The Fertility Decline in Switzerland 1870 – 1930. A study of cultural and economic variables using panel data.

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Abstract: This study analyzes the impact of socioeconomic and cultural variables on marital fertility for Switzerland in the period comprising 1870 – 1930. Using panel data techniques the analysis shows that variables measuring industrialization had an impact in declining fertility as well as cultural variables such as religion and language.

Keywords: fertility decline, Switzerland, panel data estimation, historical demography

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> "There are no magical 'cultural' or 'economic' forces controlling individuals, other than those affecting the dispositions, thoughts and actions within individual human actors. People do not develop new preferences, wants or purposes because mysterious 'social forces' control them. What have to be examined are the social and psychological mechanisms leading to such changes of preference, disposition or mentality. What does happen is that the framing, shifting and constraining capacities of social institutions give rise to new perceptions and dispositions within individuals. Upon new habits of thought and behaviour, new preferences and intentions emerge…The crucial point in the argument here is to recognize the significance of reconstituitive downward causation on *habits*, rather than merely on behaviour, intentions, or preferences." (Hodgson, 2003; pp 162, as cited by Fleetwood, 2008; pp 188).

1. Introduction

The study of fertility decline in demography is a topic which has been of concern for both contemporary and historical populations. In analyzing the long term trends of fertility and mortality over time, scholars came up with the formulation of the debated demographic transition theory. The relevance and acceptance of this theory inspired a number of studies related to the great fertility decline in Europe with the aim of scrutinizing in detail which factors could have led to this change in populations. Another objective of such studies was also to have an understanding of how contemporary populations behave and in this way formulate policy advise.

The way in which scholars have approached this area of study has been using data of quality for historical populations of Europe. The results of these studies are in controversy and now one can not even claim that there is a demographic transition theory. Moreover, it could be agreed that there is not even a proper theory of fertility in which there is an articulate body of analysis trying to explain the main features of the economy and society and the way these structures influence fertility decisions by individuals (McNicoll, pp 441).

Nonetheless, there is still a growing concern among students of demography and sociology to discern which factors drove fertility down in the end of the nineteenth century and in the beginning of the twentieth century. Therefore, there has been a rising amount of studies with different approaches trying to explain the fertility decline in Europe. Nowadays, with the aid of more detailed datasets, it is possible to study

individual level decisions and in this way elucidate more how populations in the past were behaving in terms of controlling family size. However, there have also been advancements in econometric methods which help to estimate models of fertility change using less detailed datasets. These facts led me to the idea of trying to use these econometric methods with the objective of studying a country which is of high interest for the analysis of fertility decline and in this way try to offer an explanation with both empirical and theoretical purposes.

Switzerland is an unique country for the study of fertility decline due to the multiple social, cultural, and economic cleavages that coexist in the four different populations that conform the country; the Swiss-German speaking people who are in certain way culturally and as well geographically close to Germany and Austria; the Swiss-French population, culturally and geographically close to France, the forerunner in fertility decline in Europe; the Italian-Speaking population, adjacent to Italy, and the Swiss-Romansh; a minority in Switzerland located in the Grisons canton, an isolated area surrounded by mountains.
Moreover, to add more complexity and flavor to the study of fertility decline, these linguistically divergent populations are further divided in Protestants and Catholics. Another interesting feature of Switzerland is its unique political system, which grants autonomy from the federal government to its 26 cantons.

The studies of the fertility decline in Switzerland using aggregated data in a cross-sectional fashion have found that education, religion, and migration in the Italian-speaking canton of Ticino had an impact for the decline in marital fertility (Van de Walle, 1975, 1980).

The aim of this thesis is to use more advanced econometric techniques in order to test how changes in both socioeconomic and cultural variables influenced the change in marital fertility in the period comprising 1870-1930. Another explicit aim of the thesis is to also study fertility differentials in a pooled cross sectional fashion. Switzerland was a forerunner in fertility decline since its fertility dropped by 10% in 1885 (Lesthaeghe, pp 4). Therefore, the period we are analyzing is of crucial importance for the understanding of the factors that contributed to the decline in fertility in this small, landlocked country of Europe.

The dataset that will be used in this study belongs to the both acclaimed and criticized European Fertility Project[1]. However, there have only been two published articles making use of this dataset, and a manuscript which unfortunately was never published[2] (Van de Walle, 1975, 1980, manuscript). The methods used to analyze were rather basic and in cross-sectional fashion. Van der Walle does simple linear correlation analysis and also variance analysis.

This leaves us room to explore in more detail and with different statistical methods this dataset and we hope that the results obtained will be of interest. This thesis will apply panel data methods similar to those used by Dribe (2008); Galloway et al (1994); and Richards (1977) to estimate the influence of both economic and cultural forces in fertility change. Furthermore, to our knowledge, there has only been one study (Richards, 1977) using data from the EFP and using similar econometric techniques as the ones we will use in this thesis.

It is a conviction of mine that both economic and social change are intertwined and changes in these variables have an effect in the decisions to limit family size.
This is why the objective of the present study is to test a multifaceted hypothesis of fertility decline in Switzerland, where both economic transformation and cultural change (change in norms regarding religious practices) had an effect in the behaviour of Swiss people regarding the decision to limit marital fertility.

Based on the description given above, we can now turn to the main questions of this thesis. Question 1 and 2 address "cultural" hypotheses whereas question 3 addresses the role of economic change and its possible relationship with family limitation:

1) How important is religious affiliation in the fertility decline in Switzerland?

2) Are there significant fertility differences between linguistic regions?

[1] This dataset is available in the website of the Office of Population Research of Princeton University. http://opr.princeton.edu/archive/pefp/switz.asp
[2] This manuscript is available in the library of the University of Neuchatel, Switzerland; and was kindly provided by PhD Reto Schumacher of the University of Geneva.

3) Did economic forces play a role in the process of fertility decline?

A potential limitation to this study is the aggregate nature of the data. We will not be able to really assess the direct mechanisms which may have an influence in fertility decisions and on religious values; for that, we would need a far more detailed data set of longitudinal characteristics. However, the data we have is presented by district. It is worth reminding that in the period under analysis, our dataset contains details for 25 cantons which are formed by around 177 districts. Thus, even if it is aggregated data, it contains certain level of detail which makes it interesting for the statistical analysis to be carried in this thesis.

We think this approach will shed light on some aspects of the decline of fertility in Switzerland and it will connect to studies making use of the same econometric techniques, specially the study made by Richards (1977), which also made use of data created and used by the EFP.

The thesis starts with a general background describing the controversy around the EFP methodology and some previous research supporting the application of the econometric methods we will use in this thesis. Then, the paper briefly describes the topic of pre-transitional fertility. The next section gives an overview of what the data roughly shows in a cross-sectional fashion. Here, we will present the different indexes of the EFP and its trend differentiating them by religious and linguistic affiliation. Afterwards, a justification of the model to be used is given, taking into account the critics made to the EFP methods. Then we describe what we had to do with the data in order to be estimated in a panel data fashion. Results are given afterwards. Finally, the paper offers a conclusion.

2. General Background and some previous research

The fertility decline in Europe in the nineteenth and early twentieth century is a topic which has gained the interest of many demographers at least in the last sixty years. This motivation to study why fertility declined, led theorists such as Frank Notestein and

Kingsley Davis to devise their first attempts to conceptualize the puzzle that this social and demographic phenomena presents. Their efforts led to the formulation of the controversial demographic transition theory. This theory emphasized the role of modernization, urbanization and industrialization as factors that increasingly reduced the demand for children and also the supply of children (through lower infant mortality). The theory also states that modernization is a quite complex social and economic phenomenon.

On the empirical side, the most influential studies are the ones done under the direction of Ansley Coale, namely, the European Fertility Project. The European Fertility Project tried to assess to what extent economic factors were influential in the decline. The authors of the diverse monographs published for several countries in Europe concluded that economic forces were not as important in determining fertility decline as it was thought and predicted by the demographic transition theory. The EFP stressed the influence of cultural factors such as religion or language as important factors leading to a decline in fertility through the change of how individuals´ perceptions and motivations for family limitation evolve over time (Andersson; Lesthaeghe and Wilson; 1986).

However, even if there are theories and empirical studies done in the matter, there seems to be some disagreement in the way these authors think fertility decisions shifted from high and uncontrolled fertility, to low and controlled fertility.

The general approach and results found by the EFP has been criticized due to the fact that the statistical models used do not reflect completely the idea that Ansley Coale had that fertility changes through time, not only in a specific year. (Brown and Guinnane, 2007). Additionally, the units of analysis in the EFP are too large to reflect variation in the individual level, and the information that most of the studies used regarding socioeconomic change, could probably not reflect the extent of the process of modernization. Furthermore, another potential critic to the EFP approach is that statistical procedures were biased in such a way that predisposed them to reach the conclusion that social and economic changes were irrelevant (Brown and Guinnane, 2007, pp 575).

A study made for Prussia (Galloway, Hammel, Lee; 1994) made use of a richer dataset in terms of both sample size and detailed variables which could reveal more information

about the process of modernization. Furthermore, they used panel data methods to estimate their models, which were not done by the EFP researchers, and the authors came up with results which reveal that economic circumstances of change indeed had an impact in fertility outcomes. Another potential source for the differences in the conclusions mentioned could be that the units of analysis were aggregated for the EFP while the datasets for the Germany studies were more disaggregated and contained variables that could add more social gradients to the study.

Another study which made use of advanced econometric techniques (Richards 1977) and using data provided by the EFP researcher John Knodel, found that analyzing the data with panel data estimations improves the power of explanation of socioeconomic variables.

2.1 A short note on pre-transitional fertility

Before starting with the main core of this thesis, it is quite relevant to say something about the intellectual debate of deliberate control of fertility before the onset of the fertility decline, and in order to start in a clear manner by what is meant to have changed during the fertility transition from high and uncontrolled levels to low and controlled ones, it is imperative to mention the notion of Ansley Coale, the intellectual leader of the European Fertility Project, about the conditions that need to be met in order to observe a decline in marital fertility. Coale said that “first, fertility must be within the calculus of conscious choice; second, perceived social and economic circumstances must make reduced fertility seem advantageous to individual couples; and third, effective techniques of fertility reductions must be available” (Coale, 1973; cited in Lesthaegue & Wilson in Coale and Watkins, pp. 261).

Having said this, now we turn to have a small discussion about pre transitional fertility, a topic which has dealt with how probably the fertility decline started to evolve since this time.

The conception about pre-transitional fertility in Europe is centered on the debate of whether there was a deliberate control of fertility decisions, or if the populations were merely in a state of natural fertility, which is defined by Louis Henry (1965) as a state

where there is absence of conscious control over fertility. It is widely acknowledged that a way to control fertility was the postponement of marriage until couples were able to economically sustain themselves satisfactorily. The studies of populations made at a highly aggregated level trying to measure the impact of increasing food prices on fertility outcomes (Galloway, 1988) find that indeed there is a negative impact on fertility when price crisis emerge; however, the authors do not seem to believe that this negative impact was due to a deliberate choice in controlling family size; they point out to an explanation involving temporal malnutrition, spousal separation, or marriage postponement.

In order to test for the hypothesis of whether pre-transitional populations were exerting a conscious control over their fertility decisions, a statistical technique (the so called M and m analysis) devised by Ansley Coale offers the opportunity to test whether there is deliberate control of fertility; more specifically, the method aims at looking if there was parity-specific control.

Some studies made using this statistical method find no evidence of deliberate control (Knodel, 1978; Alm Stenflo, 1989), rising the doubts that pre-transitional populations were in a state of natural fertility, and adding evidence to the diffusion of innovation hypothesis supported by the EFP.

Nonetheless, in studies made using longitudinal individual level data studying the impact of high prices on fertility (Bengtsson and Dribe, 2006), it is acknowledged that social groups in adverse economic circumstances (landless and semi landless peasants) were regulating their fertility in a deliberate way in response to high rye prices. Furthermore, deliberate spacing behaviour was also found for the belgian town of Leuven before the onset of the fertility decline (Van Bavel, 2004).

