Essays in Applied Microeconomics

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Andreas Steinhauer
from Riggisberg, BE

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Prof. Dr. Josef Zweimüller
Prof. Dr. Rainer Winkelmann
The Faculty of Economics, Business Administration and Information Technology of the University of Zurich hereby authorizes the printing of this dissertation, without indicating an opinion of the views expressed in the work.

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Chairman of the Doctoral Board: Prof. Dr. Josef Zweimüller
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1 | INTRODUCTION

“It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts.”

— Arthur Conan Doyle, *Sherlock Holmes*

This thesis—in the current field classification in economics—fits best into the category of applied microeconomics. This means all of the papers have some bearing on microeconomics, i.e. they relate to some theoretical aspect of individual behavior, and are applied or empirical in the sense that data are used to actually learn something about real world behavior of people. Very early during my graduate studies Josef Zweimüller encouraged me to pursue the combination of theory and empirical methods. In recent years our profession has seen a dramatic shift in what is expected of empirical work, especially in applied micro. While running a regression to estimate the “association” between some outcome \( y \) (e.g. wage) and some variable \( x \) (e.g. hours of work) was acceptable for a long time, nowadays every paper needs an “identification strategy,” i.e. some way to look at real world data as if they were generated by an experiment (Angrist and Pischke (2009) is a standard reference).

This is also present in my thesis. In Chapters 2 and 3, the source of identification is the language border in Switzerland, which (we claim) separates municipalities that are economically integrated and homogeneous apart from cultural norms and values. This allows us to study the influence of culture on such variables as the demand for social insurance, labor force participation, and fertility. It has a significant advantage over just comparing outcomes across cultures (often countries), because it is difficult to believe that relatively low labor force participation of mothers in Germany for example just results from cultural factors instead of the not-so-generous child-care system. In Chapter 4 we exploit the fact that Austria changed the parental leave system by date of birth of the child, in a way that (we claim) rules out selective reactions by (prospective) mothers. The naive approach—comparing for example wages of mothers with short parental leave spells and long parental leave spells—might among other problems suffer from reverse causality if anticipated wages drove the decision regarding length of leave. Clean identification clearly leads to much more credible ceteris paribus—or causal—estimates.
But the focus (some say obsession) on identification severely limits the set of questions one can look at, as it is very difficult to find plausible sources of exogenous variation. Furthermore, the causal effects one finds are like a black box. We learn how a (local) change in $x$ on average affects $y$, but often cannot say much about potential generalizable mechanisms behind these results.\(^1\) Early on in my PhD Josef encouraged me to not only focus on the “reduced form” side of our tool set, but cultivate an interest and expertise in the theoretical aspects. To the best of my abilities, I tried to follow that advice, which is reflected in the household-plus-identity model in Chapter 2, and in the structural search model I develop in Chapter 4. Recent trends in the literature seem to confirm his advice, as more and more empirical papers find some space for theoretical considerations, be it in the form of a full-blown structural approach or a simple model to organize thoughts.

In what follows, I present extended summaries of the papers contained in this thesis. A note on the comparability of Chapters 2 and 3 seems in order beforehand, since the same methodological approach is used to compare people in different language regions in Switzerland. Chapter 3, a paper on the demand for social insurance, came first and marks the first paper published in the economics literature (to the best of my knowledge) that makes use of this identification strategy. In that paper, we compare the German-speaking region with the French-, Italian- and Romansh-speaking regions, which we designate “Latin”-speaking regions, due to the common Latin origin of these languages. In my subsequent (“job market”) paper on childlessness and working mothers (Chapter 2), I chose to focus on the German-French comparison mainly for two reasons. First, the cantons represent important institutional boundaries in Switzerland due to this country’s federalist tradition, and comparing individuals within cantons therefore ensures that a common institutional setting prevails—an important feature for this kind of identification strategy. The only officially bilingual cantons in Switzerland, Berne, Fribourg, and Valais, are all German- and French-speaking. Focusing on the German-French part of the language border thus strengthens the claim that everything except culture is the same on both sides. Second, we found considerable evidence that the French-, Italian-, and Romansh-speaking regions show similar demand for social insurance. In terms of the share of mothers of children below age 5 that are working, and childlessness among women—the main outcomes in Chapter 2—there are important differences between these language regions.\(^2\) Due to this difference in the empirical set-up, the results of the two

\(^1\)See Deaton (2009), who also covers technical problems and difficulties of interpretation. The interested reader is also referred to the Spring 2010 issue of the Journal of Economic Perspectives (Vol. 24 No. 2), which contains a series of articles regarding the pros and cons of the recent advances in handling nonexperimental data.

\(^2\)Using the sample of women as defined in that paper, the percentage of Swiss women that are childless in 2000 is 18.8% in the French-speaking region, and 25.1% in the Italian-speaking region. The percentage of mothers of children below age 5 that are working in 1990 is 43.7% in the French- and 25.9% in the
chapters are not directly comparable when the same outcome (e.g. the federal vote on maternity insurance) is contrasted.

Chapter 2: Identity, Working Moms, and Childlessness: Evidence from Switzerland

In many developed countries childlessness rates have been increasing markedly over recent decades, in line with decreasing fertility rates and increasing female labor force participation (LFP). However, there is significant variation in the cross-sectional dimension. While the secular trends are well understood in terms of a basic economic model of the household, the negative correlation between female LFP and childlessness observed in the cross-section is less easily rationalized. These patterns have generated a large literature focusing on differences in work-family policies, labor market opportunities for women and/or cultural differences. But overcoming the identification problem is difficult. In this paper, I use a unique setting in Switzerland, where German- and French-speaking women live together in a homogeneous institutional setting. I argue that work-family policies, labor market opportunities, and the general institutional setting vary smoothly at this border, while attitudes differ sharply. I present evidence for a negative correlation between childlessness and LFP of mothers at the border. Specifically, using a spatial regression discontinuity design, I find that childlessness is significantly higher and LFP of mothers lower among German-speaking women compared to their French-speaking peers. I show that one aspect of culture that differs strongly between the two regions is the lower acceptance of working mothers on the German-speaking side, which is reflected in the broader German culture by the derogatory labeling of working mothers as “Raven Mothers” (Rabenmütter). I combine a prototype household model with an identity framework based on Akerlof and Kranton (2000) to show that differences in identity costs related to combining work and motherhood are able to rationalize the language border patterns and thus highlight the importance of one particular cultural channel that has been speculated to be important in the broader context before, but never really pinned down.

Chapter 3: The Demand for Social Insurance: Does Culture Matter?

In this chapter, we study the question whether culture shapes the demand for social insurance, focusing on insurance concerning health and work risks. Across countries, we observe large differences in the degree to which governments insure their citizens against

Italian-speaking region. Just descriptively, women in the Italian-speaking region seem more similar to those from the German-speaking region than those from the French-speaking region.
Introduction

risks. One possible explanation for this pattern is that different people have different tolerance of risk and therefore demand more or less social insurance. But one could just as well turn it around and explain different demands of social insurance by different levels of provision. For example, if the government of some country randomly introduced insurance against falling trees, would this lead its citizens to get used to this policy and therefore demand this kind of insurance more strongly than those in another country without this policy? This problem of reverse-causality has received quite some attention in the public economics literature. In this paper, we provide novel evidence that the demand for social insurance varies even when the level of provision is the same—highlighting the role of cultural factors as explanatory variables.

We study the case of Switzerland, where people speaking different languages live in a homogeneous environment. We take language as a proxy of culture and compare the German-speaking to the Swiss speaking Latin-derived (Italian, French, Rhaeto-Romanic) languages at the language border separating these groups using a spatial regression discontinuity design. The main contribution of this approach, as we discuss in this chapter, is that we compare groups of individuals facing identical provision of social insurance, but with different preferences or demand for social insurance.

To measure the demand for social insurance we use voting results from federal referenda on health insurance, old age insurance, maternity insurance, and unemployment insurance. Due to the (“half-”) direct democratic system in Switzerland, there were many of these referenda which allows us to paint a comprehensive picture. We estimate that the demand for social insurance across these referenda is up to 10 percentage points higher in the Latin-Swiss population compared to their German-speaking neighbors.

After documenting this difference, we focus on possible channels that might explain it. One potential channel are networks. There might be more informal insurance in the German-speaking part, which would explain why the German-speaking are less in favor of government provided insurance. However, we find only small differences in ties to family and friends. The Latin-Swiss have slightly more ties to family and close friends, while the German-Swiss report to have slightly more friends and are slightly more likely to belong to a club. We discuss this evidence and conclude that these small differences are unlikely to explain the large differences we observe in referenda. A second possible channel is ideology and media exposure. We find large differences in survey measures related to the locus of control. The Latin-Swiss show less confidence that hard work pays off and do not feel to the same extent that they have freedom and control over their lives. We regard these differences in ideology as one potentially important channel, as a more external locus of control is consistent with a higher demand for social insurance. Furthermore, we find that media markets are largely segmented and most large newspapers and tv stations
only reach one language region. This could explain why we do not observe convergence in preferences, risk tolerance, and/or beliefs—despite the fact that especially the German- and French-speaking Swiss live very closely together.

