to emigration

A huge wave of emigration to the USA and England had already started during the famine. These very high numbers make it look unlikely that the remaining population can be compared with a healthy and stable population. Yet the question arises, what the causal connection between the emigration

[10] During the Famine, excess mortality ranged from one quarter of the population to almost zero depending on the region (Guinnane and O Grada, 2002). The number of deaths from the famine range from 0.5 to 1.5 million dependent on the estimate, with the most reliable estimate being one million excess deaths which means almost 10 percent of the population (O Grada, 1993).

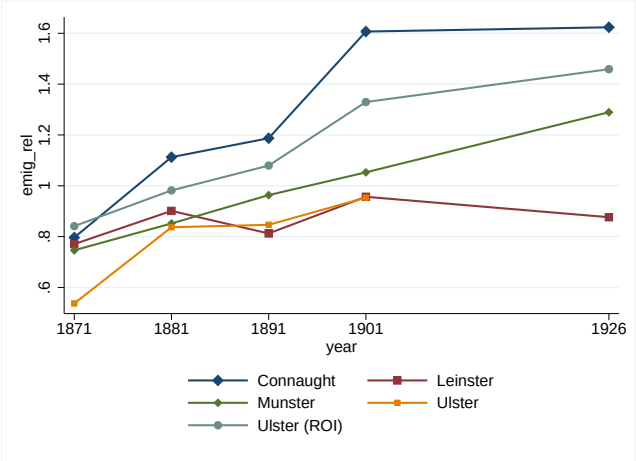

Figure 17: % of women emigrating rel. to % of men emigrating from Provinces

and a negative selection of the remaining population is. It is possible that mostly the healthy and strong persons left the country, because they were still able to do so or were expecting higher benefits from doing so. Conversely, the poor and ill ones remained in the country. If this selection effect was equally strong for males and females, the ratio of female to male emigration would play an important role in accounting for excess female mortality. As shown in the Figure, the ratio was particularly high in Connaught and Ulster, and was rising in the last decades of the 19th century.

7.7 Agricultural change and rural areas

Between 1850 and 1920 agriculture in Ireland changed fundamentally. After the famine, several developments started: firstly, there was a shift from tillage to grazing. In the 1840s half of the output consisted of crops (wheat, oats and potatoes), in 1908 farmyard hen and duck contributed more to agricultural value added than all crops together (O Grada, 1993). This was made possible, among other things, by the change in the heritage practice which changed from dividing the land among all siblings to giving the whole land to one heir.

The change in agriculture is captured first by the share of small farms relative to all farms. Figure 26 shows particularly in the most agricultural district, Connaught, that the number of small farms went down. That happened possibly due to the changes in the heritage laws that put a halt to the

progressive division of land, accompanied by a process of consolidation.

The change of production in agriculture is proxied by the share of the county area that is cultivated with crops, fruit and horticulture. The variable is shown in Figure 27. The downturn which is expected can be confirmed, but on a very low level. The share of the area cultivated diminishes from a starting point of 5 to 8 percent by 2 percentage points, meaning a downturn of at least 25%.

The agricultural change went along with different trends. First of all, there was a dramatic fall in the numbers of people working on the land, so that a negative effect on land workers has to be expected. Furthermore, the regional specialisation in agriculture shifted, but it brought only little sustained growth in aggregate value of farm output. Nevertheless, the productivity growth was rather high. While output per worker remained low compared to Britain, the gap narrowed over time with a higher TFP than in Britain. O Grada (1993) argues that changes in Irish farming patterns (induced by market conditions, embourgeoisement and technological change) reduced women's entitlement relative to men's and might therefore explain rising EFM in Ireland.

7.8 Education

Traditionally, women in Ireland had almost no rights. Girls and women had to have their meals after men and sons had eaten and they had to show consideration for them in many ways. School education was denied to more girls than boys, as women were regarded as not capable to make use of the acquired knowledge. If girls were offered school education at all, there were special curricula and books, in order to prepare them for their future life at home, that is, they learnt cooking, needlework etc. People believed that knowledge should be given to women only to a degree that should enable them to become a helpful housewife (Luddy, 1999).

Literacy and school attendance are both good indicators for the backwardness and poverty of a country. Two arguments back up this thesis: on one hand, poverty can lower the parental demand for school education, on the other hand it can be that families cannot afford school education because of their poverty.

The first argument, that poverty lowers demand for education, does not apply to Ireland according to O Grada (1993). He quotes Wakefield (1812)

with the statement: "I do not know of any part of Ireland so wild that its inhabitants are not anxious, nay eagerly anxious for the education of their children".