Therefore, there is still controversy on whether before the onset of the fertility decline, there was an attempt of certain populations to control their fertility in a deliberate way or not.

For Switzerland, there is no complete census data before 1870 for the whole country, thus, we will not be able to give an overview of pre-transitional fertility levels for our country subject of study.

3. Theoretical background

The theories which will serve as basis for analysis in this thesis will be of two kinds. Firstly, demographic theories related to the fertility decline; and secondly, theoretical approaches which deal with the way religion influences fertility decisions, more precisely, how religion could have shaped to some extent the fertility decline mainly in Europe.
The following sub-sections review the theories which will be relevant to understand and explain the results of our empirical analysis.

3.1 The Easterlin and Crimmins Supply-Demand Analysis of Fertility

This section gives an overview of the highly influential analysis of Easterlin and Crimmins (1985) related to the fertility decline. We believe it is relevant to use this framework as a theoretical basis since the concepts included in the supply-demand analysis of these authors comprises economic and biological strands of theories of fertility decline. Thus, this approach is relevant for our study due to the fact that, on the one hand we are studying a country which experienced relatively early fertility decline, and on the other hand, our cultural variable in our study, i.e. religion, is somewhat related to the so called costs of regulation. We believe religious beliefs/norms/institutions may have an impact on the relative perception of the costs and benefits that involve using contraceptive methods.

The analysis of Easterlin and Crimmins is an extension of the framework which states that fertility is determined by proximate determinants (Bongaarts, 1978). These determinants are divided in indirect determinants, which are related to cultural and socioeconomic factors; and the direct determinants, which include a set of variables such as the proportion of women married, the deliberate control of fertility induced either by contraception or abortion; and natural fertility factors which some of them are: physiological factors related to amenorrhea, intrauterine mortality fertility; and other factors related to frequency of intercourse, sterility (Bongaarts, pp 106).

We can see that this last set of factors contain a cultural ingredient, because it could be said that breastfeeding practices, post partum intercourse are factors which are probably related to the norms and beliefs about these practices.

For Easterlin and Crimmins, the demand, supply and costs of regulation jointly influence the decision to deliberately control fertility.

Demand, supply, and regulation costs

Demand for children. The demand for children is partly determined by income, prices and tastes. This is also "the number of surviving children parents would want if fertility regulation were costless" (Easterlin and Crimmins, pp 14). On the income side, the effect an increase in income would have in the demand for children could be ambiguous. Reasoning as and economist would think, an increase in income would lead to an increase in the demand for children; but if we take into account that the process of transformation of societies from rural to urban, these preferences could be inverted because for example, an increase in wages for women or an increase in female labour force participation would lead to an increase in the costs of having children.

Supply of children. This concept is defined by the authors as "…the number of surviving children a couple would have if they made no deliberate attempt to limit family size" (Easterlin and Crimmins, pp 14). This determinant of fertility is also related to physiological factors such as breastfeeding practices, amenorrhea, frequency of intercourse (which could be related as well to spousal separation) and also to infant mortality. If infant and child mortality are inherent in a society, parents may decide to increase their fertility in order to replace the lost child. Additionally, as the authors mention, the potential maximum supply of children in a given society is usually lower to the reproductive capacity of women due to the fact that the aforementioned conditions have an impact on fertility decision.

What is worth remarking about this concept is the cultural aspect inherent in it. By this I mean not only the practices which are related to breastfeeding practices which impact women's fecundity; but as well the post partum frequency of intercourse may well vary between different different religious groups.

At this point it is important to mention that if the demand for children exceeds the supply, there will be no incentives to use birth control, and if the contrary occurs, that is, when supply is bigger than demand; people may find it appropriate to limit their fertility

Costs of regulation. This broad concept attempts to conceptualize people's attitudes related to fertility control methods and also to the access people have to these methods. These costs are also related to what extent information about birth control is diffused, how costly are the methods, and as well to the acceptance of individuals to the use of contraceptive methods. Therefore, we can see that this concept includes both cultural and economic factors in its core.
For our analysis of religious and linguistic differentials in Switzerland it is relevant to give a weight to this concept due to the fact that the willingness to adopt birth control may differ by religious affiliation, and it could also be that differential economic development in the regions of our study determine in part as well the accessibility people had to information regarding birth control methods.

However, even if there is an incentive to use contraceptive methods, this will depend on the extent of the costs of regulation. If costs are low and if the methods are accepted, fertility will be the same as the demand; and if costs are high, this situation would result in a corresponding supply of children

Furthermore, the authors then present how modernization processes are related to the demand, supply and costs of regulation. They mention five aspects of modernization, which are: 1) innovations in public health and medical care; 2) innovations in formal schooling; 3) urbanization; 4) introduction of new goods; 5) the establishment of a family planning program (Easterlin and Crimmins, pp 20). The way in which these factors have an influence in deliberate fertility control will not be fully discussed in this section due to the fact that their effect may seem obvious, but this will be touched upon in more detailed in the discussion of our statistical results and how they may relate to these aspects of modernization.

This framework seems to be appropriate to explain the evidence we will present later in this paper. We are not saying by any means that our empirical model will be able to

thoroughly test all the aspects of the Easterlin and Crimmins framework; due to the fact that it would be difficult to disentangle all the possible mechanisms which shaped fertility decline in Switzerland, but we will at least try to relate the main ingredients of the story of fertility decline in Switzerland to the framework presented above.

3.2 Innovation or Adjustment Process

Carlsson's highly influential paper (1966) advanced explanations regarding the European fertility transition. These explanations fell into two categories, the innovation/diffusion aspect, and the adaptation aspect. The innovation/diffusion explanation tries to argue that the use of contraceptive methods by people is a form of new behaviour. These new behaviour could be determined by advances in medical knowledge, changes in the social conventions about the role of women in the family, changes about the acceptability of using contraceptive methods, as well as new forms of communicating.
The adaptation argument points to the direction that the adoption of fertility control by certain population is influenced by how couples adapt to the changing economic and social contexts that were happening at that time.

However, it should be noted that in this study for Switzerland we will not be able to assess the diffusion of innovation proposition with empirical data in a way like Friedlander, Schellekens and Ben-Moshe (1991). The authors of this paper did created an index which was calculated taking into account the distance between the districts of their study, with a group of towns and cities which were larger and also with a strong population increase. This could well be a good proxy to have an idea of how the interaction between districts and urban centers was developing over time (Friedlander, Schellekens and Ben-Moshe, pp 337). For our study, we will not be able to do a direct test of the diffusion hypothesis due to the fact that our dataset does not contain information about the distances between the different districts and the main urban centers and we also do not have information about the total population size for every district for the entire period of analysis.

The innovation side of the story of birth control emphasizes that this is something new in human behaviour. A very important side of this fact is how the information about birth control methods is spread within a population. This is supposed to be started in urban settings and then it is spread to rural areas with certain delay (Carlsson, pp 150).
The adjustment theory is different from the innovation perspective in regards to how birth control is conceived. In this argument, birth control is not a new thing in societies, instead, it is influenced by how people perceive in certain way the costs and benefits of children and more generally, how structural factors such as economic and social ones, have an influence in the decision to bear children (Carlsson, pp 150). Hence, the social setting is a very influential component on fertility. The author for his analysis of the Swedish population made the conclusion that it was more the adjustment perspective the one that had more importance in the Swedish case.

This thesis belief is that the fertility decline was influenced by both innovation and adjustment processes. To prove in a comprehensive way this assertion would be quite difficult, partly due to the data limitations; however, we can say that the main results support the argument of the demographic transition theory which say that economic modernization had an effect in declining fertility; and even if it can not be completely proved that these variables influenced totally fertility decline, they were somewhat influencing the decline; and here comes into play the way in which as well the innovation- diffusion argument is relevant to this thesis due to the findings regarding the cultural variables. Because as said before, even if it can not be totally proved, the results using panel data estimation point to the direction that language and religion were as well an important factor which shaped fertility decline over time.

Thus, we are trying to enrich what we know about fertility decline by posing that this was a demographic phenomenon influenced by both cultural and economic factors. Going to the main actors in fertility behaviour, couples, it can be ascertained that individuals have a fragmentary sense of what they want of their reproductive lives and these decisions are based not only on the purely normative sense that a new way of behaving just started out of nothing without being influenced by other factors in society which are political, economical, familial, and so on. All this things are taken into account by the individuals into what Simon Szreter calls the “perceived relative costs of childrearing”.

3.3 The Cultural Variables

The concept of culture in the EFP is loosely defined. In this paper we will make the attempt to define culture on the basis of the interconnection between demography and anthropology. Even if the main part of the empirical analysis of this thesis is completely quantitative, it is worth defining the cultural variables (religion and language) under this approach due to the fact that this definition will help in the attempt to contextualize and explain the results found in the econometric analysis. Furthermore, it is relevant to mention this aspect of demography because the main findings of the EFP were that the cultural settings where fertility decline occurred were the main determinants of the decline in marital fertility, rejecting, if not entirely, the notion of the demographic transition theory that socio-economic variables could have influenced as well the fertility decline.

One accepted notion of culture and its relationship with demographic behaviour is given by Hammel (1990). The author proposes that there is a "culture for the people" and "culture by the people". Under the *culture by the people* notion, it is said that culture "determines people's actions by providing them with blueprints of how things ought to be conducted" (Bernardi & Hutter, pp 547). This notion tries to explain that in certain way people learn, internalize, conform, comply or rebel against the norms that are present in their social context on the basis of internally making a cost-benefit evaluation of how their decisions will affect their life. The "*culture for the people*" notion is more applied in behavioral models and it tries to explain why individuals living in the same cultural setting act they way they do (Bernardi & Hutter, pp 547).

Under this approach, it is also stated that cultural symbols are transformed and interpreted by the people for their own purposes, and this process is mainly done through interaction with other individuals, in the form of conversation, or practices (Bernardi & Hutter, pp 547).

It is in this respect that this notions of culture and cultural behaviour are relevant for this thesis due to the fact that religion and language are elements intrinsic in individuals and they may influence to some extent the decisions they make regarding the decision to

limit family size. In our context, it is relevant to hypothesize how individuals were able to assess the costs and benefits of contraception and how acceptable it was in terms of religious affiliation due to the fact that Protestantism and Catholicism differ in their rules regarding this important aspect of family life.

3.3.1 Theoretical approaches to study religion and fertility

The way demographers have interpreted the complex relationship between religious affiliation and fertility outcomes is mainly inspired by the work of Goldscheider (1971). For this author, there exist three hypotheses linking the relationship aforementioned. The first of these hypotheses, the so called characteristics hypothesis, states that any difference in fertility outcomes found between religious or ethnic groups will be mainly due to differences in socioeconomic development. Therefore, this hypothesis rules out the effect of religion on fertility rates once the proper socioeconomic variables are controlled in a statistical analysis. The second hypothesis, the minority group status hypothesis, states that the fertility decisions of certain religious groups are dependant of the social setting where the group exists (Schellekens & Van Poppel, 2006, pp 24). Finally, the religious values hypothesis says that the fertility behaviour of religious groups is strongly influenced by the rules and norms the religion by itself professes about fertility control. For example, religious ideologies might influence the duration of breastfeeding or the acceptance of the use of contraceptives. It is here where our expectations that Catholics will show higher fertility than Protestants meet. Catholics' ideology usually values children and emphasizes its reluctance to use contraceptive methods.

It is also important to state that determining which religious values/norms influence directly or indirectly the proximate determinants of fertility is a difficult task. As said before, one could argue that the differentials in fertility outcomes are just merely due to differences in economic development between Protestant and Catholics. On the other hand, some authors (McQuillan, 2004; Praz 2006,2009) have said that religious values and norms are not totally embedded in peoples' minds, these norms have to be enforced through state institutions and their power to communicate their ideas, either in spoken word, or on written material, in form of magazines or brochures.