Chapter 4: Parental Leave and Mothers’ Careers: The Relative Importance of Job Protection and Cash Benefits

Job protection and cash benefits are key elements of parental leave (PL) systems designed to help mothers keep their labor force attachment after giving birth, and subsidizing the time needed to care for young children. A lot of attention in the literature is devoted to the effect of longer leaves on subsequent labor market outcomes such as wages. Since most parental leave policy changes consist of a joint prolongation of earnings replacement (such as cash benefits) and job protection (the right to return to the pre-birth job), little is known about the separate effects of these two central instruments. In this paper, we attempt to fill that gap by studying several reforms of the Austrian PL system that differentially changed the durations of cash benefits and job protection duration. The first reform was implemented on July 1, 1990, and consisted of an extension of the duration during which mothers received cash benefits and had the right to return to their pre-birth jobs after birth from one to two years. The second reform was implemented on July 1, 1996, and reduced the duration of cash benefits to one and a half years, while the pre-birth job was still protected for two years. The third reform, implemented as of July 1, 2000, extended the cash benefit duration to two and a half years. The way these reforms differentially changed the duration of the two PL instruments allows us to study their separate effects.

The thrust of the argument allowing us to identify the effects of the reforms revolves around the fact that the policy changes were enacted by a specific date of birth of the child. At the time these laws went into effect, prospective mothers were already pregnant, which puts significant constraints on the date of birth of the child, rendering selection unlikely (still, we of course check carefully for any evidence of selection effects). The main concern are seasonality effects. Mothers giving birth in July could be different from mothers giving birth in June, for example regarding their ability, taste for work, job-specific human capital, etc. Our empirical strategy takes this into account by effectively comparing mothers giving birth in May-June (pre-reform) with mothers giving birth in July-August in the reform years, relative to the same comparison in the year before the reform. We provide extensive evidence in the chapter that this DiD-RDD (Difference-in-Differences-Regression-Discontinuity Design) leads to credible and plausible estimates of eligibility to different PL policies. We mainly focus on the separate effects of the two instruments on return-to-work behavior, i.e. how fast mothers return to work after
birth, and medium run labor market outcomes such as wages, job stability, and risk of
unemployment. We find that longer PL durations in general significantly delay return-
to-work. The extension from one year to two years (1990 reform) on average leads to an additional 7.8 months mothers spend at home. Shortening the benefit duration to one and a half years while keeping job protection at two years (1996 reform) on average speeds up return-to-work by 3.4 months. The extension of the benefit duration to two and a half years while keeping job protection at two years (2000 reform) delays average return-to-work by 3 months. In line with previous studies on PL extensions, we find that the substantial variation in return-to-work does not affect medium-run labor market outcomes significantly.

To shed light on the mechanisms behind these results we build a non-stationary job
search model that we structurally estimate in a non-reform period (1996-2000). This
model features unobserved heterogeneity of mothers in terms of home production, time-
varying home production and offer arrival rates, and measurement error in observed wages. It is non-stationary and estimation poses substantial difficulty mainly because of the time dependent PL policies. Both cash benefits and job protection expire. This is a significant step-up from the previous literature, where policies are usually assumed constant.

Structural estimates of the model of job search suggest that mothers value time with their child more strongly right after birth than later on in their child’s life. Moreover, the time period we analyze is one where there is very little child care for children below the age of 3 years. In this setting, a PL policy can support families of newborn children by generating opportunities for prolonged parental care immediately after birth while maintaining medium-run labor market attachment of parents. We simulate return-to-work behavior under counterfactual policies and measure how much time for care and medium-
run employment these systems generate. We find that the system that combines both policy instruments generates more care immediately after birth and more employment in the medium run than systems that just use one or neither of the policy instruments. We conclude that the the two PL policy instruments need to be jointly implemented in order to achieve both goals. They interact to subsidize time for parental care immediately after birth while maintaining medium-run labor market attachment.
Identity, Working Moms, and Childlessness: Evidence from Switzerland

2.1 Introduction

Fertility rates have been declining in many developed countries, alongside increasing female labor force participation (LFP). Most explanations for these trends, at least among economists, rely on increasing female wages (Feyrer et al. (2008) provide a summary). However, this decline exhibits substantial heterogeneity in the cross-country dimension. While countries such as Norway, France, and the U.S. still have almost replacement level fertility, countries like Germany and Austria are well below replacement levels at about 1.4 children per woman. The secular trends in fertility and female LFP do not come as a surprise to many economists, as Willis (1973) in his formulation of Becker’s (1960) classical household model already proposed that, if the production of children is intensive in the wife’s time, the substitution effect from rising wages likely dominates the income effect.\(^1\) The cross-country patterns, however, are not easily rationalized in the classical model. Somewhere between 1980 and 2000, a robust positive correlation between fertility and female LFP has emerged (Ahn and Mira (2002), Feyrer et al. (2008)).

If rising wages are responsible for both rising female LFP and declining fertility due to a strong substitution effect, this correlation should be negative in the cross-country dimension. In this paper, I argue that differences in women’s identity are an important determinant of this relationship.\(^2\) Akerlof and Kranton’s (2000) seminal paper introduced

\(^1\)The prediction that increasing female LFP is accompanied by decreasing fertility has recently been revisited and mostly confirmed by Jones et al. (2008), who derive rigorously the possible set of theoretical assumptions consistent with a negative correlation between wages and fertility. They find that time-intensive production of children is a central piece to generate this relationship in many different formulations of the model.

\(^2\)The terminology in the literature regarding identity and culture is somewhat vague. While some authors talk exclusively about culture, attitudes, or norms and values, others rely more on the identity concept inspired by Akerlof and Kranton (2000). In this paper, the framework generally follows the identity approach, but since my identification strategy relies on language, and is related to the cultural literature, it would be confusing to completely avoid referring to culture. In my view, a clear distinction between the two terms is hardly possible and arguably not necessary, since identity can just be seen as an attempt to describe specific components of culture.
the notion of identity to economics, stressing that individuals derive value from their actions if they correspond to prescribed behavior. In the context of this paper, prescribed behavior relates to whether a mother should work when young children are present in the household. A mother’s decision whether to work, and a woman’s decision whether to have children, depends on the view of working mothers in society, as this view shapes their sense of what a mother should do, and thus influences their decisions as mothers and whether they want to be a mother.

I exploit a unique empirical set-up in Switzerland where German- and French-speaking women live together in the same institutional setting, but retain different views of working mothers. I demonstrate that labor market opportunities, work-family policies, and composition vary smoothly at the language border segregating the two cultural regions, due to institutional integration, while attitudes related to working mothers differ sharply. In particular, working as a mother is viewed less favorably on the German side, which I document using survey data and results from federal referenda. Using a spatial regression discontinuity approach, I find that labor force participation of mothers of children below school-age is lower and childlessness higher on the German-speaking compared to the French-speaking side. This difference is particularly large among more educated women. At the same time, the number of children, LFP of mothers of older children and LFP of childless women are similar on both sides of the border. The pattern of jointly higher fertility (due to lower childlessness) and higher female LFP (due to higher LFP of mothers) on the French-speaking side thus corresponds to the cross-country pattern, highlighting the relevance of identity in making sense of the observed relationship.

Figure 2.1 illustrates this pattern, plotting the percentage of women who have given birth to at least one child against labor force participation of mothers in OECD countries. There is a significant positive relationship between extensive margin fertility and female labor force participation among the latest cohort for which these data are available (born about 1965). Definitive fertility is measured at about age 45, when most of these women have completed their fertility spells, while LFP is measured at age 25-34 in 1990, when most of these women are mothers of young children. As can be seen, the two language regions in Switzerland fit the general picture, but the traditional explanatory factors, as will be substantiated below, do not help to explain the Swiss result.

The cultural aspect of women’s employment is the primary focus of a growing literature. Fernández and Fogli (2005) use an epidemiological approach and find that cultural origin matters for fertility and female labor supply of immigrants in the U.S., while Fortin (2005) and Giavazzi et al. (2012) demonstrate the importance of attitudes regarding the role of women for female LFP using cross-country survey data. How working mothers are viewed in society has received particular attention. Fortin (2005) uses the term “Mother’s
Guilt” to describe the psychological cost borne by mothers torn between family values and egalitarian views and finds that women who think that working mothers can establish just as warm a relationship with their children as mothers who do not work have higher labor supply. Olivetti et al. (2013) study the influence of networks (friends) on the formation of gender identity related to the labor supply of mothers. Similarly, Fernández (2007) and Fogli and Veldkamp (2011) explain the S-shaped development of female LFP in the U.S. by learning of women about whether or not a child’s development is negatively affected by a working mother. Increasing employment of mothers is a crucial determinant of the secular trends, as Fogli and Veldkamp (2011) note. In the sociological literature the connection between a country’s view of working mothers and fertility is made explicitly (Rindfuss et al. (1996), Rindfuss et al. (2003), Ruckdeschel (2009)). The general finding is that if working mothers are viewed unfavorably, fertility is lower.3 The results at the language border thus broadly correspond to the general finding in the literature. To the

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3 At the cross-country level, cultural differences are amplified by institutional differences in child-care subsidies and availability, school policies, and parental leave regulations (Algan and Cahuc, 2006). Correspondingly, generous work-family policies have been shown to be associated with higher female LFP and fertility (D’Addio and d’Ercole (2005), Lauer and Weber (2003), Del Boca and Sauer (2009)). The theoretical importance of market purchased child-care in reconciling secular trends with the cross-country relationship is explored in Ahn and Mira (2002).
best of my knowledge, however, this is the first paper where identification of the cultural determinants of fertility and female labor supply is jointly possible without relying on a potentially selected population (immigrants), and confounding differences in attitudes with differences in the institutional setting.