The second argument, that people cannot afford education, was weakened by the Intermediate act of 1878, which intended to ameliorate school education and preparation for university. First it was only designed for boys, until several influential women ensured that it was extended to all pupils (Luddy, 1999). In this act it was laid down that there should exist a central institution, which organized examinations and awarded prizes to the teachers. Moreover there were grants for boys and girls equally. The Irish education act of 1892 made school attendance compulsory for all children. Only from then girls went to school almost the same as boys. Yet it was unusual for girls to continue school after primary school. Nevertheless, several schools were opened in the 1860's in Dublin and Belfast, which offered secondary education to girls. This was the most remarkable development in the school system in the Ireland of the 19th century.[11]

While one would expect that higher female education would lower mortality by strengthening female bargaining power (and by giving access to school meals), McNay, Humphries, and Klasen (2005) found the converse effect for England and Wales and suggested that it was related to practise that high female literacy was a sign of poor female employment opportunities. The highest share of literate women can be observed in Leinster and Ulster, the lowest in Connaught (see figure 29).

7.9 Number of births

High numbers of births often increases risks of maternal mortality in reproductive ages when health care is of a low standard. As a proxy for fertility rates, I use the number of births per woman aged 20 to 44 during the year of the census. Births to women are depicted in Figure 33 and show that the lowest birth rates were in 1881 and fertility rose from then. The lowest value was almost only 0.8 children per woman in Connaught, in 1926 the rate is up at least to 1.4. Ulster always shows the highest rate, so fertility seems to be related to urbanisation.

[11] In spite of all these improvements there were still discussions that the female brain was not able to perform as well as the male one. Therefore at school girls were mostly prepared for their future life as housewives: they learned cooking, household management, child care etc. There were even special schoolbooks for the education of girls (Luddy, 1999).

Table 4: Summary statistics

Variable	Mean	Std. Dev.
Explanatories to 1926, 134 observations		
EFM 0 to 5	1.033	0.183
EFM 5 to 10	1.279	0.888
EFM 10 to 19	1.293	0.424
EFM 25 to 44	1.188	0.293
Overall Mortality rate	15.982	2.951
Females to males working	0.460	0.196
Share of workforce in prof. sector	0.119	0.061
Share of workforce in agriculture	0.521	0.146
Share of adults without job	0.206	0.075
Share of adult women in industry	0.098	0.064
Share of adult women in dom. sector	0.236	0.143
Share of adult women in prof. sector	0.047	0.021
Spinsters to Bachelors	0.809	0.138
Emigration women to men	1.018	0.270
No. of births per woman aged 20 to 45 per year	0.138	0.027
Share of farms 1 to 5 acres	0.134	0.055
Share of tilled area	0.056	0.030
Population density	0.259	0.339
Explanatories only to 1901, 108 observations		
Share of literate women	0.751	0.12
Female to male workhouse inmates	1.126	0.151
Fam. in 4th class housing	0.065	0.069

8 Estimation Results

We estimate the determinants of excess female mortality in different age groups, counties, and time spans with time and county-specific variables. As there are no time invariant county variables in our explanatory variables list the model can be estimated in the framework of a fixed effects panel model. Specification tests suggest, however, that in the age groups 0-4, 5-9, and 25-44 OLS is the preferred specification, while in the age group 10-19, random effects is the best.

The dependent variable is county excess female mortality.[12] The esti-

[12]We also ran the regression on the simply ratio of female to male mortality. The results are nearly identical and available on request.

mated parameters increase women's mortality relative to men's if they are positive. In case of a positive parameter one can speak about a negative influence of the explanatory variable on women.

Table 5 and 6 show the regression results when using the explanatory variables described in chapter 7 to explain excess female mortality. We include the age groups 0 to 4, 5 to 9, 10 to 19. The first regression is always for the longest time span possible (up until 1926), the third regression for the time span to 1901 but including more covariates, while the second regression uses fewer covariates and the shorter time span as a robustness check. In the age group 0-4, we are unable to explain EFM at the county level well, as the fit of the regression is poor and few determinants are significant. We suspect that this is related to measurement error in this age group as many infant deaths might have escaped registration.

Turning to the 5 to 9 age group, high female employment lowers EFM as hypothesized, suggesting that higher female bargaining power also helps their daughters. While this effect in areas where the share of professional workers is high, the converse is the case if the female share of employment in domestic service or the professional sector is high. In this age group, the share of literate women reduces EFM, which may also be related to better care practises among literate women.

The results for the 10-19 age group are shown in the next table. Three factors stand our in this age group. While economic structure and female employment do not strongly influence EFM at the county level, the largest and most significant impact is found for the female to male share emigrating. In areas where the female share among emigrees is particularly high, EFM is also particularly high, which would be consistent with a selection of effect where the worse off females are being left behind. Comparisons between the first and second specification show that this effect is particularly strong for the period up until 1901. The effect is large. A one standard deviation change in this ratio increases the index of EFM by 0.15, or about half of the average EFM observed in this age group.