In addition to the hypotheses described above, theorists in the area of religion and fertility have emphasized that it is not only necessary that values influence fertility decisions, religious ideology and its influence in individuals must be enforced by some religious institution and it must also have the power to enforce certain ideology/beliefs in order to say that their message was rightly conveyed (McQuillan, 2004).

Secularization

For Lesthaeghe and Wilson (1986), secularization is an important factor in fertility decline. In their study of this variable for several countries in Europe, they provide two hypotheses which are related to moral and religious perceptions of fertility control. They claim that in catholic populations the change in the view of fertility will not take place as in those populations with protestant faith. In doing so, they do a test a model in which they measure the change in fertility in periods and they include as independent variables data on occupational status of the population; whether they were employed in the agricultural sector or in the cottage industry.
They find religion and most importantly secularization (meaning as votes for non traditional parties) to have an impact on fertility outcomes; and they claim "the moral and ethical acceptability of fertility control is embedded in a much broader ideological development, not necessarily concurrent with economic modernization" (Lesthaegue & Wilson in Coale and Watkins, pp 292)

The notion of gender and religion in historical demography

Ann Francoise Praz makes the attempt in her research to call for the attention of historical demographers in making them interested in the gender aspect of demographic behaviour. She says that a renewed attention to "…the social process of gendering is actually a key element for capturing the linkage between individual lives and larger historical processes and this linkage is crucial to explain the mechanisms historical demographers strive to identify" (Praz, 2007, pp 255).

Praz is an author who has studied fertility decline in Switzerland with a strong focus on how gender relations within marriage are influential in the fertility behaviour of

couples. In Protestantism a gender role of a husband more supportive was promoted by the state institutions, instead, in the Catholics, the image of the dominant husband was the prominent form of behaviour promoted. These two different ways of viewing reproductive lives is important when studying fertility decline.

The way in which ideology impacts fertility can be through the use and acceptance of contraceptives and also through an increased demand for children ("Let God decide").

For Switzerland, Praz (2009) does a study of how also giving a dimension to gender to the study of fertility decline is revealing. She studies the way in which state institutions and the church influenced men's behaviour through the promotion of "male respectability". For Protestant cantons, the view of the male breadwinner model and that of a person who deserves intercourse whenever he wants, was progressively changed to that of a responsible father of his children and a support for his wife. This attitude was promoted in the form of writings.
Instead, in the Catholic cantons, this kind of behaviour was not encouraged at all. Sexual topics were not touched by the church, except on reaffirming the "spousal debt".

Moreover, Praz (2006) empirically tries to assess from a gender perspective the impact of state institutions on the fertility behaviour of the populations of two cantons of Switzerland with different religious beliefs, namely Protestants and Catholics. She finds that indeed state institutions and policies had an effect in the fertility transition of two cantons similar in economic conditions but different in religious affiliation. The author names some examples through which state institutions exerted influence in fertility decisions; through health policy and media policy and through school policy, through the impact of religious beliefs on the costs of children (Praz, pp 175).

These results making use of micro data should warn us about multiple social mechanisms through which fertility declines, and we are aware of the limitations of our dataset.

3.3.2 The linguistic context

In terms of linguistic heterogeneity within a country, we can surely affirm that an instructive comparable country with Switzerland is Belgium. Belgium is a country divided in French-speaking parts and Dutch-speaking parts (The Walloon and Flemish areas). Ron Lesthaegue on his research about historical populations in the fertility transition finds a pattern of differences in fertility outcomes by language region, even if specific towns were located nearby each other, and even if the villages were quite similar in economic characteristics. Specifically, the decline was faster and earlier in the French-speaking part of the country (Knodell and van de Walle in Coale & Watkins, pp 413).

This finding is striking and it reveals a pattern of change that is influenced by cultural factors that are probably associated with language; however, the mechanisms behind these findings have not been scrutinized in detail, in part because it is not that simple to say what is in language that affects or not fertility decisions.

The linguistic component in Switzerland and its possible relationship with declining marital fertility has only been analyzed in cross-sectional fashion and using rather basic statistical tools by Francine van de Walle (manuscript). She found that language was not an important factor in the decline of fertility, she emphasized more the influence of religious affiliation in the diverging trends of marital fertility; the influence as well of a socioeconomic variable (agriculture); and she did not find any strong evidence that industrialization had an influence in fertility decline when analyzing the linguistic regions of Switzerland.

We could only hypothesize that the spread of information about birth control was faster in districts which were closer to the main urban centers of Switzerland, such as Zurich, Basel, Geneva; where the decline in marital fertility was earlier than in other districts. But it is in this aspect where the complication about the social features of the districts comes in play. Differences in religious affiliation, in linguistic terms, and also in the level of economic development of the district. Therefore, it is not that simple to say that language was one of the decisive factors in declining marital fertility levels.

In a more theoretical point of view about language and its relationship with culture, we may connect this aspect with the notion of Simon Szreter's "communication communities". This author is interested in explaining how language and its intrinsic features could have had influenced fertility behaviour in England. We previously mentioned the "culture by the people" notion in which it was said the social context is important in a given population because it outlines the way people conduct and determine their actions. We can easily connect this notion with Simon Szreters writings. For him, "…roles, norms, and social identities are essential elements of the shared language of any mutually recognizing, communicating human group. They are constructed by and embodied in the shared social practices and values of social groups" (Szreter, pp. 546); or what he cleverly terms "communication communities".

This notion of culture and language provides us with an elegant background to hypothesize about our expectations of the different linguistic groups of Switzerland. It should be said that in the past, there was nearly no communication between the different parts of Switzerland, and this was further reinforced by the longstanding antagonism between Protestants and Catholics.

The way communication communities influences their members is through complex institutional and social mechanisms, and giving an answer to what aspects of language and linguistic regions had an influence, if any, on fertility outcomes for our populations is not an easy task.

Our study will most probably not be able to fully differentiate which determinants of fertility are in play when we talk about linguistic regions; however, it is the aim of doing this analysis to shed some light in how differentials by linguistic should not be disregarded when studying the fertility decline in Europe, by studying a highly heterogeneous country such as Switzerland. Furthermore, we would have to obtain other kind of data to see what is in language that affects fertility. This is problematic in aggregated studies as the one carried in this thesis.

The previous theoretical and empirical overview allows us now to explicitly state what we expect to find with the study being carried out in this thesis. On the economic side of the story, we have seen that even if there has been denial of the fact that variables measuring industrialization and urbanization have a negative impact on marital fertility, we have learned that this notion is no longer heartedly accepted due to the fact that the appliance of more elaborated statistical methods and also with the aid of more detailed datasets have found that these kind of measures indeed had an influence in the fertility decline of Europe. Therefore, we can safely argue that because we are using a statistical method more advanced than the one used by the EFP scholars, we could well expect to find a negative relationship between growing industrialization and marital fertility.

In regard to the so called cultural side of the story, we have seen that this notion is the most accepted by most of the previous research. The impact of religious affiliation in marital fertility has been acknowledged by different scholars and therefore, we could say that for our study of Switzerland we can expect to find some evidence that these factors also had an impact in the process of fertility decline.

4. The fertility indices

This thesis makes use of data collected by Francine van de Walle under the auspices of the European Fertility Project (EFP). As such, the indices the author calculated based on official data for Switzerland (*Statistique de la Suisse*) are in line with those devised by the EFP. Therefore, it is imperative to start describing the indices of fertility which will be subject of analysis throughout this study.

The basic indicators are *If, Ig, Ih* and *Im*. *If* is an index of total fertility, *Ig* is an index of marital fertility, *Im* shows the proportion of women in fertile ages who are married. Finally, *Ih* is an index of fertility of women not being married. As Coale and Treadway (1986) confirm, this index only contributes slightly to the overall fertility index *Ig*, this is why the total fertility index *If* is approximately equal to the product of the index of fertility of married women and the index of married women (*Im x Ig*). (Coale and Treadway, pp 33).

The researchers of the EFP devised these indexes with the idea that these should be related to the maximum number of births women would have had without fertility

control (natural fertility). In order to do this, the indexes are calculated in relation to the maximum fertility rates ever recorded, (which are not necessarily the maximum biologically possible); and these correspond to those of the Hutterite women in the period 1921-1930. The proportion of married index *Im* is a measure that offers an opportunity to see how women in childbearing ages would contribute to the determination of overall fertility. In a more detailed way, it can be said that this measure provides an idea of how marital status would contribute to the realization of maximum fertility (Coale and Treadway, pp 34).

All four indexes have a value which is between zero and one. A value of zero means no childbearing behaviour, while a value of one means that the population under study has fertility equal to that of the Hutterites.

These indexes can be written as in the following equation:

$$I_f = (I_m x I_g) + (1 - I_m) x I_g$$

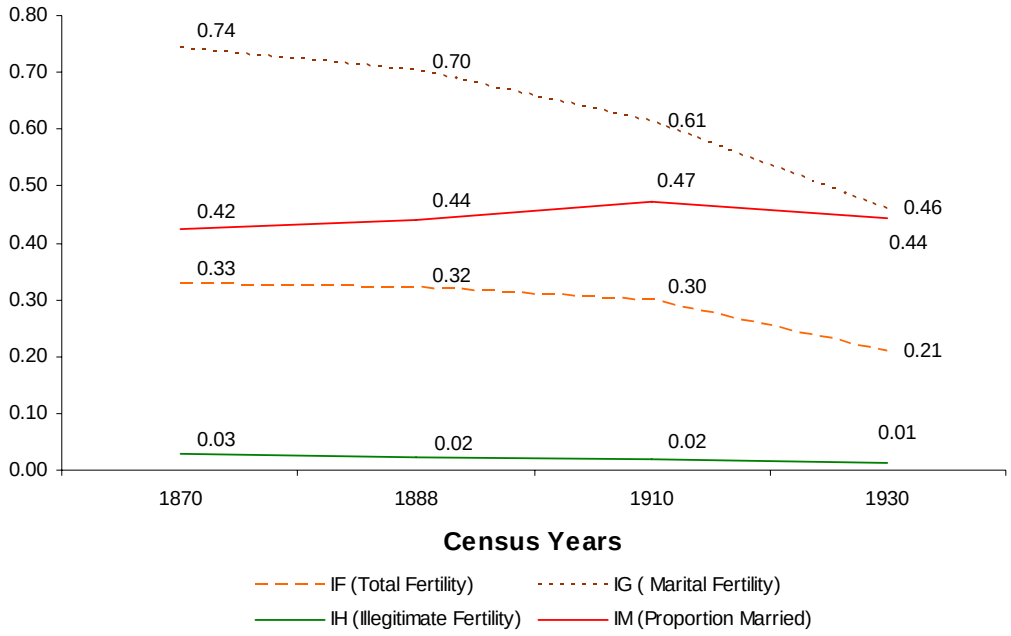
Concerning the data to be used in this study, it should be mentioned that it was not possible to obtain records before 1870 due to the fact that the first comprehensive census in Switzerland only took place in 1860, therefore, we can not present any data on pre-transitional levels. Van de Walle (manuscript) says that it is safe to accept the notion that before the starting period of analysis in this study, there was little decline in fertility, with the notable exception of Geneva.

In the following sections some basic patterns which were found in the main cultural variables of our dataset will be shown. First, the average of the four demographic indices for the whole period of study will be presented. Then, the same indices will be presented differentiating them by religious affiliation of Switzerland.
Afterwards, we will show how the indices look when we look separately at them by focusing on linguistic criteria.

5. Trends in the data

The following graph presents the basic trend of our central indexes subject of analysis in our study.