The literature has largely remained silent on the theoretical link between identity, female labor force participation, and fertility so far. In the second part of the paper, I augment the classical household model with the identity framework proposed by Akerlof and Kranton (2000) to spell out how the basic mechanism potentially operates. Specifically, I add an identity cost of combining work and motherhood to a simple version of the household model inspired by Willis (1973) and Jones et al. (2008). I show that this framework is able to rationalize the language border patterns, and thus the cross-country relationship, by differences in identity costs, while retaining the assumption that children are intensive in the wife’s time, required to explain the secular trends and cross-sectional (within country) patterns. I also explore interactions with wages, finding that the model accommodates the language border results, where particularly large differences are found among more educated women.

The contribution of this paper to the literature is twofold. First, using the unique language border setting in Switzerland, new evidence is presented that identity is an important determinant of completed fertility and female labor force participation, thereby highlighting its relevance in terms of making sense of the positive correlation between female LFP and fertility found in the cross-country dimension. Second, it is shown that a specific component of identity, the acceptance of working as a mother in society, is lower in the German-speaking compared to the French-speaking part, and that this difference is able to rationalize the language border patterns, which reflect the larger cross-country pattern, in a basic household model combined with the identity framework.

The rest of the paper is organized as follows. In section 2, the language border set-up is described and the language border difference in childlessness and LFP of mothers, as well as additional margins of fertility and labor market outcomes, are estimated. Section 3 presents evidence regarding differences in attitudes and presents a basic household model augmented by the identity framework. Section 4 concludes.

2.2 Identification

There are four official languages in Switzerland: German, French, Italian and Rhaeto-Romanic. Figure 2.2 shows the geographical distribution of the four languages, as

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4The languages in their written form largely correspond to the official languages in Germany, France, and Italy. However, their spoken forms manifest in various dialects, which differ (some times dramatically,
Figure 2.2: Language regions in Switzerland

Notes: Map plots municipalities of Switzerland by majority language among its Swiss residents surveyed in the 2000 Swiss population census. Heavy black lines delineate cantonal (state) borders. Note that language region affiliation of municipalities is stable over time. Using the 1970 census instead, only one municipality changes affiliation from French to German.

surveyed in the 2000 census. The German- and French-speaking Swiss are segregated geographically, resulting in a sharp language border that runs between municipalities in North-South direction.

Language and culture are closely associated, as a common language provides the means for the emergence and maintenance of norms and values within a group, and limits external influence. Speaking a language fosters a person’s identity and the sense of belonging to a group (see Clots-Figueras and Masella (2013) for a recent paper on the link between language and identity). In Switzerland, media outlets such as newspapers and television, are organized by language regions. No major newspaper has a German and French variant, although some internationally renowned publications such as the “Neue Zuercher Zeitung” are read everywhere. Despite the segregation by language, linguistic co-existence, institutional integration and a lack of discrimination of members of other language groups have a long tradition in Switzerland, vividly pictured by McRae (1983) in his “Conflict and Compromise” series.

To identify the effects of culture, or norms and values, Brügger et al. (2009) develop a method they call Spatial Regression Discontinuity Design. Their idea is that comparing French- and German-speaking Swiss individuals at the language border allows for the
e.g. the Swiss-German spoken in the canton of Valais) from the spoken languages in the surrounding countries.

5See Dell (2010) for another recent paper using this approach.
interpretation of differences in outcomes as quasi-causal effects of culture. Their outcome is the duration of unemployment of prime-age men, which they show is about one week higher in the French-speaking part. This is the same method as in Chapter 3, where we show that the demand for social insurance is higher in the Latin-speaking part (measured by voting results in federal referenda), and in Eugster and Parchet (2011), who show that despite the difference in demand for social insurance, municipality-level tax rates converge at the border. They argue that this is the result of municipality-level competition due to mobility pressure.

As can be seen in Figure 2.2, the language border cross-cuts three cantons (states): Berne, Fribourg, and Valais (in North-South direction). This aspect of the segregational patterns is crucial, as in Switzerland, the cantons have considerable legislative authority regarding schooling policy (e.g. school starting age), taxes, social assistance systems, and other institutional parameters. I exploit this feature below by running specifications limiting the sample to include only the bilingual cantons while controlling for canton fixed effects.

Besides the fact that the language border does not coincide with the main institutional borders (cantons/states), one might be worried that the pattern of segregation leads to differences in economic circumstances. After all, a common institutional setting does not guarantee that labor markets are integrated. Cattaneo and Winkelmann (2005) study economic integration of the German- and French-speaking parts of Switzerland by looking at earnings differentials. They find no evidence that labor markets are separated across the language regions. Another piece of evidence in this direction is the classification of Switzerland into greater regions along economic, political and social dimensions by the Federal Statistical Office, according to Eurostat’s NUTS-2 specification. As shown in panel (a) of Figure 2.3, the language border cuts through two of these seven regions.

Additionally, the Federal Statistical Office separates Switzerland into 16 labor market regions, according to commuting dynamics (questions in the Census questionnaire). As shown in Panel (b) of Figure 2.3, the language border cuts through three of these regions.

From commuting patterns in the census it is directly observable where people live and work, and what languages they speak at home and at work. Panel (a) of Figure 2.4 plots the share of residents who work across the language border, by distance. As one approaches the border, there is a clear increase in people working across the border. Looking at language at work (panel b), it becomes evident that a lot of French is spoken

\footnote{Egger and Lassmann (2013) use this empirical setting to study language and trade.}

\footnote{From north to south: Espace Mittelland, CH02 (comprising the French-speaking cantons of Neuchâtel and Jura, the bilingual canton of Berne and the German canton of Solothurn). Region Lemanique, CH01 (comprising the French-speaking cantons Geneva and Vaud and the bilingual canton of Valais).}

\footnote{From north to south: Biel/Bienne (region 6), Fribourg (region 4), Sion (region 3).}
Figure 2.3: Economic integration

(a) Greater regions (NUTS2)  
(b) Labor market regions

Notes: Maps plot language regions (by municipality) as in Figure 2.2. Panel (a): black borders delineate the 7 greater regions (NUTS2). Panel (b): black borders delineate the 16 labor market regions.  

in firms on the German-speaking side. This is important considering the fact that the French-speaking Swiss are a minority in Switzerland, and one could be concerned that they are discriminated against by German employers, resulting in higher fertility due to worse career perspectives. Observing that French is an important language in firms on the German-speaking side of the border should alleviate this concern.

Labor market integration should also be reflected in hourly wages. To see whether this is the case, I use data from the Swiss Labor Force Survey, carried out yearly in spring. To avoid attrition bias (it’s a panel), I limit the sample to data from the first interview with Swiss women age 25-55, sampled between 1996 and 2009.9 Their real hourly wages are regressed on quadratics in age, experience and indicator variables for highest educational achievement, marital status, and survey year. The residuals from this Mincer regression are then plotted against distance to language border in Figure 2.5. There is no significant difference at the language border in the unexplained part of mean real hourly wages of women.10

Other important factors when looking at childlessness, according to previous studies, are school starting age, organization of pre-school institutions like kindergarten, and costs and availability of child care (for children below kindergarten age). Differences in school starting age, early schooling (kindergarten), child-care subsidies and tax-deductibility

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9The SLFS was started in 1991, but highest educational achievement is not comparable before and after 1996.

10The same exercise for men does not lead to a significant difference either (point estimate of the difference at the border: 0.028, standard error 0.049). Unfortunately, the survey interviews only one member of the household, so I cannot use the relative wage of the wife as a dependent variable (in the best case one would have pre-marriage wages of both spouses). Instead, I consider assortative mating by education in the census data below.
Figure 2.4: Labor market integration

(a) Cross-border commuting

(b) Language at work

Notes: Negative distance=French-speaking, positive=German-speaking municipalities. Panel (a) plots share of residents working in a municipality in the other language region, e.g. at the border, about 20% of residents commute across the border. Panel (b) plots the share of residents who declare that they mainly speak Swiss-German or High German at work, among residents who either speak German of French (any dialect) at work. See notes to Figure 2.9 for details regarding RD method.


Figure 2.5: Residuals from Mincer wage regression

Notes: Negative distance=French-speaking, positive=German-speaking municipalities. Figure plots mean residuals from regression of log real hourly wage on quadratics in age and experience, and indicator variables for highest educational achievement, marital status and survey year for Swiss women age 25-55, sampled in the Labor Force Survey 1996-2009 (first interview only, i.e. no panel structure). See notes to Figure 2.9 for details regarding RD method. Note that the labor force survey does not contain data on place of birth, so for this figure, I have to rely on place of residence. Only data from years 1996-2009 are used as highest educational achievement before and after 1996 is not comparable. Number of observations: 10,484. Cross-section weights are used.

of child-care costs can be ruled out within canton (state), since these are regulated at the cantonal level. Different levels of child-care provision might arise if mothers were reluctant to put their child in a facility in the other language region, or if there were unobserved constraints (cultural or institutional) on starting a child-care establishment. Otherwise, competition and mobility should equalize levels at the border.

To see how child-care supply varies at the border, I use data from the Swiss Firm Census, which is carried out roughly every three years and covers most private sector firms. The first year which contains information on child care firms is 1995. I compute full-time equivalents working for day-care firms in each municipality and divide it by the number of resident women age 20-40 in 1990. Figure 2.6 plots this ratio against distance to the language border, including predicted values and confidence intervals of the intercepts according to the specification outlined in the next section. At the border, there is no significant difference in day-care supply. Considering the evidence of higher labor force participation of mothers (at the border) in the French-speaking part, presented below, this result is consistent with sufficient mobility by mothers in terms of choosing a child-care facility location.