Secondly, population density lowers EFM suggesting that urban areas generated better relative conditions for young females. Conversely, a high share of literate women is associated with higher EFM, just as it was found for England and Wales. Lastly, the relate share of women in workhouses is associated with higher EFM, which is in contrast to findings from England. To the extent that this is an indicator of relative female economic opportunities, the finding is not surprising. It may also indicate, that in contrast to

England and Wales, poor relief did not ensure better relative treatment than the household.

Lastly, we consider the results in the 25-44 age group where our models are best able to capture the spatial and temporal variation in EFM. Here we find a number of expected results. Female employment again is associated with reduced EFM. Conversely and consistent with findings from England and Wales, a high female industrial employment increases EFM, pointing to adverse health effects in this age group. Similar adverse conditions appear to hold in domestic service. Regarding economic structure, agricultural regions are associated with higher EFM, consisting with the view of lower and declining female employment opportunities there. Relative emigration rates again affect EFM, but the effect is only significant in the first specification where 1926 is included, suggesting that the effect is particularly large in that year. High shares of literate women as well as a preponderance of females in workhouses continues to adverse affect EFM in the county.

Based on these results, we can now also speculate on the reasons why EFM in Ireland was particularly high, certainly when compared to England and Wales (but also compared to the rest of Europe). Three factors appears important. First, Ireland is more agricultural (e.g. around 1880, Ireland's agricultural employment share was 52%, compared to England's 33%). As this adverse affects EFM, particularly in the 25-44 age group, this can account for part of the difference. Secondly, the adverse impact of the workhouse might contribute to the differences. While in England and Wales, the workhouse appeared to provide more equal access to resources than the household, this does not appear to be the case in Ireland. Lastly, and probably most importantly, the much higher emigration rates from Ireland appear to account for a large share of the reported EFM there, largely due to an apparent selection effect where counties with high female-male ratios of emigrants report much higher EFM of the remaining populations.

9 Conclusions

The aim of the paper was to explore the determinants of Irish excess female mortality in the late 19th and early 20th century. Several studies have described the phenomenon and possible explanatory factors (e.g. Fahey (2003) or Kennedy (1973)), but they did not empirically test these hypotheses.

Our findings on the influence of labor market participation of women

are in line with the results found earlier on England and Wales (McNay, Humphries, and Klasen, 2005) and with theories of intra-household resource allocation. We find that women's situation improves with a higher labor market participation. But, as working conditions are detrimental to health during the observed period, a higher female participation in sectors such as the industrial sector or domestic service ruins the gains in power over family resources.

Of particular importance, however, appears to be the impact of emigration on the EFM of those left behind. The higher the female-male share of emigration in this high-emigration country, the higher EFM of the left behind suggesting a positive selection of emigrants (and a negative selection of those left behind). One may also speculate that an additional channel of this effect might be the reverse relationship, i.e. that poor conditions for females in this county led to high female relative emigration rates. This is a hypothesis worth examining in more detail in future work.

Future work should also consider the incidence of EFM prior to the Irish famine where rates of EFM appear to be very high as well and emigration rates were low. Examining that period as well would then add to the understanding of the Irish exceptionalism in the poor female relative survival prospects.

Table 5: Panel regression 1

	(1) EFM 0 to 4	(2) EFM 0 to 4	(3) EFM 0 to 4	(4) EFM 5 to 9	(5) EFM 5 to 9	(6) EFM 5 to 9
Mortality rate	0.032**	0.012	0.008	0.037	-0.015	0.003
	(2.91)	(1.28)	(0.81)	(0.71)	(0.56)	(0.11)
W to m working	0.732	0.461	0.796	-5.875	-3.246+	-3.820+
	(0.92)	(0.70)	(1.15)	(1.59)	(1.72)	(1.94)
Workers in prof	0.722	-0.465	-0.347	-0.097	-5.715+	-6.562+
	(0.54)	(0.40)	(0.28)	(0.02)	(1.72)	(1.86)
Workers in agr	0.318	-0.253	-0.278	3.177	-0.169	-0.419
	(0.42)	(0.38)	(0.40)	(0.90)	(0.09)	(0.21)
Pop. with no job	-0.627	-0.203	0.005	4.673	-0.044	-0.381
	(0.71)	(0.25)	(0.01)	(1.14)	(0.02)	(0.16)
W in dom * 1871	1.108	0.496	0.491	-4.074	-5.136+	-5.332*
	(0.94)	(0.53)	(0.52)	(0.74)	(1.93)	(2.00)
W in ind.	-0.241	-0.384	-0.610	7.708+	3.131	3.440
	(0.24)	(0.42)	(0.66)	(1.67)	(1.20)	(1.32)
W in dom	-1.393	-0.976	-0.931	11.497+	5.065	4.807
	(1.06)	(0.86)	(0.82)	(1.89)	(1.58)	(1.50)
W in prof	2.504	-0.009	-0.440	15.175	9.341	10.487
	(0.93)	(0.00)	(0.15)	(1.22)	(1.15)	(1.27)
Spinst to Bach	-0.407	-0.472+	-0.562+	2.314	0.439	0.103
	(1.24)	(1.72)	(1.92)	(1.52)	(0.56)	(0.12)
Emig w to m	0.058	0.044	0.017	-0.103	-0.125	-0.223
	(0.52)	(0.39)	(0.15)	(0.20)	(0.39)	(0.68)
No. of births	-2.145*	-1.571+	-1.201	-1.490	3.588	0.117
	(2.14)	(1.96)	(1.22)	(0.32)	(1.57)	(0.04)
Perc. tilled area	-0.609	0.029	-0.126	-0.190	2.205	2.979
	(0.73)	(0.04)	(0.17)	(0.05)	(1.10)	(1.44)
Share small farms	-0.660	-0.771+	-0.811+	1.117	1.524	0.734
	(1.22)	(1.68)	(1.68)	(0.44)	(1.16)	(0.54)
Population density	-0.030	0.076	0.056	-0.537	0.090	0.255
	(0.31)	(0.89)	(0.63)	(1.20)	(0.37)	(1.01)
Share lit. women			-0.124			-1.193
			(0.45)			(1.54)
W to m in workh.			-0.108			-0.275
			(0.76)			(0.68)
4th class housing			-1.194+			1.374