Figure 1. Fertility Indexes for the Census Years



It is clearly seen that marital fertility decreases in the period of analysis. The drop is more pronounced from 1910 to 1930 than for the previous census years which show a slight but steady downfall. As it was mentioned in the introduction, Switzerland is a forerunner in the fertility decline in Europe, being Geneva a quite special case since its fertility was already declining before the period of analysis. Geneva is a canton of Switzerland which shares its borders with France, the country which experienced an early decline in Europe; and as it is mentioned by van de Walle, this could be influenced by the impact of thirty thousand french migrants in 1880.

The nuptiality and illegitimate fertility indexes remain practically constant throughout the whole period.

In the next sections we will obtain a deeper picture of how these indexes differed when we look at them separetely by relgious and linguistic affiliation.

5.1 Religious affiliation

The following table and graphs illustrate the differences in the fertility indexes regarding religious affiliation. The criterion to divide the cantons between protestant and catholic was that if at least 60 percent of the population belonged to one or the other, otherwise it is a mixed canton.

Table 1. Demographic Indices by religious affiliation of cantons from 1870 to 1930

Protestants				
	1870	1888	1910	1930
IF	0.340	0.321	0.260	0.164
IG	0.727	0.669	0.522	0.339
IH	0.029	0.025	0.020	0.012
IM	0.447	0.458	0.475	0.461
Catholics				
	1870	1888	1910	1930
IF	0.338	0.334	0.339	0.250
IG	0.826	0.777	0.728	0.590
IH	0.024	0.020	0.017	0.011
IM	0.394	0.419	0.454	0.415
Mixed				
	1870	1888	1910	1930
IF	0.281	0.267	0.259	0.182
IG	0.665	0.614	0.544	0.416
IH	0.024	0.020	0.019	0.011
IM	0.405	0.419	0.458	0.427

A first thing to note of the table is that the index of marital fertility is the highest for the catholic cantons, and in some years it is the lowest in the mixed cantons. The picture

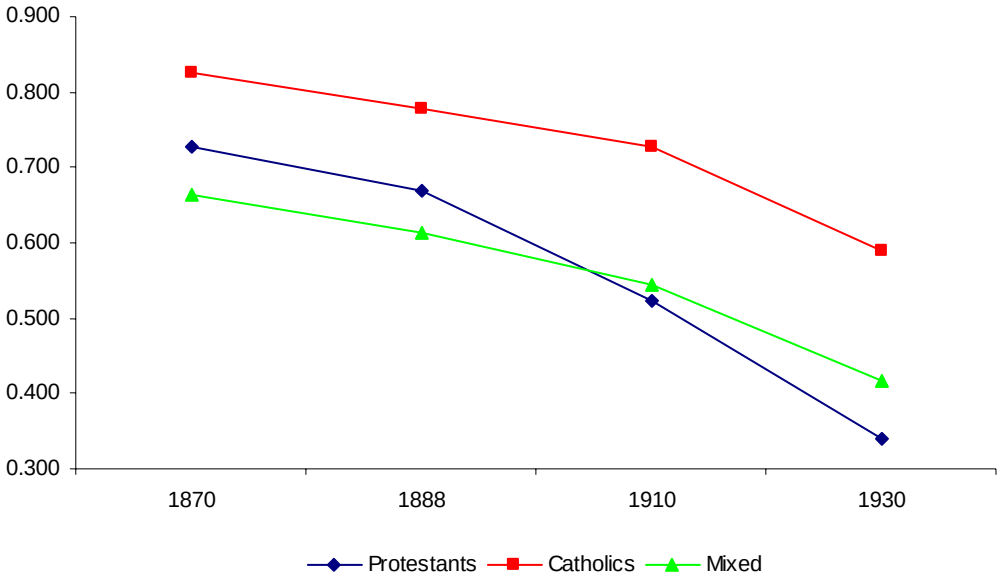
obtained in the mixed districts is similar to the protestant ones. Already in 1910 fertility had shown a noticeable decline from its level in 1888 and it accelerated until 1930. Another interesting feature to note is the difference in the proportion married. The tendency seems to be constant for protestant and mixed cantons, but the level of *Im* is lowest in the catholic cantons.

It could be inferred that the decline of marital fertility in protestant cantons of Switzerland was well underway in 1888, speeding up in 1910 until reaching a value of 0.339 in 1930. Whereas the marital fertility of catholic districts up to 1910 still shows a relatively high value, declining slightly in 1930. According to Francine van der Walle (manuscript) there are catholic districts that even in 1960 show a high level of marital fertility, however, these districts are located in high altitudes, a result that she found to be of importance in explaining fertility differentials.

Francine van der Walle in her manuscript reports simple linear correlations between the proportion of Catholics and the fertility indices. She finds a weak relationship in the beginning of the period, but by 1910, she says that based on the high correlation coefficient and the time when Ig declined under 0.6, we can say that there is evidence of the difference in speed of the decline between the two religious groups.

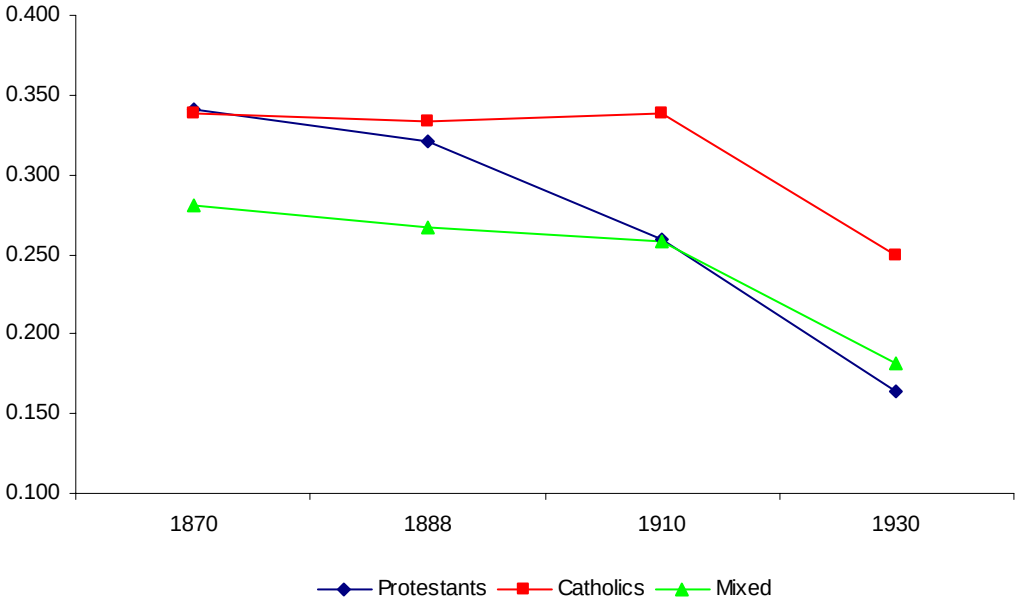
In figure 2, it can be appreciated the course of marital fertiliy looking at the different religious groups of Switzerland. It is remarkable that the level of marital fertility is higher for Catholics in the whole period of analysis and it well stays at a high level by 1930. Instead, the Protestants show a precipitous decline especially in the period of twenty years comprising from 1910 to 1930. We believe that religious affiliation alone is not the main determinant of the differences in the levels of marital fertility; however, it is safe to say that it is an important factor which influences marital fertility.

Figure 2. Index of Marital Fertility (Ig) by Religious Affiliation



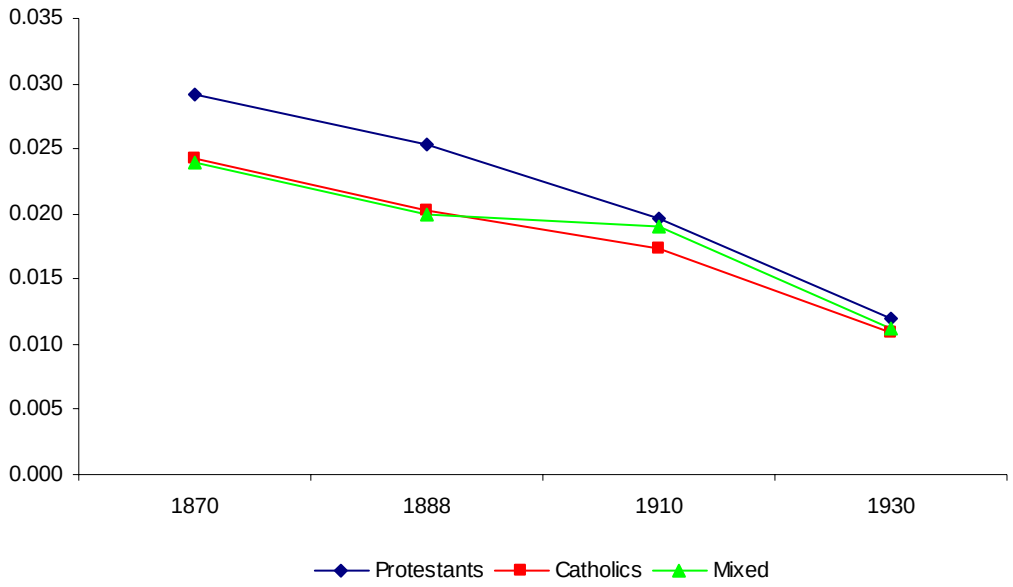
The picture we obtain in figure 3 for the index of overall fertility is quite similar to the one analyizing marital fertility alone.

Figure 3. Index of Overall Fertility (If) by Religious Affiliation



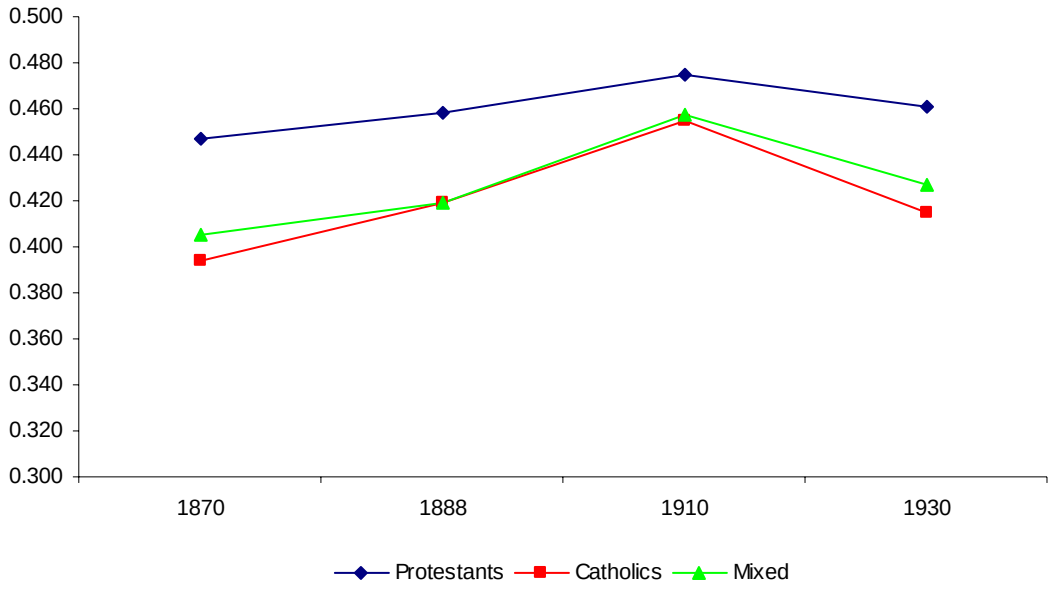
In figure 4 we can see the levels in illegitimate fertility. Francine van de Walle in her manuscript emphasizes that Switzerland as a whole was a country with one of the lowest levels of illegitimate fertility, thus, its contribution to overall fertility is quite small. What can be seen in the figure is a steep decrease in this index. Furthemore, it is quite clear that this index is lower for Catholics, a result that should come as no surprise due to the high importance and moral value that this religion gives to the marriage institution and to childbearing only within marriage.