On the grounds of this combined evidence, this paper argues that the language border provides the unique possibility to identify the effects of differences in culture on fertility and labor supply outcomes, holding constant the main explanatory variables in the previous literature: labor market and family policies, child-care availability, wages, and taxes.

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11As far as there is no national law restricting cantonal authority. Most school-related policies are left to the cantons, although there have been some largely successful attempts to harmonize the system. Regarding child-care costs I am ignoring a subtle detail here. The total tax deduction depends on cantonal regulations and the municipality-level tax rate (in addition to federal and cantonal tax rate). But Eugster and Parchet (2011) show that mobility pressure equalizes any differences in municipality-level tax rates.

12The 1995 edition is the first which contains the NOGA 85.32A code, used to classify day-care firms. In the data, the number of workers are categorized by hours: working 90% or more, 50% to 90%, or less than 50% but at least 6 hours per week (100% are 40 hours per week). From this, I calculate full-time equivalents by summing up over the number of workers multiplied by interval midpoints (95%, 70%, 32.5%).

13Dividing by the number of children under a certain age would also be possible, but might be problematic since this paper will demonstrate that fertility is different at the border, and I want to capture ex ante expectations of women regarding child-care supply.
Figure 2.6: Day-care supply

Notes: Negative distance=French-speaking, positive=German-speaking municipalities. Figure plots ratio of full-time equivalents working in day-care (as of 1995) and number of women age 20-40 (residents in 1990). Each dot represents the average of this municipality-level ratio within a 2km distance “bin”. See notes to Figure 2.9 for details regarding RD method.


2.3 Data and methodology

In this paper, I use census data from the 1990 and 2000 Swiss population census. These rich data sets cover all individuals living in Switzerland, with detailed household information, demographics, and labor market outcomes. The geographically smallest units available are municipalities (about 2,500), with a median size of 7.25 square kilometers. To construct the language border, and assign every municipality a distance measure to this border, I rely on map data provided by search.ch, an internet search engine. These data come in the form of a matrix, containing road distance between any two municipalities. I assign a language region to every municipality by majority language in the 2000 population census, and compute the shortest distance to a municipality in the other language region.14

Figure 2.7 plots the share of individuals indicating Swiss-German (a German dialect, panel a) or Swiss-French (panel b) as their main language (among the 4 official languages, which also include Italian and Rhaeto-Romanic). Both shares change abruptly as one

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14To determine affiliation, I compute the share speaking any of the four official languages among Swiss residents age 15+, and assign the language region of the largest share (always exceeds 0.5 for municipalities assigned to German- or French-speaking region, except in parts of Grisons, which is a mountainous canton in the East). Note that language regions in Switzerland are stable over time. Using the 1970 census instead, only one municipality changes affiliation from French to German (Courgevaux, 48.7% German-speaking in 1970, 50.6% German-speaking in 2000).
Notes: Negative distance—French-speaking, positive—German-speaking municipalities. Plotted is the share speaking Swiss-German or Swiss-French as their main language (questionnaire asked for the “language in which you think and which you master best (only indicate one)”). Population is defined as all residents holding Swiss nationality and speaking one of the four official Swiss languages (German, French, Italian, Rhaeto-Romanic). One data point in the figure therefore represents the population living in municipalities within a 2km range distance to the language border, since the distance measure and assignment to language region are on the municipality level (majority language by 2000 census). Distance is driving distance to nearest municipality in other language region.
Source: Data from 2000 Swiss population census, Federal Statistical Office, Neuchatel.

crosses the constructed border. This forms the basis of the sharp regression discontinuity design approach used in the empirical part of the paper. The assumption being that the majority language in a municipality determines the dominant culture.

The focus of this paper is on completed fertility of women and the labor supply of mothers. These two outcomes have to be measured at different points in time, as a woman’s childbearing age is usually assumed to end somewhere beyond age 40, while mothers’ labor supply has to be measured earlier. Due to the restriction implied by the census data being only available every 10 years, I therefore focus on one 10-year cohort of Swiss women, born 1952-1961, which are observed in 1990, when most of these women are mothers of young children, and in 2000, when most of these women have completed their fertility spells. Excluded are women living in group quarters, women living on farms, and women with missing fertility information in 2000 (1.33% in the French- and 1.30% in the German-speaking part).

This cohort of women is on average 33 years old in 1990 and 43 years old in 2000. This illustrates the trade-off in choosing the cohort boundaries, as mothers are slightly too old in 1990 — on average already having given birth to their second child—and just starting

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15In the 1980 census there is unfortunately no birth place information, effectively limiting me to one cohort which I observe at two points in time.

16Living on farms means that either the woman or her partner is working in agriculture (sector 1).
to be old enough in 2000 to look at completed fertility. One might worry that return to work behavior differs by parity of the child and age of the mother and that the cohort window introduces selection. I will present robustness checks below controlling for parity and age to alleviate these concerns. Completed fertility is usually measured somewhere around age 40–45 in most sources. From the Swiss birth register, which contains data up to 2009, it can be shown that of the 1952-1961 cohort, 99.31% of births have occurred by the end of 2000.

Being in a stable relationship is an important determinant of whether a woman has children and whether a mother participates in the labor market. To have a homogeneous group of women facing the same constraints, I therefore exclude never-married women from my sample. This introduces the possibility for sample selection if the mating process is different for German- and French-speaking women. To alleviate this concern, I compare composition of the sample at the language border, and check for differences in marriage market success indicators below.

The baseline specifications I will estimate are local linear regression models including only municipalities close to the language border of the following form

$$y_{im} = \beta_0 + \beta_1\text{german}_m + \beta_2\text{german}_m \times \text{distance}_m + \beta_3\text{distance}_m + \epsilon_{im},$$ (2.1)

where $y_{im}$ is the outcome of interest for individual $i$ in municipality $m$. german$_m$ and distance$_m$ are language region affiliation and distance to the language border of the municipality of birth (where the respondent’s mother lived when giving birth) of individual $i$. I use municipality of birth instead of residence for three reasons. First, there is substantive evidence that norms and values in general, but specifically those related to the role of women and the family, form during early childhood and adolescence (Vella (1994), Bisin and Verdier (2000b), and references therein). Second, mobility choices might reflect a desire to be surrounded by peers sharing the same beliefs, which would lead to an upward bias in the language border difference using municipality of residence. Third, I focus on two outcomes measured at different points in time—completed fertility and labor supply when young children are present. By relying on municipality of birth, these two outcomes are measured for the same women at different points in time.


18Of the women born in 1961, which are the youngest in 2000, 96.41% and 97.40% of births have occurred in the French- and German-speaking regions, respectively. Note that the census was carried out in December of 2000.

19Additionally, I conducted the whole empirical exercise without conditioning on marital status and obtained very similar results (within less than 1 standard error from conditional results). Results available upon request.
Figure 2.8: Population distribution, by distance to border

(a) Population density

(b) Cumulative density

Notes: Left panel: negative distance—French-speaking, positive—German-speaking municipality of birth. Both panels: distance to language border is distance in driving km to the closest municipality in the other language region, where municipality is the mother’s municipality of residence when the individual was born. Language region affiliation by majority language among all residents in 2000. Sample includes Swiss women born in Switzerland between 1952 and 1961 (2000 population census). Panel a includes predicted values from estimating equation 2.1 with sample population count by municipality as dependent variable, along with confidence intervals for the intercepts at the border (see notes to Figure 2.9).


While manipulation of the running variable (distance to language border) is a minor concern in this set-up due to relying on municipality of birth to compute the measure, it is important to check that municipality characteristics and sample composition are the same. This is due to the fact that fertility and labor market outcomes vary strongly by municipality characteristics, e.g. on the urban-rural scale, and by demographics. Figure 2.8 plots population density and cumulative density by distance to the language border. Municipalities in the French-speaking region are coded with negative distance approaching zero at the border, while municipalities in the German-speaking region are coded with positive distance. I add estimated slopes and intercepts resulting from estimating equation 2.1 with population count as dependent variable (population includes only Swiss women born 1952-1961, sampled in the 2000 census), along with confidence intervals for the intercepts at the border. The estimated discontinuity is 38.4 with a standard error of 62.1. There are a couple mid-size towns close to the border. On the French-speaking side these are Neuchatel (11.6km) and Fribourg (5.5km). On the German-speaking side Biel/Bienne (5.5km) and Solothurn (16.3km). The bigger cities are further away from the border, namely Lausanne (52km), Bern (30.1km) and Basel (38.6km). The bandwidth of 30km in the empirical specifications ensures that population size on both sides of the border is about the same, and no big cities are included on either side.

I restrict all analyses to an RD sample bandwidth of 60km for the figures, and 30km for estimation. This means only women born in municipalities within 30km and 60km of
the language border are included in the sample, respectively. Following the suggestions of Porter (2003) and Hahn et al. (2001), the model is estimated using local linear regression relying on a triangular weighting kernel which gives more weight to individuals born closer to the border. Robust standard errors are computed using a bootstrap procedure with 2,000 replications, clustered on the municipality level.