Continued on next page...

... table 5 continued

	(1) EFM 0 to 4	(2) EFM 0 to 4	(3) EFM 0 to 4	(4) EFM 5 to 9	(5) EFM 5 to 9	(6) EFM 5 to 9
			(1.96)			(0.79)
1881	0.346	0.122	0.103	-2.045	-2.337*	-2.511**
	(0.81)	(0.37)	(0.31)	(1.03)	(2.45)	(2.64)
1891	0.165	0.050	0.050	-1.707	-1.908*	-2.050*
	(0.44)	(0.17)	(0.17)	(0.98)	(2.29)	(2.48)
1901	0.299	0.049	0.020	-1.313	-1.441+	-1.522+
	(0.84)	(0.17)	(0.07)	(0.80)	(1.79)	(1.89)
1926	0.155			-0.372		
	(0.48)			(0.25)		
Constant	0.691	1.652+	1.920+	-3.475	2.502	4.866
	(0.70)	(1.78)	(1.79)	(0.76)	(0.94)	(1.60)
Observations	134	108	108	134	108	108
R-squared	0.13	0.09	0.13	0.21	0.24	0.28

Absolute value of t statistics in parentheses
(1) to (6): OLS Regressions on pooled sample
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 6: Panel regression 2

	(1) EFM 10 to 19	(2) EFM 10 to 19	(3) EFM 10 to 19	(4) EFM 25 to 44	(5) EFM 25 to 44	(6) EFM 25 to 44
Mortality rate	-0.003	0.002	-0.005	0.037**	0.018	0.012
	(0.14)	(0.14)	(0.30)	(2.88)	(1.40)	(0.93)
W to m working	1.083	1.166	1.083	-1.791+	-1.976*	-1.955*
	(0.68)	(0.96)	(0.88)	(1.95)	(2.28)	(2.14)
Workers in prof	5.585+	0.940	0.831	-2.198	-1.177	-1.048
	(1.89)	(0.40)	(0.34)	(1.43)	(0.77)	(0.64)
Workers in agr	0.892	-0.764	-0.836	0.936	1.252	1.297
	(0.54)	(0.58)	(0.63)	(1.06)	(1.42)	(1.41)
Pop. with no job	0.581	0.827	0.702	-0.472	0.439	0.425
	(0.33)	(0.57)	(0.49)	(0.46)	(0.42)	(0.40)
W in dom * 1871	1.605	0.528	1.080	-0.401	-0.736	-0.608
	(0.67)	(0.31)	(0.65)	(0.29)	(0.60)	(0.49)
W in ind.	-0.621	-0.589	-0.641	2.734*	3.059*	3.036*
	(0.30)	(0.34)	(0.38)	(2.38)	(2.54)	(2.50)
W in dom	-0.483	-0.241	-0.439	1.779	2.648+	2.678+
	(0.18)	(0.12)	(0.22)	(1.17)	(1.79)	(1.79)
W in prof	-11.943*	-4.407	-3.655	3.432	1.723	1.686
	(2.15)	(0.82)	(0.68)	(1.11)	(0.46)	(0.44)
Spinst to Bach	-0.103	-0.527	-0.270	-0.068	0.248	0.410
	(0.15)	(0.99)	(0.49)	(0.18)	(0.69)	(1.06)
Emig w to m	-0.150	0.562**	0.665**	0.272*	0.049	0.105
	(0.66)	(2.74)	(3.28)	(2.14)	(0.33)	(0.69)
No. of births	-2.940	-2.338	0.229	-0.297	0.207	1.453
	(1.36)	(1.49)	(0.12)	(0.26)	(0.20)	(1.12)
Perc. tilled area	0.096	1.147	0.944	-0.012	-0.011	-0.197
	(0.05)	(0.80)	(0.64)	(0.01)	(0.01)	(0.21)
Share small farms	-0.355	-0.378	0.388	-0.008	0.010	0.367
	(0.28)	(0.39)	(0.39)	(0.01)	(0.02)	(0.58)
Population density	-0.269	-0.249	-0.369*	0.136	0.081	0.025
	(1.22)	(1.43)	(2.05)	(1.22)	(0.73)	(0.21)
Share lit. women			1.001+			0.514
			(1.86)			(1.43)
W to m in workh.			0.616*			0.210
			(2.37)			(1.12)
4th class housing			-0.102			-0.024