Figure 4. Index of Illegitimate Fertility (Ih) by Religious Affiliation



In figure 5 we can appreciate the development of the index which is an approximation to nuptiality. Switzerland was a country that shared with other countries the pattern of late marriage and high celibacy, by 1860 the mean age at first marriage for women was 28, while only 17 percent of females in the age group 20-24 were married (Van de Walle, manuscript). A point that is remarkable from the figure below is the fact that this index is lower for Catholics than for Protestants.

Figure 5. Index of Proportion Married (Im) by Religious Affiliation



5.2 Linguistic affiliation

The percentage distribution of the population of Switzerland by language is roughly 70% of German speaking, 21% of French speaking, 7% of Italian speaking, and nearly 2% Romansh speaking.

There exist some mixed cantons where both German and French are official languages (Bern, Valais, and Fribourg) and in the canton of Grisons German, Italian and Romansh are official.

The following table shows the demographic indices for the different linguistic regions of Switzerland. The first fact that is easily observable is that the French districts have a lower fertility than that of the German ones.

Table 2. Demographic Indices by language spoken in districts: 1870-1930				
German				
	1870	1888	1910	1930
IF	0.337	0.320	0.303	0.213
IG	0.761	0.703	0.618	0.468
IH	0.029	0.022	0.019	0.012
IM	0.423	0.440	0.474	0.446
French				
	1870	1888	1910	1930
IF	0.330	0.333	0.286	0.200
IG	0.703	0.701	0.573	0.419
IH	0.030	0.030	0.020	0.012
IM	0.449	0.455	0.481	0.467
Italian				
	1870	1888	1910	1930
IF	0.263	0.277	0.300	0.178
IG	0.705	0.708	0.674	0.467
IH	0.007	0.015	0.017	0.011
IM	0.367	0.377	0.435	0.369
Romansh				
	1870	1888	1910	1930
IF	0.275	0.300	0.314	0.234
IG	0.769	0.727	0.709	0.596
IH	0.011	0.018	0.012	0.011
IM	0.352	0.401	0.433	0.385

At this point it is important to mention the canton Geneva. Geneva is the canton of Switzerland with lowest marital fertility and it was already declining in the beginning of the period of our study. If we remove Geneva from the sample, the differences between the German and French *If* are nearly negligible. We should also mention that Geneva was the place where Protestanism was born in Switzerland with Calvin as its main prominent personality.

However, if we turn to differentials in marital fertility, we can see that the French districts show the lowest levels of fertility while the Romansh show the highest.

Looking at the proportion married, we can see that it is very similar in the French and German districts, but it is quite lower in the Italian and Romansh districts.

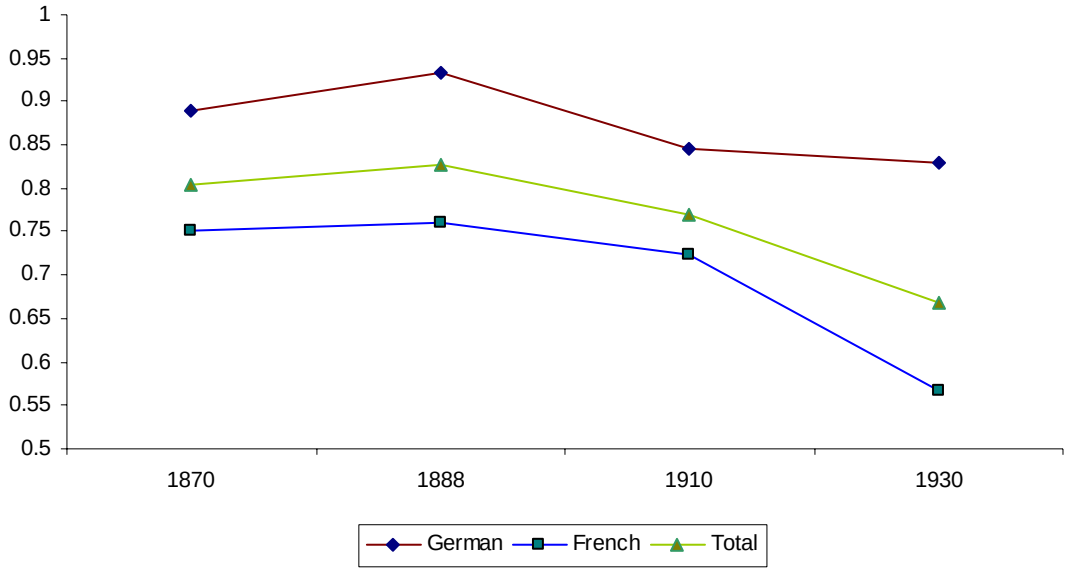
Both German and French cantons differ in religious affiliation meaning that they include both Protestants and Catholics, while in the Italian canton of Ticino the population is by majority Catholic. There are differences in marital fertility of the Protestants and the Catholics inside linguistic regions. As a matter of illustration the next table shows the level of marital fertility for the French districts of Switzerland. We can directly observe that Protestants hold a remarkable lower fertility than the Catholics. The case of Geneva is quite particular because even if it is of mixed religious affiliation, its marital fertility is even lower than that of the Protestants.

Table 3. Marital Fertility (Ig) by Religious Affiliation, French Districts. 1870 -1930

Religious Affiliation	1870	1888	1910	1930
Catholic	0.795	0.806	0.742	0.585
Protestant	0.678	0.657	0.509	0.333
Geneva (Mixed)	0.447	0.408	0.274	0.172

Going in line with intra differences in linguistic regions, the canton of Valais is an interesting case of diverging fertility trends. This canton is catholic by majority but it is mixed in linguistic terms. Furthermore, it is an agricultural economy. What can be seen is that the marital fertility of women who speak French is: 1) Lower than the German speaking part of the population; 2) The decline of fertility speeds up from 1910 to 1930 and the index *Ig* reaches a value of less than 0.60. The differentials in marital fertility are particularly strong in the end of the period.

Figure 6. Marital Fertility (IG) by language spoken, Valais. 1870-1930



What can we infer from this? Not much as the data we have does not allow for a closer inspection of differentials in how the spread of information about birth control was spread. However, we can mention the fact that the French districts of Valais are less isolated and are in the border with the protestant canton of Vaud; while the German districts are strictly located inside the Alps. The speculation we can do is that it is differences in access to the spread of new ideas and the diffusion of these is what might be the cause between these two linguistic regions of Valais.

The case of the catholic and Italian speaking canton of Ticino is different. The marital fertility of this canton shows a remarkable decline from 1910 to 1930. According to van der Walle (1975) this could be influenced by the common migration of men due to the poor economic conditions of the canton at that time.

Now we turn to a graphical description of the indexes in this study. In figure 7 below the levels of marital fertility can be apreciated. It is remarkable to see that the french speaking districts show a lower value from 1910 onwards than all the other groups, however, the decline is steepest for the main linguistic groups of the country, i.e. German and French.

Figure 7. Index of Marital Fertility (Ig) by language spoken

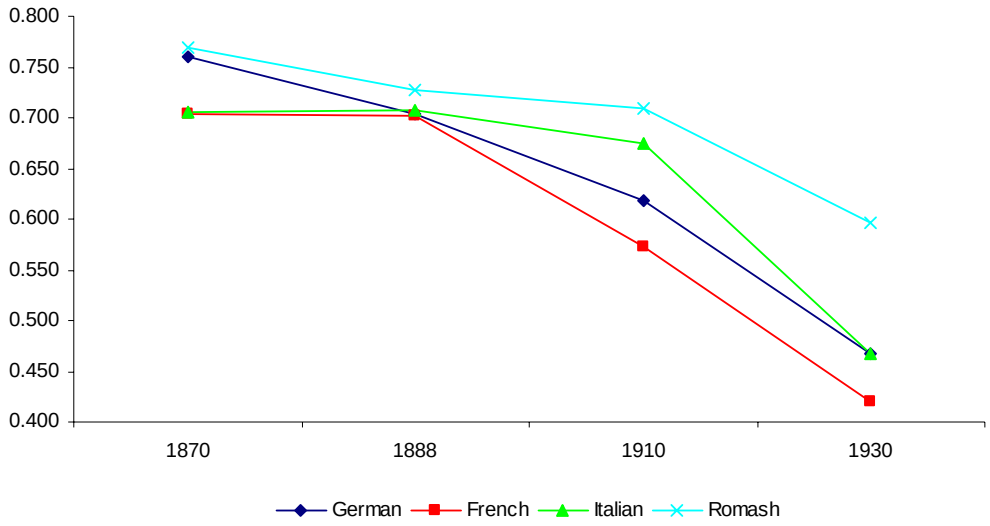


Figure 8 present the index of overall fertility. It is interesting to note that for the beginning of the period is higher for the french speaking districts and then, from 1910, is lower than that of the German speaking districts, but not that much higher. This value could be influenced by the proportion married which is slightly higher for the French districts.