Identification in the RD design relies on a discontinuity in treatment, which in the present context is the dominant cultural environment, while other determinants of the outcomes have to vary smoothly at the discontinuity. Here, this mainly concerns composition (e.g., educational achievement), child-care and labor market policies, taxes and wages. These are variables I can test (or that have been tested by others) for discontinuities. Regarding unobserved differences like genetic endowment (biological infertility in this context) there is not much that can be done to assure that they vary smoothly around the cut-off, as in other RD settings. However, regarding biological infertility, the heterogeneous effects when splitting the sample by educational achievement presented below are one piece of evidence against the importance of this particular channel.

I have presented evidence above that policies, taxes and wages vary smoothly at the language border. Regarding sample composition, Table 2.1 presents estimates of equation 2.1 with a set of marriage market outcomes as dependent variables. Regarding the share married, divorced, and widowed, there are no significant differences at the border. The same holds true for years since last change of marital status, either when looking at married or divorced women. The number of observations is slightly higher in the 1990 census, which reflects deaths and emigration. Overall, there does not appear to be reason for concern that focusing on ever-married women is subject to selection bias.

Table 2.2 looks at sample composition of ever-married women, the sample used in the empirical part of the paper, using a broad set of demographic characteristics measured in 1990 and 2000 as dependent variables in equation 2.1. At the language border, there is a sharp difference in the main language, as expected. There are no significant differences in educational achievement, marital status, or partner’s characteristics. There are differences regarding religious affiliation, though they are not highly significant. Women from German-speaking municipalities are more likely protestant, while women from French-

\[ \text{Regarding policies and taxes, this statement holds within canton (state). I will estimate all of the main specifications for all cantons combined, and using only the bilingual cantons, including cantonal fixed effects.} \]

\[ \text{Unfortunately, this measure is not available in the 1990 census, and there is no measure directly capturing age at first marriage or duration (stability) of marriage in either census. However, the rate of re-marriage is relatively low (20\% of women were non-single upon marriage in 2000), and the average age at re-marriage was about 38 in 2000 (both numbers from ESPOP, Federal Statistical Office, Neuchâtel). If there were significant differences in age at first marriage or duration of marriage, one would expect them to show up in the years since last change of marital status.} \]
Table 2.1: Marriage market outcomes at the language border

<table>
<thead>
<tr>
<th>Census year</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept (French)</td>
<td>German difference (2)</td>
</tr>
<tr>
<td>Share married</td>
<td>0.7221 (0.0144)</td>
<td>-0.0169 (0.0235)</td>
</tr>
<tr>
<td>Share divorced</td>
<td>0.0748 (0.0084)</td>
<td>-0.0064 (0.0099)</td>
</tr>
<tr>
<td>Share widowed</td>
<td>0.0068 (0.0012)</td>
<td>-0.0026 (0.0017)</td>
</tr>
<tr>
<td>Years since last change of marital status (married)</td>
<td>17.0261 (0.2565)</td>
<td>-0.6525 (0.5124)</td>
</tr>
<tr>
<td>Years since last change of marital status (divorced)</td>
<td>7.7008 (0.3578)</td>
<td>0.0536 (0.4131)</td>
</tr>
</tbody>
</table>

Observations 25,263 32,852 23,771 31,631
Municipalities 273 287 273 287

Notes: Table entries are estimates of $\beta_0$ (Columns 1 and 3) and $\beta_1$ (Columns 2 and 4) of equation (2.1), i.e. estimates of the intercept approaching the border from the French-speaking side and the border discontinuity. Estimation by local linear regression with triangular kernel (30km bandwidth), bootstrapped standard errors in parentheses, clustered on municipality of birth (2,000 replications). Statistical significance (two-sided test against zero based on normal approximation) of German border difference ($\beta_1$): * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Sample includes Swiss women born 1952-1961 within 30km of the language border. Excluded are women living in group quarters or on farms, and women with missing fertility information in 2000.

speaking municipalities are more likely catholic. As can be seen from the large standard errors, there is significant variation. I present robustness checks below where I control for religious affiliation on the individual and municipality level. The number of observations is now slightly higher in 2000 compared to 1990, resulting from women of this cohort marrying after 1990, i.e. after they have reached age 29-38, offset by deaths and emigration as discussed above.

Table 2.3 looks at municipality characteristics in 1970, 9-18 years after the 1952-1961 cohort was born, and 2000, the point in time completed fertility is observed. Since these characteristics will be used as control variables in robustness checks, I exclude women in panel A and compute population, population density, and labor market structure for Swiss men above age 15. As can be seen, population and labor market characteristics look very similar on both sides of the language border. Panel B presents additional characteristics for the total population. Since giving birth to a child requires a male partner, it is important to have smoothness in the gender ratio. There is no significant difference at the border in this ratio. Whether municipalities are mostly urban or rural is captured
by the share of land occupied by settlement and farming, which look very similar at the border. Lastly, this table contains the estimates regarding child-care supply computed in the same way as in Figure 2.6. There is no significant difference in full-time equivalents working in child-care in 1995 per 100 women age 20-40 at the border.
Table 2.2: Composition at the language border, ever-married Swiss women born 1952-1961

<table>
<thead>
<tr>
<th>Age and language</th>
<th>Intercept (French)</th>
<th>German difference (2)</th>
<th>Intercept (French)</th>
<th>German difference (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>33.6544</td>
<td>−0.0906</td>
<td>43.5155</td>
<td>−0.1253</td>
</tr>
<tr>
<td>2000</td>
<td>(0.0636)</td>
<td>(0.0853)</td>
<td>(0.0667)</td>
<td>(0.0889)</td>
</tr>
<tr>
<td>German speaking</td>
<td>0.2026</td>
<td>0.6077</td>
<td>0.1862</td>
<td>0.6281</td>
</tr>
<tr>
<td>1990</td>
<td>(0.0490)</td>
<td>(0.0859)**</td>
<td>(0.0407)</td>
<td>(0.0779)**</td>
</tr>
<tr>
<td>2000</td>
<td>0.7910</td>
<td>−0.6084</td>
<td>0.8057</td>
<td>−0.6267</td>
</tr>
<tr>
<td>French speaking</td>
<td>(0.0498)</td>
<td>(0.0844)**</td>
<td>(0.0407)</td>
<td>(0.0769)**</td>
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</tbody>
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Education

<table>
<thead>
<tr>
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<th>Intercept (French)</th>
<th>German difference (2)</th>
<th>Intercept (French)</th>
<th>German difference (2)</th>
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<tbody>
<tr>
<td>Mandatory education only</td>
<td>0.2612</td>
<td>0.0013</td>
<td>0.2744</td>
<td>−0.0144</td>
</tr>
<tr>
<td>1990</td>
<td>(0.0223)</td>
<td>(0.0458)</td>
<td>(0.0246)</td>
<td>(0.0444)</td>
</tr>
<tr>
<td>2000</td>
<td>0.6266</td>
<td>0.0125</td>
<td>0.5629</td>
<td>0.0432</td>
</tr>
<tr>
<td>Upper secondary education</td>
<td>(0.0172)</td>
<td>(0.0349)</td>
<td>(0.0129)</td>
<td>(0.0326)</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>0.0850</td>
<td>−0.0177</td>
<td>0.1281</td>
<td>−0.0343</td>
</tr>
<tr>
<td>1990</td>
<td>(0.0170)</td>
<td>(0.0200)</td>
<td>(0.0198)</td>
<td>(0.0237)</td>
</tr>
<tr>
<td>2000</td>
<td>0.2711</td>
<td>−0.0247</td>
<td>0.2758</td>
<td>−0.0128</td>
</tr>
<tr>
<td>Partner’s characteristics</td>
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Partner present

<table>
<thead>
<tr>
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<th>German difference (2)</th>
<th>Intercept (French)</th>
<th>German difference (2)</th>
</tr>
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<tr>
<td>1990</td>
<td>0.8982</td>
<td>0.0156</td>
<td>0.8245</td>
</tr>
<tr>
<td>2000</td>
<td>(0.0101)</td>
<td>(0.0124)</td>
<td>(0.0131)</td>
</tr>
<tr>
<td>Age</td>
<td>36.6917</td>
<td>−0.1429</td>
<td>46.0388</td>
</tr>
<tr>
<td>1990</td>
<td>(0.1440)</td>
<td>(0.2003)</td>
<td>(0.1316)</td>
</tr>
<tr>
<td>2000</td>
<td>0.1066</td>
<td>−0.0092</td>
<td>0.0855</td>
</tr>
<tr>
<td>Mandatory education only</td>
<td>0.0809</td>
<td>(0.0127)</td>
<td>(0.0091)</td>
</tr>
<tr>
<td>Upper secondary education</td>
<td>0.4990</td>
<td>0.0481</td>
<td>0.4400</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>0.2711</td>
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<td>0.2758</td>
</tr>
<tr>
<td>1990</td>
<td>(0.0259)</td>
<td>(0.0339)</td>
<td>(0.0231)</td>
</tr>
<tr>
<td>2000</td>
<td>0.2471</td>
<td>0.2421</td>
<td>0.2344</td>
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<td>Religion</td>
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Protestants

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<th>Intercept (French)</th>
<th>German difference (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.6678</td>
<td>−0.2427</td>
<td>0.6439</td>
</tr>
<tr>
<td>2000</td>
<td>(0.1168)</td>
<td>(0.1466)**</td>
<td>(0.1112)</td>
</tr>
<tr>
<td>Catholics</td>
<td>0.0508</td>
<td>−0.0012</td>
<td>0.0768</td>
</tr>
<tr>
<td>1990</td>
<td>(0.0111)</td>
<td>(0.0170)</td>
<td>(0.0145)</td>
</tr>
<tr>
<td>2000</td>
<td>0.0342</td>
<td>0.0018</td>
<td>0.0448</td>
</tr>
<tr>
<td>No religion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other religion</td>
<td>(0.0062)</td>
<td>(0.0102)</td>
<td>(0.0080)</td>
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Observations