Continued on next page...

... table 6 continued

	(1) EFM 10 to 19	(2) EFM 10 to 19	(3) EFM 10 to 19	(4) EFM 25 to 44	(5) EFM 25 to 44	(6) EFM 25 to 44
			(0.09)			(0.03)
1881	0.962	0.449	0.708	-0.501	-0.522	-0.436
	(1.13)	(0.74)	(1.19)	(1.02)	(1.19)	(0.99)
1891	1.142	0.711	0.875+	-0.466	-0.429	-0.372
	(1.52)	(1.34)	(1.70)	(1.08)	(1.12)	(0.97)
1901	0.925	0.523	0.738	-0.460	-0.470	-0.411
	(1.30)	(1.02)	(1.48)	(1.12)	(1.27)	(1.10)
1926	1.292*			0.200		
	(2.01)			(0.54)		
Constant	0.075	0.817	-1.313	0.517	0.220	-0.815
	(0.04)	(0.45)	(0.65)	(0.45)	(0.18)	(0.58)
R-squared				0.55	0.35	0.37
Observations	134	108	108	134	108	108
R^2 (within)	0.43	0.41	0.41	0.55	0.35	0.37

27 Counties included
Absolute value of t statistics in parentheses
(1) to (3): Panel random effects, (4) to (6) OLS
+ significant at 10%; * significant at 5%; ** significant at 1%

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10 Appendix

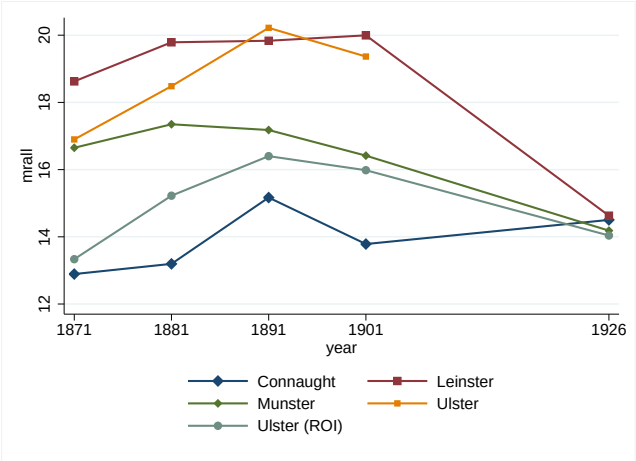

Figure 18: Overall mortality rates

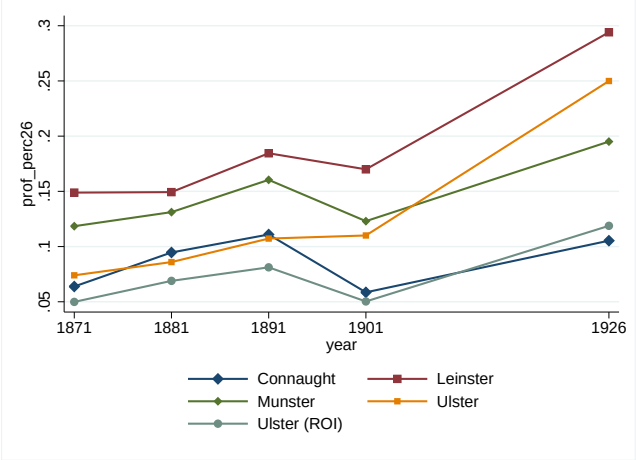

Figure 19: Percentage of Men and Women over 20 years working in the professional sector (based on census data; own calculation)