Figure 8. Index of Overall Fertility (If) by language spoken

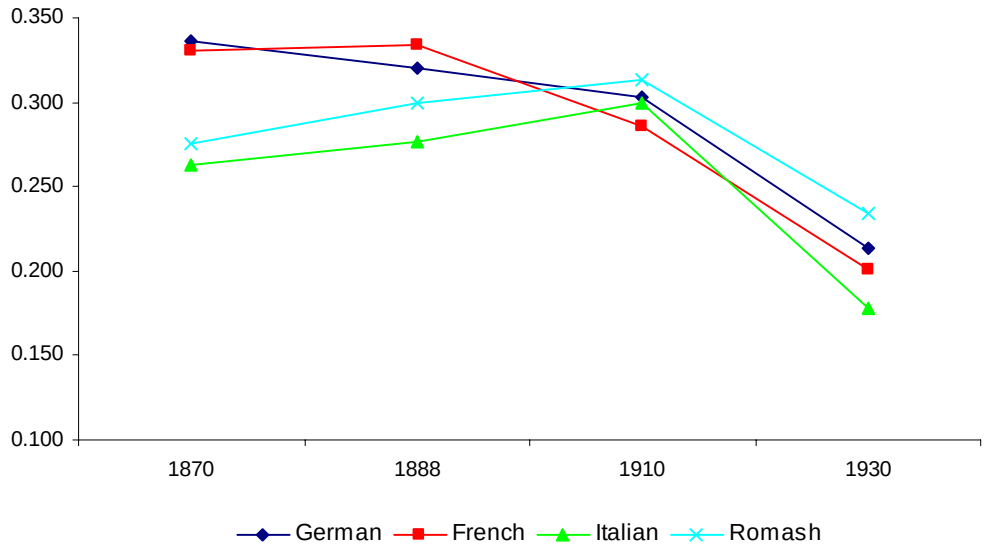


Figure 9. Index of proportion married (Im) by language spoken

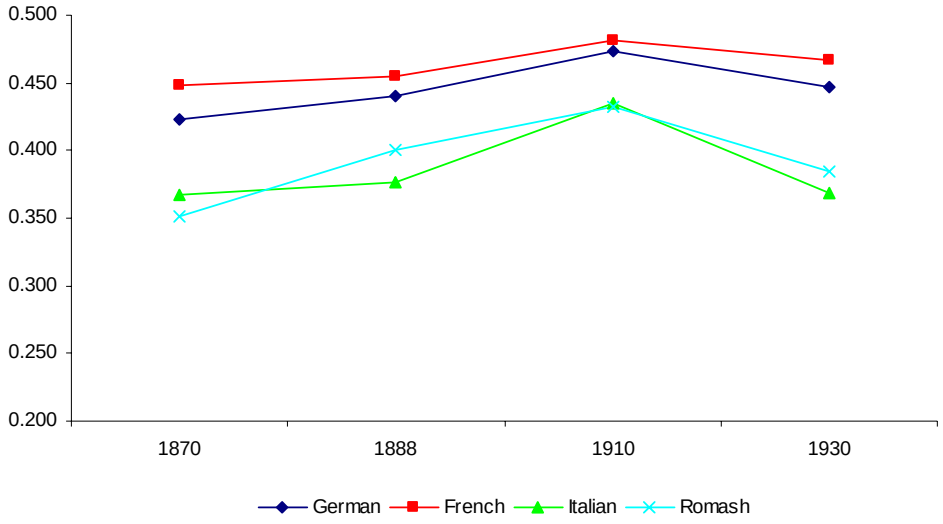
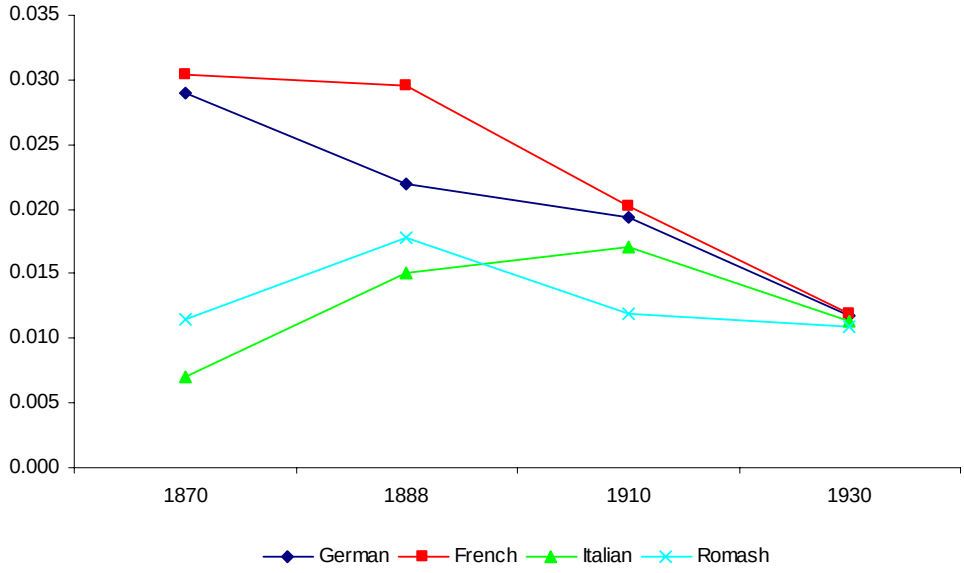


Figure 10. Index of Illegitimate Fertility (Ih) by language spoken



Therefore, could we conclude in this brief inspection of the data that there are large differences in terms of linguistic regions? The answer is negative. The differences in fertility outcomes seem to be much more influenced by religious affiliation, even if some particularities emerge such as the case of Valais. But we can say that our more detailed statistical analysis in the next sections will help us to see more in detail how the relationships were changing over time.

6. Data and model specification

The dataset to be used in this study was compiled by Francine van der Walle, and as was mentioned before, it belongs to the EFP. The best option for our purposes is to estimate a panel data econometric model in order to capture the effect over time that the different cultural and socioeconomic variables had in fertility outcomes. In order to do so, the variables necessarily have to be comparable across the four cross sectional data points we have. To our misfortune, all the variables we would like to include in our pooled model are not comparable over time; however, we have a set of variables which are common for the four years we have the data.

The interesting side about this study will be the novelty to implement sophisticated econometric methods using data originally published by the EFP. Until now, there has only been one attempt to do a pooled data analysis with EFP data. This was done by Richards (1977) where she analyzed the same data that John Knodel used in his study of the German fertility transition. The results obtained by Richards point to the direction that the power of explanation by making use of combined cross sectional data with time series increases substantially. Furthermore, the socioeconomic variables show an impact in the fertility decline, contrary to the general conclusions reached by the EFP.
These findings call for the need of making honour to Coale's vision of fertility change, that is, fertility change occurs through time, not just in one moment in the history of any given population.
There have also been other studies (Galloway et al, 1994) using the statistical methods aforementioned, where the authors indeed find that socioeconomic variables influenced the fertility decline in Germany. This paper for Prussia was made with a far more detailed dataset than the ones published by the EFP, however, we think that our study will shed light on some aspects of the fertility decline in Switzerland that have not been done before.

Now we turn to describe the variables that will be subject of analysis in this thesis. The variables are of three kinds: socioeconomic, cultural, and demographic ones.

The socioeconomic independent variables which will be included in our pooled model will be:

Proportion of total labour force in industry. This variable is a measure of industrialisation per se and it is related to how the costs and benefits of children may have an impact in the decision making process of couples. As industrialization advanced, the costs of childbearing are supposed to increase due to the incompatibility of labour with child care. We expect this variable to be negatively related to marital fertility.

Proportion of total female labour force. This variable theoretically would be negatively related to marital fertility due to the fact that an increasing female participation in the labour market would increase the costs of childbearing. The relative importance of this variable can be weakened if we argue that this variable is measuring many activities in which women were active in the period of analysis. This variable could be influenced by for example, agricultural workers, and we must bear in mind that as time passes, people will gradually move away from agriculture.

Proportion of female labour force in industry. As with the total labour force in industry, this variable is expected to be negatively related to marital fertility, and especially for female workers who are the ones with higher cost of childbearing.

Proportion of labour force in trade, transportation, and administration. This is an interesting variable which is common in the four census years. It is measured as the proportion of the labour force working in the tertiary sector; namely on trade, transportation and in the public service. . Galloway et al (1994) say that this kind of information would be a good proxy for how well developed are communication and transport systems; and in this way obtain possible information of how information about contraception methods was spread. Therefore, this variable is more related to urbanization than with industrialization.

We also hypothesize that these people are a rather select group of the population with probably high level of education and access to information regarding birth control, regardless of religious affiliation, and these people could have spread rapidly information they may received about contraceptive methods.

It should be mentioned that there was a slight problem with this variable. The original value for the year 1888 seemed quite unreasonably small (0.06), therefore, it was decided to take the mean value between 1870 and 1910 in order to avoid problems that could arise due to this extreme value.

Education. Education is a variable which has been treated as influential in declining fertility. For contemporary populations, we can see that in countries with low fertility a high proportion of young people invest more of their time in attaining higher education. In the theory of demographic transition, this variable is thought to have an effect in historical populations through several mechanisms. For example, a higher level of education would probably raise knowledge about contraception methods, or it could raise the material aspirations of individuals and their expectations on their children; making the option to decrease marital fertility a viable one.
The underlying nature of this variable is as follows. The data of this variable comprises the grades that young men obtained in exams which were designed to measure the ability to read, write, maths, geography and history (Van de Walle, pp 465). The information available for this variable is as follows: proportion of examinees with high grade, proportion of examinees with low grade; and finally, proportion of examinees with education level beyond primary school. In our regression analysis, we will only use the proportion of examinees with higher education than primary school due to the fact that it may be a good proxy for literacy; furthermore, the grading system in Switzerland changed from 1870 to 1888, therefore, these variables measuring the draftees with either low or high grade may not be comparable over time. Another point that is worth mentioning is that the value of our education variable is the same in 1930 and in 1910, so, we should be aware when interpreting the results.

Francine van de Walle already studied the effect of these variables on fertility and she indeed found the hypothesized relationship, however, she did it with a bivariate model and only in cross sections.

The demographic variable that we will use in this study is:

Infant mortality rate. This variable is measure per thousand of population. The underlying assumption with this variable is that as infant mortality rate declines, the

demand for children declines as well due to the fact that couples may have a desired number of children to form their family. We expect this variable to be positively related to marital fertility. That is, the more infant mortality, the higher the incentives to not control fertility. However, this is a potential endogenous variable in the model. The endogeneity from this variable is explained by the fact that infant mortality is related to other factors which could reduce it, such as a better net nutrition, or by more investments by the parents in the children which could well reduce the risk of dying (Dribe, pp 82). Dribe (2008) mentions that the results of this variable should be taken with caution due to the fact that we can not firmly conclude about causation if we are not able to find a suitable instrument for this variable.

Finally, the cultural variables will be the following:

Protestant: this variable measures the proportion of Protestants in a given district. It is expected that the population under this religious affiliation has a negative relationship with marital fertility due to the more open and unrestrictive rules concerning family limitation methods.

Catholic: this variable measures the proportion of Catholics in a given district. We expect this variable to be positively related to fertility due to the more restrict rules regarding contraception the Catholic Church has usually professed.

German: proportion of the population whose language is German. The expectations regarding German-speaking population remain ambiguous.

French: proportion of the population whose language is French. We expect this variable to be negatively related to fertility due to the fact that the region of Switzerland where French is spoken is more culturally close to France, a forerunner in the fertility decline in Europe. Furthermore, this region contains the canton of Geneva, which was the canton of Switzerland that by 1830 it already had low levels of marital fertility (Schumacher, PhD Thesis).

In table 4 we present the summary statistics of the variables to be estimated in the regression analysis to come in the following pages.

Table 4. Summary Statistics of the variables subject of analysis

	1870		1888		1910		1930	
	Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation	Mean	St. Deviation
Ig	0.747	0.100	0.708	0.102	0.618	0.125	0.462	0.150
Protestants	0.551	0.411	0.551	0.411	0.534	0.384	0.539	0.376
Catholics	0.445	0.412	0.445	0.412	0.459	0.382	0.452	0.375
German	0.670	0.425	0.670	0.425	0.644	0.411	0.664	0.414
French	0.229	0.384	0.229	0.384	0.231	0.379	0.230	0.377
Total labour force in Industry	0.332	0.159	0.368	0.173	0.411	0.170	0.378	0.139
Total labour force in trade, communications and public service	0.169	0.065	0.147	0.090	0.129	0.149	0.130	0.060
Female labor force in industry	0.329	0.127	0.335	0.113	0.315	0.098	0.242	0.086
Total female labour force	0.355	0.057	0.522	0.215	0.299	0.072	0.301	0.058
Education index	0.182	0.747	0.144	0.093	0.277	0.145	0.277	0.145
Infant Mortality	0.235	0.053	0.187	0.028	0.138	0.023	0.078	0.016
N	177		177		177		177	

Data source: Office of Population Research, Princeton University

The above table offers an opportunity to have a glimpse at how the main variables to be used in the statistical analysis behaved in the period under study. The index of marital fertility clearly declined in this sixty year period; as was already said in the previous section. It is very important to mention that the proportion of Protestants slightly declined, while the proportion of Catholics showed a similar pattern in the opposite direction. The variable measuring the total labour force in industry also shows an increasing trend, though it slightly decreases in 1930 compared to the previous value in 1910. The variable measuring the total labour force in trade, communications and public service shows a somewhat stable but slightly decreasing trend. The variable measuring the female labour force in industry also shows a stable trend though it decreases in the final year of analysis. The variable measuring the total female labour force in agriculture shows a stable trend until 1930, when it is noticeable a decrease in this variable. This could may be due to the influence of labour force slowly moving away from agriculture to other activities in this period of industrialization. The variable which we name education index shows an increasing trend, however, we have to mention that the value for 1930 is the same for 1910. It was explained in the codebooks of the data that this was done due to a lack of data for this variable in 1930. The precise nature of

this variable will be explained in the following pages. Finally, infant mortality decreases substantially in the period under analysis, which is a fact that has been well documented for other countries of Europe of the time.

Details

The data for the four census years for Switzerland contains a rich variety of socioeconomic variables, however, several of the variables which would be elegant to use are not common for the four cross sectional census. Therefore, the variables used in this analysis were chosen because of availability.

The data had to be prepared in order to be used in a pooled fashion. The number of districts in Switzerland varied somewhat from 1870 to 1930, however, these changes were trivial since the districts which varied were either split or merged into one from one census to the other.
The number of districts was 181, 182, 187, and 183 for the years 1870, 1888, 1910 and 1930 respectively. The canton of Solothurn had five districts until 1900 when these were split and they became 10 instead. In the canton of Saint Gallen two districts (St. Gallen and Tablat) were merged in 1925, as were the two districts of the canton of Basel Land in 1926. The districts of Mittelland and Vorderland in the canton of Appenzell Inn were merged in 1879 additionally; the canton of Geneva had three districts until 1929 when they were consolidated into one. Thus, we can see that the changes in the number of districts were minor. and it should not pose any problem in re-calculating the different variables to be used by simply taking the mathematical average of the variables to be used in order to make the number of districts stable across the four census years so that the panel could be estimated without any problem.