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>20,373</td>
<td>25,859</td>
</tr>
<tr>
<td>Municipalities</td>
<td>273</td>
<td>287</td>
</tr>
</tbody>
</table>

Notes: See notes to Table 2.1. * p < 0.10, ** p < 0.05, *** p < 0.01. Sample includes Swiss women born 1952-1961 within 30km of the language border. Excluded are never-married women, women living in group quarters or on farms, and women with missing fertility information in 2000.
Table 2.3: Municipality characteristics at the language border

<table>
<thead>
<tr>
<th>Census year</th>
<th>1970</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept (French)</td>
<td>German difference</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td><strong>Panel A. Swiss men age 15+</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log population</td>
<td>5.1246</td>
<td>0.2609</td>
</tr>
<tr>
<td></td>
<td>(0.2040)</td>
<td>(0.2978)</td>
</tr>
<tr>
<td>Population density</td>
<td>2.2845</td>
<td>−0.0850</td>
</tr>
<tr>
<td></td>
<td>(0.7669)</td>
<td>(0.9501)</td>
</tr>
<tr>
<td>Employment-population ratio</td>
<td>0.8537</td>
<td>0.0033</td>
</tr>
<tr>
<td></td>
<td>(0.0065)</td>
<td>(0.0097)</td>
</tr>
<tr>
<td>Share unemployed</td>
<td>0.0011</td>
<td>−0.0008</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0005)</td>
</tr>
<tr>
<td>Share working in agriculture</td>
<td>0.2802</td>
<td>0.0621</td>
</tr>
<tr>
<td></td>
<td>(0.0333)</td>
<td>(0.0518)</td>
</tr>
<tr>
<td>Share working in manufacturing</td>
<td>0.5040</td>
<td>−0.0610</td>
</tr>
<tr>
<td></td>
<td>(0.0279)</td>
<td>(0.0433)</td>
</tr>
<tr>
<td>Share working in services</td>
<td>0.2158</td>
<td>−0.0011</td>
</tr>
<tr>
<td></td>
<td>(0.0160)</td>
<td>(0.0228)</td>
</tr>
<tr>
<td><strong>Panel B. Other characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share male</td>
<td>0.5212</td>
<td>0.0064</td>
</tr>
<tr>
<td></td>
<td>(0.0050)</td>
<td>(0.0075)</td>
</tr>
<tr>
<td>Share foreigners</td>
<td>0.0867</td>
<td>−0.0265</td>
</tr>
<tr>
<td></td>
<td>(0.0146)</td>
<td>(0.0188)</td>
</tr>
<tr>
<td>Share settlement area</td>
<td>0.1217</td>
<td>0.0014</td>
</tr>
<tr>
<td></td>
<td>(0.0178)</td>
<td>(0.0333)</td>
</tr>
<tr>
<td>Share farming area</td>
<td>0.4659</td>
<td>0.0700</td>
</tr>
<tr>
<td></td>
<td>(0.0304)</td>
<td>(0.0437)</td>
</tr>
<tr>
<td>Day-care supply in 1995†</td>
<td>0.0620</td>
<td>−0.0038</td>
</tr>
<tr>
<td></td>
<td>(0.0414)</td>
<td>(0.0522)</td>
</tr>
</tbody>
</table>

Observations | 273 | 287 | 273 | 287

Notes: See notes to Table 2.1. * p < 0.10, ** p < 0.05, *** p < 0.01. Population density is Swiss men age 15+ per 100 hectare (municipality area as of 1997). Settlement and farming areas as of 1997 (Arealstatistik, Federal Statistical Office, Neuchatel). Share male and share foreigners for total resident population (not just Swiss nationality), excluding group quarters. † Day-care supply is full-time equivalents working in day-care firms (Firm census 1995, which is the earliest firm census for which day-care classification is available) per 100 resident women age 20-40 (per 1990 census).
2.4 Results

2.4.1 Childlessness and LFP of mothers at the language border

In the previous sections, the emphasis was on smoothness in the environment around and composition of one cohort of Swiss women, born 1952-1961. These women were born kilometers apart, but exposed to a different cultural environment at home and in school. In this section, I look at their fertility outcomes at the end of their childbearing years, and at their participation in the labor market at the time they were mothers of young children. At both stages, I exclude never-married women at the respective point in time to ensure comparable constraints. Figure 2.9 plots childlessness at age 39-48 of this cohort against distance from their place of birth to the language border. Ceteris paribus, women born in German-speaking municipalities are about 3.7 percentage points more likely to remain childless than their peers born in French-speaking municipalities. As will be shown below, there is no statistically significant difference at the border in terms of the number of children mothers give birth to. In terms of completed fertility, German-speaking women have about 0.14 less children than their French-speaking peers.

This difference is robust to bandwidth variation, as shown in Table 2.4. Column (1) is estimated using the preferred bandwidth of 30km driving distance from the municipality of birth of the individual to the closest municipality in the other language region, leading to the 3.7 pctp difference at the border as plotted in Figure 2.9, statistically significant at the usual levels. Columns (2)-(4) contain estimates using different bandwidths of 15km, 60km and the optimal bandwidth of Imbens and Kalyanaraman (2012), respectively. The estimated border difference is robust to bandwidth variation (also see Figure 2.15 in the appendix, which plots the discontinuity estimates for the whole range of possible bandwidths), while precision gets markedly lower for the smallest bandwidth.

Table 2.5 checks robustness with respect to the inclusion of control variables, using the 30km bandwidth in all specifications. Column (1) is the same as in Table 2.4. Columns (2) to (4) add control variables from Tables 2.2 and 2.3 on the individual and municipality level. The estimated border difference is slightly smaller and more precisely estimated. In column (6), partner’s characteristics (from Table 2.2) are added as additional control variables. This excludes women who are not living (anymore) in a household with a

\[I also estimated the border discontinuity following the suggestions of Angrist and Pischke (2009) in allowing for a more flexible parametric specification for the effect of distance. Specifically, I included a quadratic function for distance (different on both sides of the border) in the 30km bandwidth set-up, and a quartic in the 60km set-up, without kernel weights. The estimated discontinuity in those models is 0.0465 with a standard error of 0.0081 and 0.0878 with a standard error of 0.0167, respectively (both clustered at the municipality of birth).\]
Figure 2.9: Childlessness at the language border

Notes: Negative distance = French-speaking, positive = German-speaking municipality of birth. Municipality of birth is the mother’s municipality of residence when the individual was born. Language region affiliation by majority language among all residents in 2000. Distance to language border is distance in driving km to the closest municipality in the other language region. Sample includes Swiss women born in Switzerland age 39-48 (in 2000). Women working in agriculture (or with partners working in agriculture) are excluded. Scatter-plot consists of 2km bin averages. Note that population density varies over distance. Municipalities close to the border are smaller, so the variance is naturally higher. Included are local linear regression estimates (individual level) on both sides separately using a triangular kernel with 30km bandwidth and bootstrapped (2,000 replications) confidence intervals. The same procedure generates the discontinuity coefficient and standard error, but jointly estimating both sides with the same kernel (triangular) and bandwidth (30km).

Table 2.4: Border difference in childlessness

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>30km</th>
<th>15km</th>
<th>60km</th>
<th>40.6km†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Intercept (French side)</td>
<td>0.0907</td>
<td>0.0801</td>
<td>0.0885</td>
<td>0.0911</td>
</tr>
<tr>
<td></td>
<td>(0.0049)</td>
<td>(0.0099)</td>
<td>(0.0040)</td>
<td>(0.0046)</td>
</tr>
<tr>
<td>German border difference</td>
<td>0.0369</td>
<td>0.0451</td>
<td>0.0390</td>
<td>0.0307</td>
</tr>
<tr>
<td></td>
<td>(0.0091)***</td>
<td>(0.0177)**</td>
<td>(0.0066)***</td>
<td>(0.0081)***</td>
</tr>
<tr>
<td>Observations</td>
<td>48,395</td>
<td>23,870</td>
<td>122,243</td>
<td>85,237</td>
</tr>
<tr>
<td>Municipalities</td>
<td>560</td>
<td>250</td>
<td>1,137</td>
<td>779</td>
</tr>
</tbody>
</table>

Notes: See notes to Table 2.1. * p < 0.10, ** p < 0.05, *** p < 0.01. Sample includes Swiss women born 1952-1961 within 30km of the language border. Excluded are never-married women, women living in group quarters or on farms, and women with missing fertility information in 2000. † Optimal bandwidth as suggested by Imbens and Kalyanaraman (2012).