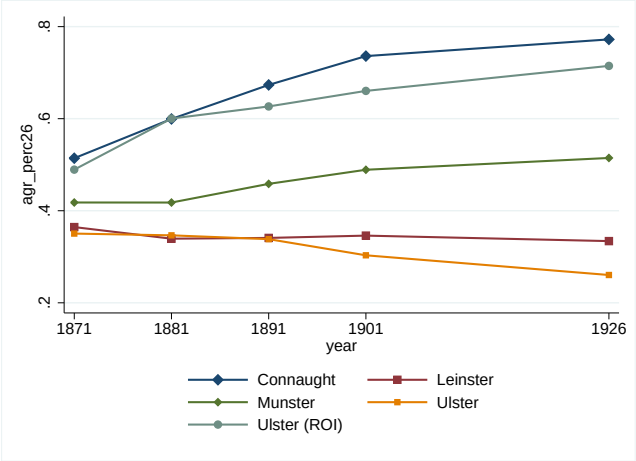

Figure 20: Percentage of Men and Women over 20 years working in agricultural sector (based on census data; own calculation)

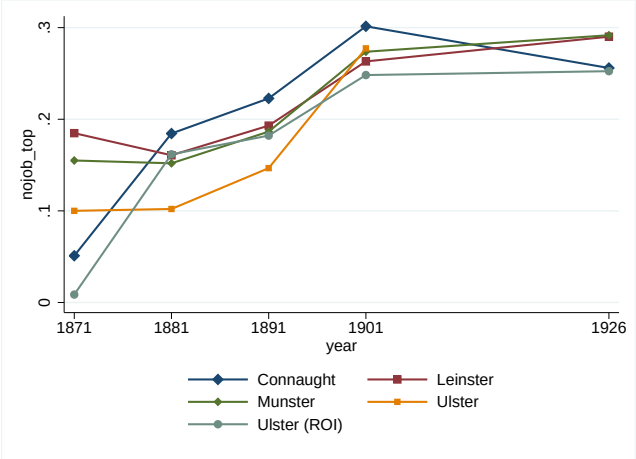

Figure 21: Percentage of Men and Women over 20 years not working rel. to population (based on census data; own calculation)

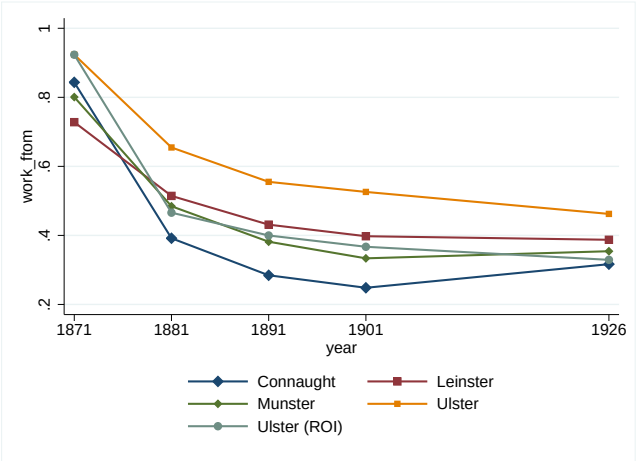

Figure 22: Women working to men (based on census data; own calculation)

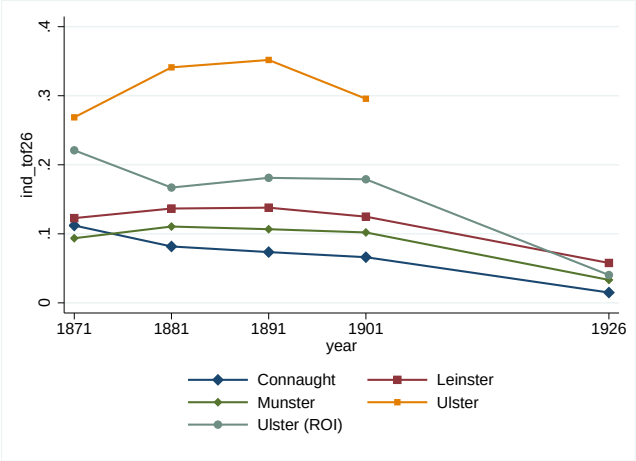

Figure 23: Share of adult women in industry (based on census data; own calculation)

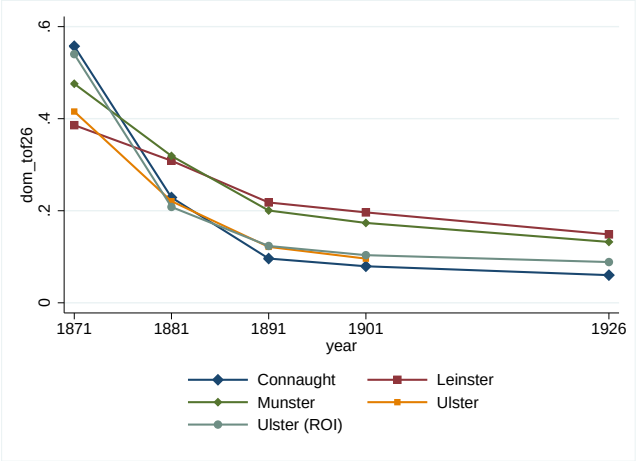

Figure 24: Share of adult women in domestic sector (based on census data; own calculation)