This is why the number of districts had to be equal for the four census years in order to have a consistent dataset ready to be used with panel data techniques. As the changes in the districts were rather trivial, the averages of the cantons which were split were taken, and we think this poses no problem of lost data or variance in the data, since the districts were small and homogeneous in terms of religious affiliation and linguistic pattern. Therefore, after doing the right coding of the districts for the four census years,

we ended up with a total of 177 districts which as a total represents 708 observations for the whole period.
In spite of the fact that some variables will have to be ruled out of the analysis, we believe the statistical method may to a certain extent suffice to explain part of the variation in fertility caused by the influence of demand factors such as industrialisation or urbanization; and also how religious affiliation could have had an influence in the choice of regulating fertility within marriage.

A potential limitation regarding the cultural variables in the model is that we will not be able to disentangle carefully the mechanisms through which, for example, religious values or norms are enforced. The only information available about religious affiliation is the percentage of the population in the district that belongs to either Catholicism or Protestantism.
The linguistic variable also poses a challenge in interpreting whatever result we obtain. We will only be able to speculate about the mechanisms that could have influenced, for instance, the flow of information regarding birth control.

Justification of the Method.

One of the aims of this thesis is to use the EFP data to test for the possible influence of economic forces in fertility outcomes. We believe that not only the cultural variables such as religion had an effect in the fertility decline of Switzerland; we also believe that variables which are related to the growing industrialization had an impact in fertility regulation. Francine van der Walle in her monograph analyzing the fertility decline of Switzerland mainly found that religion and socioeconomic variables such as labour force in agriculture were variables that had an effect in fertility. However, when she tested for the effect of for example, female labour in industry, she found that, once other factors are controlled, it did not have any significant effect in marital fertility. Furthermore, she did her analysis in a cross sectional fashion. The critics of some authors (Brown and Guinnane, 2007) are that the quite basic statistical methods used by the EFP authors were not completely adequate to test for a multi-faceted effect of socioeconomic and cultural variables on fertility. One potential limitation of the EFP statistical research was the lack of control for unobserved heterogeneity in their models. One way to cope with this limitation is to use fixed effects models. Another interesting

feature that the results of this kind of method give is that they give an idea of how change in the independent variables had an effect in the dependent variable, i.e. marital fertility.

Additionally, this thesis will also make use of pooled OLS and compare the results with the fixed effects estimates. The pooled regressions aim is more to try to understand, for example, how industrialization in general affects fertility, whereas the fixed effects models try to answer the more subtle question of how changes in industrialization in time, are related to differences in fertility in time, all within our Swiss districts (Brown & Guinnane, pp 589).

Another justification for the use of panel data model is that its results will reflect in a better way the idea of change in the fertility transition theories. As has been said before, the usual approach taken by other authors part of the EFP was to model marital fertility in just a cross sectional point in time and this is not the right approach to model change.

Marital fertility will be modelled for the districts of Switzerland for the period 1870-1930. The analysis to be performed will be multivariate, due to its more predictive power in explaining the possible relationships the dependent variable has with the independent ones.

Therefore, the econometric models to be used in the analysis will be of two kinds. Pooled OLS and fixed effects.

At a later stage of the analysis, dummy variables will be introduced for the different religious and linguistic groups. This is done in order to test if there was really an effect of belonging to certain religion or linguistic group by differentiating them.

In this study, we will focus on the main two linguistic groups of Switzerland, i.e. Swiss-Germans and Swiss-French. This was decided due to the fact that the cantons of Ticino and the Grisons (where Swiss Italians and swiss-romansh habitate) are a minority comprising approximately 13 percent of the population. Furthermore, Ticino is

traditionally catholic canton, therefore, it is more interesting to focus on the largest groups of the population which within them, are divided in Protestants and Catholics.

It is imperative to mention that before doing the regression analysis, the correlation coefficients between the independent variables were calculated in order to avoid problems of multicollinearity in the regression.
The proportions of Catholics and protestants had a nearly perfect correlation (r=-0.996), fact that makes it highly unlikely to include them in the same regression. The same case was with the main linguistic variables, i.e. German and French, which had a high correlation coefficient (r=0.784). This correlation coefficient would not matter that much if the variables were measuring distinct aspects, but as they are measuring a close cultural phenomenon, we decided they should not be included in the same regression model.
The correlation coefficient between the socioeconomic variables was acceptable in order to include them in our equation. The variables which anyone could doubt they could be included together, surprisingly (Total labour force in industry and female labour force in industry) had a somewhat tolerable relationship, r=.50; the other two variables which had to be checked before including them in the model were female labour force in industry and total female labour force, the correlation coefficient was r= -.10. For the rest of the independent variables (total labour force in trade, transport and public service) the correlation coefficient between all the other was low (r=.026, r=.1290, r=.107).

Having said this, it is worth mentioning that four models were estimated taking into account this limitations regarding the so called cultural variables in our dataset. First a model was estimated with independent variables protestant and German; then protestant and French; afterwards it was estimated catholic and German, and finally catholic and French. Furthermore, it should be noted that we did a Hausman test in order to verify statistically if FE was prefered to random effects. The p-value was 0, therefore, it is safe to use fixed effects. This was done just to check the validity of the justification of the method chosen for the data we have.

6.1 Results

Tables 5 and 6 present the basic results of our panel data construction for 177 districts of Switzerland from 1870-1930. The results are presented in two tables, showing the main four models which were estimated. These models are namely: Protestant-German, Protestant-French; and, Catholic-German, Catholic-French.

The variable measuring the total labour force in industry has a negative impact in marital fertility in both estimated models (OLS and fixed effects). This is for the case when the proportion of French is included in the model with Protestants (in both OLS and FE) and Catholics in the OLS regressions. This result is what was expected and shows that as time was passing by, the costs of childbearing were probably increasing and couples were maybe thinking more in terms of quality than of quantity. Furthermore, the value of children in terms of labour was higher in agricultural settings.

The variable concerning the labour force in trade, communications and public service is only statistically significant in the OLS model, meaning that this variable was important between districts but not within districts, and that it influenced fertility levels, but not change in fertility over time. This result makes sense if we think that this variable could be a proxy for how well information was diffused.

Female labour force in industry is negatively impacting marital fertility in both OLS and fixed effects models for the four separate regressions that were estimated. Additionally, if we look at the coefficients of this variable, we can see that it increases very much in the FE estimationThis result is in line with what was expected and confirms in a way that children were becoming increasingly more costly to women working in factories due to the incompatibility of work and family formation. It is an interesting result because comparing the the results with the OLS estimations, it is noticeable that this variable was quite important in fertility change and not that much on fertility levels, as with the variable measuring labour force in trade and so on.

The variable measuring the total female labour force is showing a negative coefficient in the OLS but when the fixed effects model is implemented, its sign reverses, though it does not become statistically significant. This variable is only significant in the OLS

model Catholic-French. We expected this variable to show a consistent negative and statistically significan relationship with marital fertility, however, the results from this variable show in certain way that female labour force as a total was not that important in influencing fertility change, what was more important was the activity where women were participating. The results we obtained could als be due to the fact that as industrialization was advancing, people were gradually moving out of agricultural work and its impact in changes in Ig (marital fertility) were loosing importance in a time when fertility was declining.

Our demographic variable, infant mortality rate; shows the sign we were expecting and it is significant in all the estimations we did; however, we should recall this variable is highly endogenous and the results obtained could well not be very informative about the direction of the causality. However, it should be noted that Francine van de Walle (1986) in a more thorough analysis of the relationship between infant mortality and marital fertility found that before the onset of the decline in marital fertility there was no relationship between the variables, but afterwards, she finds a positive relation which "…becomes increasingly significant as the decline progresses" (Van de Walle, pp 228).

The education variable shows a negative relationship with fertility, but very insignificant. This could be due to the fact that the data for two census years is repeated and also, this variable in my opinion is not very informative about the status of education of Switzerland at the time of analysis.

Concerning the religious variables, we can see that in the OLS estimations both Protestants and Catholics have the expected sign (negative and positive) and both are statistically significant, however; when the variables are estimated via fixed effects, they reverse their sign and become statistically insignificant, with the exception of the Protestant-French model. We should recall that this result has been consistently found in the previous studies making use of panel data with fixed effects models (Brown and Guinnane, 2007; Richards, 1979). In our dataset, we must remember from our descriptive statistics that the proportion of Protestants decreases over time, while the proportion of Catholics increases; this could be the reason for the unexpected "wrong" sign of this variables.

Looking at the results of the main linguistic groups of Switzerland, it can be appreciated that the French population has negative and statistically significant impact in both OLS and FE estimations. Furthermore, the size of the coefficient increases substantially in the FE models.

For the German linguistic group, the relationship is positive and statistically significant in both estimations, and the size of the coefficient as well increases in the FE estimations.

Regarding the statistical power of explanation of the models, we can see the R-squared improves from the pooled OLS to the fixed effects model. It increases from around 0.69 in the OLS to 0.82 in the FE model. But in any case, we can safely say that for both models the R-squares explains well the variation in marital fertility.

Table 5. Ordinary Least Squares and Fixed Effects Results for Marital Fertility (Ig) with Protestants.

	Pooled OLS				Fixed-effects			
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Protestant	-0.1178	0.000	-0.1309	0.000	0.1688	0.019	0.1127	0.127
French	-0.0648	0.000			-0.8666	0.000		
German			0.0818	0.000			0.4137	0.000
Total labour force in industry	-0.2297	0.000	-0.2636	0.000	-0.1784	0.001	-0.1036	0.088
Total labour force in trade, communications and public service	-0.2353	0.000	-0.2057	0.000	0.0326	0.340	0.0227	0.436
Female labor force in industry	-0.0963	0.025	-0.1178	0.004	-0.1842	0.000	-0.1909	0.000
Total female labour force	-0.0222	0.433	-0.0093	0.728	0.0352	0.091	0.0359	0.092
Education index	-0.0417	0.433	-0.0369	146.000	-0.0052	0.206	-0.0055	0.188
Infant Mortality	0.7163	0.000	0.6917	0.000	0.7831	0.000	0.7581	0.000
1888 (1870 omitted)	0.0019	0.880	0.0007	0.952	0.0004	0.957	-0.0035	0.704
1910	-0.0506	0.002	-0.0475	0.002	-0.0336	0.006	-0.0338	0.007
1930	-0.1782	0.000	-1807.0000	0.000	-0.1644	0.000	-0.1711	0.000
Constant	0.8212	0.000	0.7725	0.000	0.7730	0.000	0.3113	0.000
R2 within					0.8280		0.8252	
R2 between					0.0029		0.0004	
R2 overall	0.6856		0.7012		0.0682		0.1331	
N	708		708		708		708	
p(F)	0.000		0.000		0.000		0.000	
rho					0.969		0.920	

Note: The p-values are based on heteroskedasticity robust standard errors
Data source: Office of Population Research, Princeton University

Table 6. Ordinary Least Squares and Fixed Effects Results for Marital Fertility (Ig) with Catholics

	Pooled OLS				Fixed-effects			
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Catholic	0.1199	0.000	0.1328	0.000	-0.1192	0.089	-0.0692	0.337
French	-0.0644	0.000			-0.8565	0.000		
German			0.0813	0.000			0.4197	0.000
Total labour force in industry	-0.2263	0.000	-0.2603	0.000	-0.1769	0.001	-0.1013	0.096
Total labour force in trade, communications and public service	-0.2324	0.000	-0.2026	0.000	0.0234	0.396	0.0203	0.487
Female labor force in industry	-0.0999	0.019	-0.1212	0.003	-0.1838	0.000	-0.1906	0.000
Total female labour force	-0.1639	0.000	-0.0086	0.746	0.0347	0.096	0.1137	0.077
Education index	-0.0417	0.100	-0.03694	0.144	-0.0053	0.199	-0.00560	0.183
Infant Mortality	0.7151	0.000	0.6917	0.000	0.7776	0.000	0.75390	0.000
1888 (1870 omitted)	0.0017	0.892	0.0005	0.962	0.0001	0.983	-0.0038	0.679
1910	-0.0504	-0.002	-0.0472	0.002	-0.0357	0.003	-0.0354	0.004
1930	-0.1781	0.000	-0.1803	0.000	-0.1666	0.000	-0.1727	0.000
Constant	0.7024	0.000	0.6407	0.000	0.9181	0.000	0.4009	0.000
R2 within					0.8272		0.8248	
R2 between					0.0075		0.0012	
R2 overall	0.6879		0.7034		0.0811		0.1598	
N	708		708		708		708	
p(F)	0.000		0.000		0.000		0.000	
rho					0.967		0.914	

Note: The p-values are based on heteroskedasticity robust standard errors
Data source: Office of Population Research, Princeton University

However, it is hard to conclude from these models that there were significant differences between both religious and main linguistic regions of Switzerland; in order to test for this; we have to differentiate the different groups and convert the variables into dummy categories in order to catch if there were really significant differences between these groups.