One dimension which I have neglected so far is mobility. The fertility outcomes are measured for women born close to the border, but they could move anywhere in Switzerland before age 39-48 in 2000. This potentially raises concerns regarding smoothness of the institutional set-up, since German-speaking women move to different parts of the country compared to their French-speaking peers born across the language border, and institutional differences increase to some degree in distance from the border. There are two pieces of evidence that mitigate these concerns. First, one particular feature of Switzerland is low geographical mobility. Of this sample of women, in 2000, 21 percent live in the same municipality in which they were born. Furthermore, median distance from municipality of birth to municipality of residence is only 17km. Second, splitting the sample into women that stayed within 30km of the border, and women that moved outside this window yields border differences of 3.4 (with a standard error of 1.1) and 3.5 (1.2) percentage points, respectively.23 Additionally, in panel a of Figure 2.17 in Appendix A, childlessness is plotted by municipality of residence. The border discontinuity estimate in that specification is 0.0324 with a standard error of 0.0124, in line with (selective) mobility playing a minor role at the language border. Thus it does not appear to be the case that an interplay of mobility and differences in institutional environment drive the language border results. This highlights the importance of vertical transmission of norms and values as suggested by Bisin and Verdier (2000b) in particular, and of cultural determinants of fertility outcomes in general.

23Both are slightly lower than the estimates for the whole sample, which is possible here because of kernel weighting, i.e. observations do not have the same weights in both split-sample models.
Table 2.5: Border difference in childlessness with controls

<table>
<thead>
<tr>
<th>Dependent variable: never gave birth to a child (1 = childless, 0 = not childless)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>German border difference</td>
<td>0.0369</td>
<td>0.0351</td>
<td>0.0326</td>
<td>0.0359</td>
<td>0.0360</td>
</tr>
<tr>
<td>(0.0091)***</td>
<td>(0.0076)***</td>
<td>(0.0076)***</td>
<td>(0.0089)***</td>
<td>(0.0096)***</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>48,395</td>
<td>48,395</td>
<td>48,395</td>
<td>48,395</td>
<td>40,448</td>
</tr>
<tr>
<td>Municipalities</td>
<td>560</td>
<td>560</td>
<td>560</td>
<td>560</td>
<td>559</td>
</tr>
<tr>
<td>Individual controls</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Canton fixed effects</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Municipality controls</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Partner controls</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes: See notes to Table 2.1. * p < 0.10, ** p < 0.05, *** p < 0.01. Sample includes Swiss women born 1952-1961 within 30km of the language border. Excluded are never-married women, women living in group quarters or on farms, and women with missing fertility information in 2000. Individual controls are indicator variables for religious affiliation (catholic/protestant/other/none), age (in 2 year increments), highest educational achievement, and marital status. Municipality controls are from Table 2.3 (1970 version). Partner controls are partner’s age, and indicator variables for highest educational achievement and employment status. Last column only includes women living with a partner (in 2000).

In 1990, these same women are mostly mothers of young children. Figure 2.10 and Table 2.6 present border discontinuities regarding their propensity to work. When they are mothers of young children, women born in German-speaking municipalities are about 8 percentage points less likely to be in the labor force than their French-speaking peers. Bandwidth variation, limiting the sample to bilingual cantons (including canton fixed effects), and/or including control variables does not lead to important differences. Doing the same comparison for mothers where the youngest child is age 5–9, or women without a child in the household, there is no significant difference in LFP at the language border (see panels a and b of Figure 2.19 in the Appendix).

Thus in terms of (extensive margin) labor supply, the only difference between German- and French-speaking women is observable when they are mothers of children below school age. This is interesting in the sense that one alternative explanation for cross-country

---

24 Of the mothers, we observe about 40% when their youngest child is below age 5. It is important to note that all of these results are robust to inclusion of year of birth dummies, age of youngest child in the household, and/or varying the cohort window.

25 About 3 percent of those in the labor force report to be unemployed.

26 The results are almost the same when using only the sample of women born in bilingual cantons, and highly statistically significant whether the bandwidth is varied or control variables are included. Also, in panel b of Figure 2.17 in the appendix, labor force participation of mothers is plotted by municipality of residence, leading to a border estimate of -0.1011 with a standard error of 0.0252. Thus, as was found to be the case for childlessness, LFP of mothers appears not to be driven by mobility decisions.
Figure 2.10: Labor force participation of mothers of young children

Notes: Negative distance = French-speaking, positive = German-speaking municipality of birth. Sample includes Swiss women born 1952-1961, sampled in the 1990 census, with children under age 5 present in the household. See notes to Figure 2.9 for details regarding RD technicalities.

Source: 1990 population census, Federal Statistical Office. Distance data: search.ch map data.

differences in female labor supply concerns the speed of adoption of a “modern” identity Fortin (2009). While traditionally most women were withdrawing from the labor force completely after getting married, modern women never left the labor force or returned to work when their kids reached school age. As there is no difference in LFP at the language border except among mothers of young children, it does not appear to be the case that a differential speed in adopting the modern identity is driving the language border patterns. Instead, cultural differences linked only to mothers seem to be the main drivers. This forms the basis for the simple explanatory approach relying only on differences in the acceptance of working mothers outlined below.

The difference in LFP, especially its magnitude, is not as clean as the difference in childlessness, however. Since there is a significant difference in extensive margin fertility at the language border, the sample of mothers is not necessarily the same in terms of observed and unobserved characteristics, which might raise concerns that the difference in labor force participation of mothers is driven by selection. But this effect is likely small even in the most extreme case, since childlessness is still relatively low on both sides of the border in terms of the population of women. According to a back-of-the-envelope calculation assuming all the “surplus” childless women in the German-speaking part were working at the time they would hypothetically be mothers of young children, labor force participation of mothers would be about 5.4 percentage points lower at the border among
Table 2.6: Border difference in labor force participation of mothers

<table>
<thead>
<tr>
<th>Panel A. Varying the bandwidth</th>
<th>Bandwidth</th>
<th>30km</th>
<th>15km</th>
<th>60km</th>
<th>40.5km†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (French side)</td>
<td>0.3872</td>
<td>0.4114</td>
<td>0.3905</td>
<td>0.3862</td>
<td></td>
</tr>
<tr>
<td>(0.0187)</td>
<td>(0.0290)</td>
<td>(0.0108)</td>
<td>(0.0146)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>German border difference</td>
<td>−0.0821</td>
<td>−0.0981</td>
<td>−0.1045</td>
<td>−0.0960</td>
<td></td>
</tr>
<tr>
<td>(0.0241)***</td>
<td>(0.0384)***</td>
<td>(0.0159)***</td>
<td>(0.0203)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>18,924</td>
<td>9,502</td>
<td>48,029</td>
<td>33,330</td>
<td></td>
</tr>
<tr>
<td>Municipalities (clusters)</td>
<td>557</td>
<td>247</td>
<td>1,121</td>
<td>768</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B. Adding controls (30km bandwidth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>German border difference</td>
</tr>
<tr>
<td>(0.0185)***</td>
</tr>
<tr>
<td>Individual controls</td>
</tr>
<tr>
<td>Canton fixed effects</td>
</tr>
<tr>
<td>Municipality controls</td>
</tr>
<tr>
<td>Partner controls</td>
</tr>
</tbody>
</table>

Notes: See notes to Table 2.1. * p < 0.10, ** p < 0.05, *** p < 0.01. Sample includes Swiss women born 1952-1961 within 30km of the language border with a child below age 5 in the household (at the time of the census), sampled in 1990. Excluded are never-married women, women living in group quarters or on farms. See notes to Table 2.5 for details regarding control variables.
† Optimal bandwidth as suggested by Imbens and Kalyanaraman (2012).

From the results presented so far, I conclude that there is a significant difference in childlessness and labor force participation of mothers at the language border in Switzerland, which does not coincide with differences in wages, taxes, child-care availability, or composition (e.g. educational achievement). Women born in German-speaking municipalities are significantly more likely to remain childless, and significantly less likely to work at the time there are below-school-age children in the household, compared to their mothers born in the German-speaking part.\(^27\)

\(^{27}\)Using the baseline estimates (30km bandwidth) at the border, 90.9 percent of the French-speaking women are mothers, compared to 87.2 percent among German-speaking women. Combining this with the estimates of Table 2.6, 35.2% of women are working mothers on the French compared to 26.6% on the German side. Attributing the percentage point difference in the share mothers (3.7) to working mothers thus leads to 30.3% working mothers on the German side. Then, LFP of mothers on the German side would be 33.3%, compared to 38.7% on the French side, a 5.4 percentage point difference.
peers born in French-speaking municipalities.

### 2.4.2 Heterogeneity

One important dimension with regards to fertility and labor supply is human capital. It is a consistent pattern that women with higher educational achievement are found to have lower fertility and higher labor supply. Willis (1973) speculated that higher human capital might decrease fertility due to the combination of increased opportunity costs and child “production” being time intensive in the wife’s time. At the language border, according to Figure 2.5, German- and French-speaking women can expect to earn the same wage. From a pure economic point of view, one would therefore expect the language border difference to be identical for women with different potential wages.  

![Figure 2.11: Childlessness by education](image)  

Notes: Negative distance=French-speaking, positive=German-speaking municipality of birth. Mandatory education in Switzerland consists of 9 years of primary and secondary education. Exact rules vary by canton. Post secondary education are mostly 3-4 year apprenticeships, but include also teaching seminars or (usually 6 years) high schools that award a university entrance qualifying degree. Tertiary education includes university, advanced teaching seminars or degrees in applied sciences for professionals. See notes to Figure 2.9 for details regarding RD technicalities.  


This is not the case, however, as can be seen in Table 2.7 and Figure 2.11. The language border difference in childlessness is only marginally significant for women who completed mandatory education, and strongly increasing with higher educational achievement.  