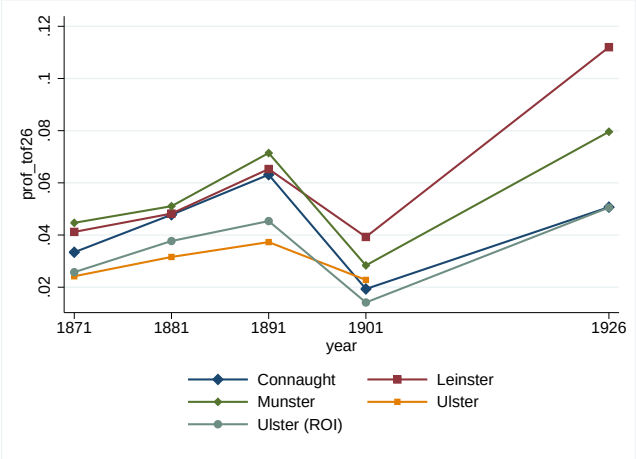

Figure 25: Share of adult women in the professional sector (based on census data; own calculation)

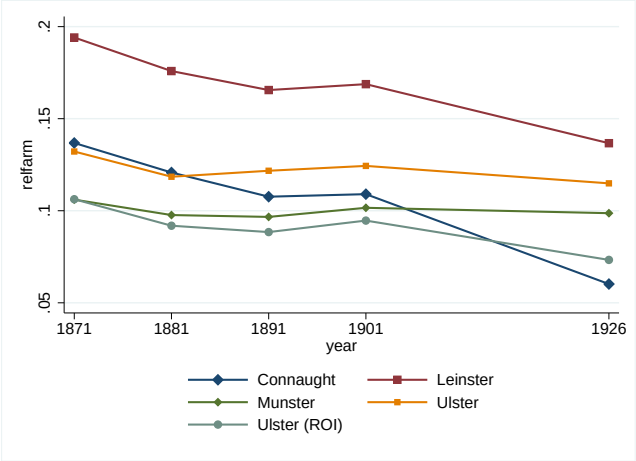

Figure 26: Small farms relative to all farms (based on census data; own calculation)

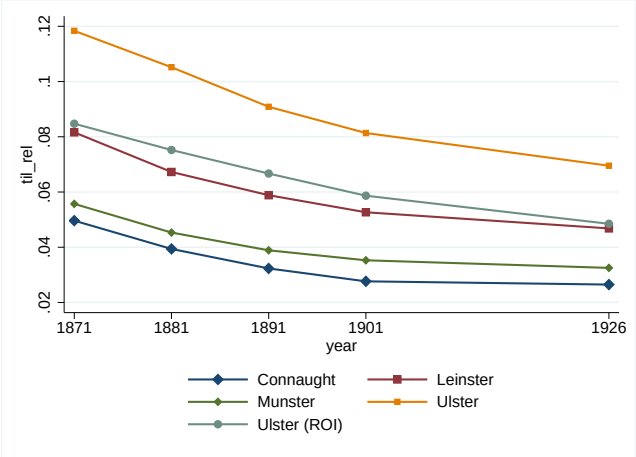

Figure 27: Share of county area cultivated with crops, fruit and horticulture (based on Irish Farm Statistics)

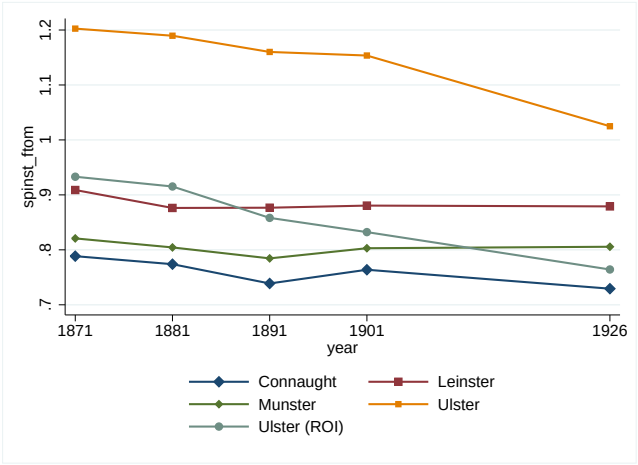

Figure 28: Spinsters rel. to bachelors (based on census data; own calculation)