In order to do so, dummy variables were created taking as reference group the larger group. For this, we took with the religious categories the Protestants to be the reference group, and in the linguistic regions, we took the German speaking districts as the reference group. The rest of the linguistic groups of Switzerland, i.e. Italian, Romans, and the mixed districts (where both German and French are official languages) were grouped into one sole category. This is mainly because they are minorities and we are mainly interested with differences between the largest groups of the country.

The results of this estimation can be seen in table 7. What can be appreciated from the analysis is that even though our main explanatory variables are statistically significant,

the relative power of explanation for the decline in Ig is weak. This does not imply that the results we found should be completely neglected. We think these results shed some light on some aspects of the fertility decline of Switzerland that had not been studied as such in the past, using the dataset at our hands. The relatively small signs of our coefficients could be due to effect of aggregation. We are studying a dataset which contains data for a whole country with strong heterogeneous profile and we can not say that this kind of dataset will suffice to explain all the factors that shaped the fertility decline of Switzerland.

Table 7. Ordinary Least Squares and Fixed Effects Results for Marital Fertility (Ig) with dummy variables for the cultural dimension.

	Pooled OLS		**Fixed-effects**	
	Coefficient	p-value	Coefficient	p-value
Total labour force in industry	-0.2342	0.000	-0.1418	0.013
Total labour force in trade, communications and public service	-0.1857	0.000	0.0237	0.418
Female labor force in industry	-0.1189	0.003	-0.1676	0.001
Total female labour force	-0.0096	0.721	0.0307	0.146
Education index	-0.0361	0.121	-0.0053	0.197
Infant Mortality	0.6903	0.000	0.7919	0.000
1888 (1870 omitted)	0.0001	0.996	0.0001	0.984
1910	-0.048	0.002	-0.0377	0.001
1930	-0.1786	0.000	-0.1634	0.000
Catholics (Protestant omitted)	0.1111	0.000	0.0582	0.045
Mixed (Protestants and Catholics)	0.0076	0.633	-0.02942	0.127
French (German omitted)	-0.0664	0.000	-0.1499	0.005
Italian, Romansh and Mixed (French and German)	-0.0476	0.000	-0.0718	0.049
Constant	0.7612	0.000	0.6623	0.000
R2 within			0.8232	
R2 between			0.2809	
R2 overall	0.7095		0.5902	
N	708		708	
p(F)	0.000		0.000	
rho			0.690	

Note: The p-values are based on heteroskedasticity robust standard errors
Data source: Office of Population Research, Princeton University

From the results above, we can see that the variables that had negative sign in our previous models (Total labour force in industry, female labour force in industry) remain statistically significant.
In this model, we are trying to see if there were significant differences between the religious and linguistic groups of our sample. The criterion to make the divisions of the groups was somewhat arbitrary. For the religious groups, the cut-off for the dummy variables was defined at 65 percent or bigger, whereas for the linguistic groups this was 70 percent or bigger. One reason for doing this is that there are districts where say, German or French is spoken by at least 70

The results from doing this differentiation can be seen in the table above. For the religion variable the reference category is the proportion of Protestant districts. We can see that in both OLS and FE estimations the Catholics consistently have a larger fertility than protestants; though the magnitude of the coefficient decreases in the within regressions.

For the linguistic groups, we can see that French have a consistent negative impact on fertility and it becomes larger in the FE estimations. This result is interesting and is in line with the expectations. It is difficult to conclude that only because people spoke French their fertility was lower than that of the German speaking population. What comes into play here, and it should be said clearly, is that we can speculate that the flow of information in the French speaking districts was more intense in the period under analysis and that there could have been some sort of acculturization of the French districts with its border partners France. Or a more plausible explanation could be that information started spreading from Geneva to the canton of Vaud and Neuchatel. It is also worth saying that most of the districts in which French is the main language, Protestantism is the main religion. This could be another reason for the acceptance of the new behaviour tending to limit family size by the use of new contraceptive methods.

Table 8. Distribution of the Districts in terms of linguistic and religious affiliation

	Language			
Religion	German	French	Others	Total
Protestants	257	106	22	385
Catholics	159	64	53	276
Mixed	32	4	11	47
Total	448	174	86	708

6.2 Discussion about the results

So far we have only described generally the trends and main findings seen in the regression analysis, however, a discussion regarding the consequences of these results is necessary.

It has to be said that the coefficients of our regression analysis are quite small and they need to be interpreted with care. For example, if we look at the results of the FE estimations for Protestant-French model in table 1, we can say that a 10% increase in the total labour force in industry brought a decrease in Ig (marital fertility) of 1.7%. This is a quite small effect over time in marital fertility and it is not certain whether these results could be decisive about the strength of both socioeconomic and cultural variables.

The cultural variables also present coefficients that are similar to the ones measuring socioeconomic change. This poses a challenge as well in making an interpretation of the size and magnitude of the regression analysis.

The sign of the coefficients is what we were expecting and this is a sign that these results should not be neglected entirely just because of the small coefficient size. This could also be due to a statistical artifact of sample size. Furthermore, the complex heterogeneity of Switzerland could also be another reason for not finding a decisive magnitude in the effect of the independent variables. There could have been other unobservable factors that are left unmeasured even in the fixed effects model. It is a

conviction of mine that a sophisticated econometric analysis, however complex it is in its formulation, it can not explain everything that happened in the social phenomenon we are trying to explain in this thesis. We have to remind that we are studying a lengthy period of sixty years and also that we only have four points in time of data; it would have been great to have more census years to have a more complete dataset with more observations.

What these results call for is for the need of more disaggregated analysis of sub-populations of Switzerland. Praz has done interesting studies of cantons in French-speaking Switzerland, taking as a point of departure the differences in religious affiliation; and she has found that the delay in the decline of marital fertility of Catholics was influenced by state institutions and by the way the church acknowledged the acceptability of contraceptive methods.

It should also be reminded that by the inspection of the data in a cross-sectional fashion in the previous sections it was found that Catholics had higher fertility than Protestants, and that German speaking Swiss had higher fertility than Swiss French; and in our regression analysis we found the expected signs for it.

The size of the signs for these cultural variables was not as expected, but even if this statistical artifact can not leads us to be hardly conclusive about their effect in marital fertility, we can be certain that something was going in these regions of the country.

A suitable interpretation I can think of is that there was a mixed effect of innovation/diffusion aspects, via religious acceptance of contraceptive measures and as well within linguistic regions and how fast it was diffused; and in addition to this; there was an adaptation due to the increasing industrialization that was happening in the period under analysis.

We can also see that this easily connects with the supply/demand and costs of regulation framework. As time was passing by, the demand for children was decreasing due to a rising female labour force participation in industry; this was reinforced by a decline in the supply of children via reduced infant mortality. Concerning the costs of regulation, we could also say that as industrialization and urbanization was advancing, health

services were improving as well, making contraceptive methods less expensive to those people who were willing to use them to consciously control their family size. We could also speculate that in the French speaking districts of Switzerland, this kind of information was diffused fastly due to the fact that it is close to France, and also to Geneva; further, the french speaking districts have more Protestants than Catholics and this could have also influenced the way religious institutions were conveying their messages about their acceptance to contraceptive methods, or to the role of the woman in the family.

What this results highlight is that economic forces indeed played a role in the fertility decline and this result contradicts some results that Francine van der Walle found in her manuscript, where she found the differences among religious groups and also found that agriculture is positively related to fertility. These results of the previous research could be due to the fact that the models were estimated the data in a cross sectional fashion and this fact could have biased her conclusions on the fact that industrialization was not a decisive factor for the decline of fertility.

Our pooled dataset with the help of the more sophisticated statistical methods shows a statistical significance in our results. Probably the distrustful reader could reject these results saying that the economic impact of industrialization variables was nearly null, but these findings call for the need of more detailed analysis of sub-regions of Switzerland.

7. Conclusion

The aim of this thesis was to use panel data techniques (pooled OLS and Fixed Effects) to analyze the fertility decline in Switzerland for the period comprising 1870-1930 using data compiled under the auspices of the European Fertility Project. Our explanatory variables included measures of industrialiation and also variables related to cultural factors such as religion and language. The debate around the conclusions of the EFP which stated that socioeconomic variables did not play an important role in the fertility decline, but cultural variables were more influential in the form of an innovation diffusion process can be tested more thoroughly through pooled OLS and Fixed Effects techniques.

The results found in this analysis show that in terms of modeling fertility change, which was Ansley Coale's vision, the variables measuring industrialization show a negative impact in marital fertility as time was passing by. A cultural variable that proved to be important in modeling change was the proportion of French speaking districts. This is an interesting result, however, it is not that simple to interpret it due to the fact that it is quite difficult to isolate the underlying nature of what is in language itself, however, we think this result should be of interest to sociologists who are interested in how language affects social relations among individuals. Our results are theoretically relevant since they support in certain way what economists would think about the process of modernization and its relationship with the changing costs of chilbearing; and as well, it also gives weight to the influence that religion played in the decline of fertility in Switzerland.

One unexpected result was the somewhat weak coefficients in the regression analysis. This could be due to a statistical artifact of small sample size, and this result also points to the direction of using more detailed dataset. However, what we found in this thesis point to the direction that the effect of important variables measuring industrialization was important in the experience of fertility decline of Switzerland. These results are in line with those found in studies using similar econometric techniques (Galloway, Hammel, Lee, 2004; Dribe, 2008, Richards 1979).

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The complexity of studying a highly aggregated phenomenon but with its roots being a micro-social decision poses a challenge in interpreting and assessing the real causes behind the study that was made. We studied a whole country, characterized by multiple heterogeneity and highly different patterns of behaviour. Therefore, this thesis makes a point in the sense that what was influential in fertility decline was probably both a process of adjustment to new socioeconomic conditions in the social scene, and as well as a innovation/diffusion process of making contraceptive use more acceptable.

This thesis makes a point in the sense that in order to study the European Fertility Decline, it is necessary to use panel data techniques in order to really account for change in fertility. This study contributes to the literature dealing with fertility decline because it confirms what other studies had found and it finds a relative importance of a linguistic variable. We should say that in order to disentangle the mechanisms behind changes in cultural variables should be conducted with more detailed datasets; this work has already been started by Praz (2006,2007, 2009) and it would be clarifying to study in detail what is in language that affects fertility decline.

Our results also support the view of the supply and demand factors influencing the decline in fertility. As modernization was advancing, health services were also improving, making contraceptive methods more available and also driving infant mortality down, hence, reducing the supply of children. Furthermore, the gradual departure from an agricultural society, to an industrial one where women are actively engaged in industry labour proved to be a factor driving fertility down in Switzerland through reduced demand for children.

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