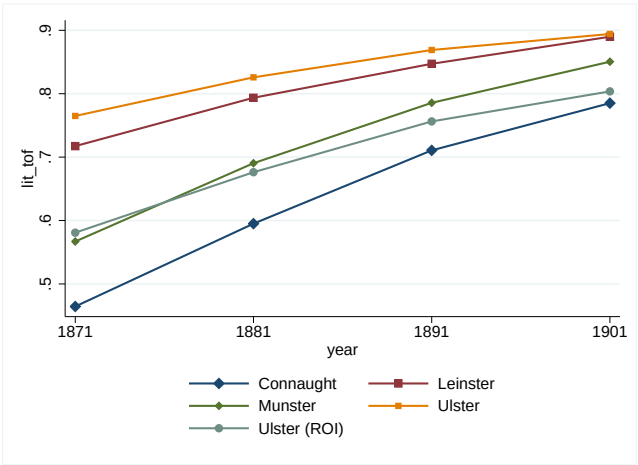

Figure 29: Share of literate women over five relative to all women over five (based on census data; own calculation)

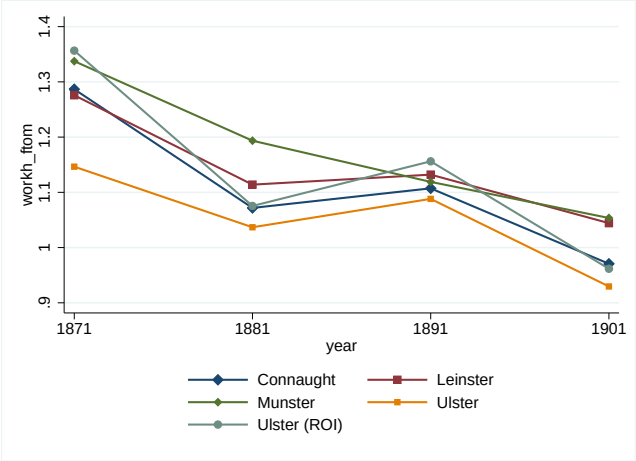

Figure 30: Women in workhouses to men in workhouses (based on census data; own calculation)

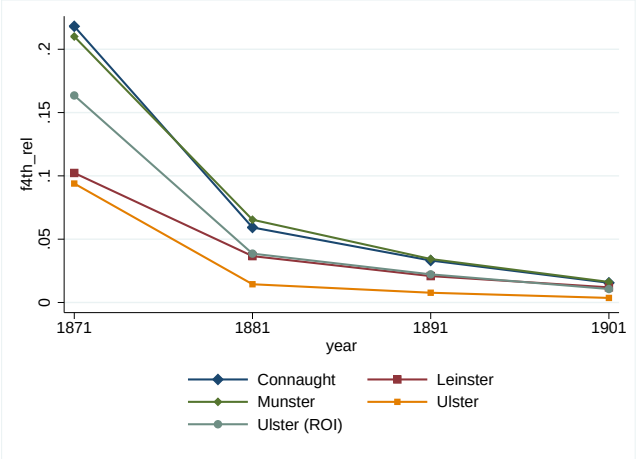

Figure 31: Share of families living in 4th class housing (based on census data; own calculation)

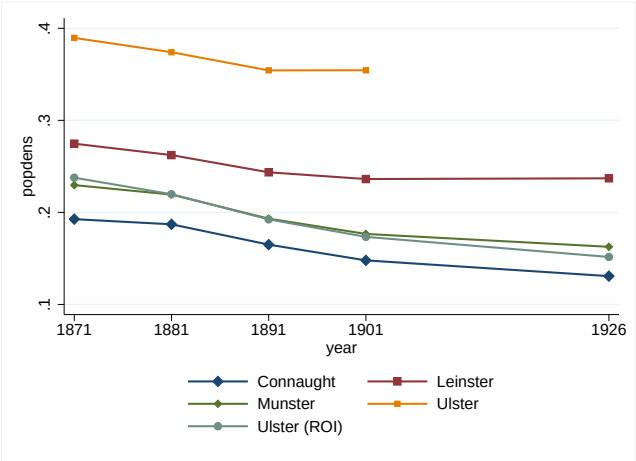

Figure 32: Population density (based on census data; own calculation)

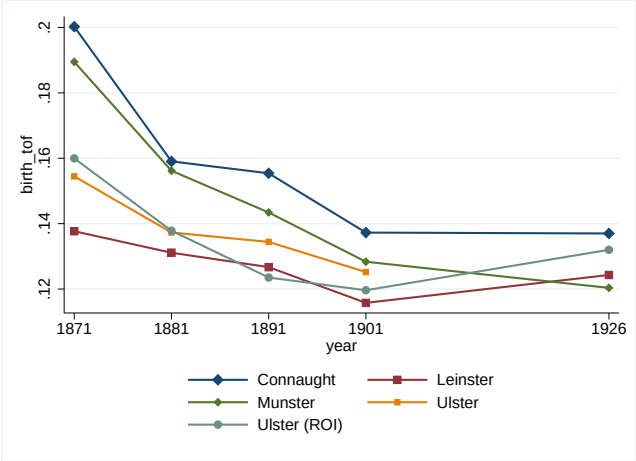

Figure 33: Number of births relative to women aged 20 to 44 (based on census data; own calculation)