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28Highest educational achievement is strongly linked to observed wages. In the 2000 Labor Force Survey, median hourly wages of Swiss women age 25-55 were CHF 25.7 for women with mandatory education, 31.9 for post secondary education, and 39.7 for tertiary education. In terms of US dollars, with an exchange rate of 0.6 USD for 1 CHF (March 1st 2000, oanda.com), these are equivalent to USD 15.4, 19.1, and 23.8.  

29Note that the educational system in Switzerland resembles the German dual system. In most cantons (states), mandatory education consists of 9 years of primary school, followed by either 4 years of university preparation, or an apprenticeship accompanied by education in a professional school (hence the word “dual”). Both university preparation and an apprenticeship are classified as post secondary education in the ISCED. After passing university preparation exams or obtaining a comparable degree at a professional school (in addition to apprenticeship related education), individuals are eligible to enrolling at any Swiss
the same time, when these women are mothers of young children, they are equally likely to work if they only completed mandatory education. Among mothers with post secondary (mostly apprenticeships) or tertiary education, those born in German-speaking municipalities are increasingly less likely to work, compared to their French peers. These differences do not appear to be the result of selection, as there is no evidence for differential educational achievement at the language border (Table 2.2). Similarly, differential assortative mating does not appear to be reason for concern, as adding all the control variables used in the robustness checks above, which include partner’s education, does not change the picture significantly.\textsuperscript{30}

The pattern that differences in childlessness and LFP of mothers are larger among more highly educated women is also visible when comparing France and Germany (see Figure 2.20 in the Appendix). But comparisons of these two countries are difficult as the educational system is different and levels of educational achievement (and therefore composition) differ. At the language border, this result has more weight, since the system is the same, and there does not appear to be differential selection into educational tracks.

The patterns of fertility and mothers’ labor force participation at the language border are puzzling in the light of previous research, and not easily explained away by taste. Below, I present a new approach to resolve these difficulties, potentially shedding light on what drives the significant cross-country variation we observe in these two important statistics.

2.4.3 Additional outcomes

There might be some concern that higher childlessness among German-speaking women is driven by giving birth later in life. This could result from different career planning horizons, or differences in the mating process. Additional fertility outcomes of the cohort of Swiss women born 1952-1961 are given in Panel A of Table 2.8 (corresponding to Figure 2.18 in the appendix). As can be seen, there are no significant differences at the language border in terms of age at first birth and age at birth of last child. This should alleviate concerns that differences in childlessness are driven by delayed childbirth of German-speaking women.

Furthermore, on both sides of the language border, (ever-married) women of this cohort have on average about 2.1-2.2 children, highlighting the fact that the cultural difference in fertility mainly occurs along the extensive margin. This is in line with the university (general or professional) to obtain a BA/MA/PhD, which are classified as tertiary education.

\textsuperscript{30}Adding all the control variables as in column (6) of Table 2.5, the border difference in childlessness is 0.035 (s.e. 0.017), 0.026 (s.e. 0.012), and 0.105 (s.e. 0.041) for women with low, medium, and high education, respectively. For mothers’ LFP the border differences with all controls are 0.014 (s.e. 0.041), -0.084 (s.e. 0.028), and -0.224 (s.e. 0.082) for women with low, medium, and high education, respectively.
### Table 2.7: Childlessness and labor force participation of mothers by education

<table>
<thead>
<tr>
<th>Highest completed education</th>
<th>All</th>
<th>Mandatory only</th>
<th>Post secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A. Childlessness in 2000</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept (French side)</td>
<td>0.0907</td>
<td>0.0762</td>
<td>0.0936</td>
<td>0.1150</td>
</tr>
<tr>
<td>(0.0049)</td>
<td>(0.0084)</td>
<td>(0.0062)</td>
<td>(0.0147)</td>
<td></td>
</tr>
<tr>
<td>German border difference</td>
<td>0.0369</td>
<td>0.0193</td>
<td>0.0368</td>
<td>0.0852</td>
</tr>
<tr>
<td>(0.0091)***</td>
<td>(0.0122)</td>
<td>(0.0125)***</td>
<td>(0.0320)***</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>48,395</td>
<td>12,600</td>
<td>29,219</td>
<td>4,906</td>
</tr>
<tr>
<td>Municipalities</td>
<td>560</td>
<td>551</td>
<td>559</td>
<td>464</td>
</tr>
</tbody>
</table>

| **Panel B. LFP of mothers of children under age 5 in 1990** |           |                |                |             |
| Intercept (French side)     | 0.3872    | 0.2270         | 0.3807         | 0.6675      |
| (0.0187)                    | (0.0242)  | (0.0189)       | (0.0498)       |             |
| German border difference    | −0.0821   | 0.0197         | −0.0800        | −0.2124     |
| (0.0241)***                 | (0.0366)  | (0.0243)***    | (0.0630)***    |             |
| Observations                | 18,924    | 3,504          | 13,368         | 1,689       |
| Municipalities              | 557       | 486            | 552            | 321         |

**Notes:** * p < 0.10, ** p < 0.05, *** p < 0.01. See notes to Tables 2.1 and 2.6 for details. Mandatory education consists of 9 years of primary school (in most cantons (states)), followed by either 4 years of university preparation, or an apprenticeship accompanied by education in a professional school (hence the word “dual education system”). Both university preparation and an apprenticeship are classified as post secondary education in the ISCED. After passing university preparation exams or obtaining a comparable degree at a professional school (in addition to apprenticeship-related education), individuals are eligible to enrolling at any Swiss university (general or professional) to obtain a BA/MA/PhD, which are classified as tertiary education.

Conclusion of the German Federal Statistical Office in their 2008 report on fertility,³¹ where they state that declining fertility among recent cohorts (born after 1949) in Germany is mainly due to increasing childlessness.³²

As shown above, women born in the German-speaking part of Switzerland are more likely to stay at home when they are mothers of young children than women born in the French-speaking part. An interesting follow-up question is whether this difference in lifetime labor force participation leads to observable differences in labor market outcomes.

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³²They report a relatively stable distribution of the number of children per woman for cohorts born after 1949. About 30% of these mothers have 1 child, 45% have 2 children, and 20% have 3 or more children.
Table 2.8: Other fertility and labor market outcomes in 2000

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mothers</th>
<th>Childless women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept (French)</td>
<td>German difference</td>
</tr>
<tr>
<td>Panel A. Fertility outcomes (in 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at birth of first child</td>
<td>26.1465</td>
<td>0.3629</td>
</tr>
<tr>
<td></td>
<td>(0.1588)</td>
<td>(0.3119)</td>
</tr>
<tr>
<td>Age at birth of last child</td>
<td>30.1197</td>
<td>−0.0670</td>
</tr>
<tr>
<td></td>
<td>(0.0185)</td>
<td>(0.0322)</td>
</tr>
<tr>
<td>Number of children (excl. childless)</td>
<td>2.1879</td>
<td>−0.0468</td>
</tr>
<tr>
<td></td>
<td>(0.0185)</td>
<td>(0.0322)</td>
</tr>
<tr>
<td>Panel B. Labor market outcomes (in 2000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor force participation</td>
<td>0.7599</td>
<td>−0.0046</td>
</tr>
<tr>
<td></td>
<td>(0.0096)</td>
<td>(0.0151)</td>
</tr>
<tr>
<td>Weekly hours of work</td>
<td>26.1012</td>
<td>−1.4159</td>
</tr>
<tr>
<td></td>
<td>(0.2973)</td>
<td>(0.5296)**</td>
</tr>
<tr>
<td>Share managers</td>
<td>0.0269</td>
<td>−0.0138</td>
</tr>
<tr>
<td></td>
<td>(0.0054)</td>
<td>(0.0067)**</td>
</tr>
</tbody>
</table>

Notes: See notes to Table 2.1 for details. * p < 0.10, ** p < 0.05, *** p < 0.01. Hours of work regressions only include observations with positive hours. Share managers is computed from “position in main job”-variable, only including observations with “employee position” and “superior position” (about 80% of working mothers and 75% of working childless women; other possible answers were self-employed (9%/11%), employed in own company (2%/2%) and employed in family enterprise (4%/2%); about 9%/5% did not indicate their position).

Later in life, Panel B of Table 2.8 looks at labor force participation, weekly hours of work, and the share reporting to be in a managerial position in their firm in the 2000 census, splitting the sample into mothers and childless women.

According to these results, labor force participation does not differ significantly at the border either among mothers or childless women. In terms of weekly hours of work, the German border level is about 1.4 hours lower than on the French side among mothers, and there is no difference among childless women. The share managers is slightly lower among German-speaking mothers, while there is again no difference among childless women. Thus mothers in the German-speaking part work less on the intensive margin and at lower positions in their firms later in life compared to their French-speaking peers. This result is in line with French-speaking mothers returning to work more quickly after giving birth, and thus being less exposed to losses in human capital.
However, note that since culture has been shown to be an important determinant not only of the labor supply of mothers, but also of extensive margin fertility, these results have to be interpreted with caution, as there is a selection problem. Specifically, it has been shown that women with higher education are more likely to stay childless in the German-speaking part, which likely leads to negative selection (in terms of human capital) of German-speaking mothers. Thus the worse labor market outcomes of German-speaking mothers represent the combined effect of selection into motherhood and lower lifetime labor force participation. In the combined sample of women, the difference in hours is -0.775 with a standard error of 0.477 (p=0.104). The difference in the share managers is -0.011 percentage points, with a standard error of 0.006 (p=0.087). Thus the total effect of cultural differences on labor market outcomes at ages 39-48 is weakly negative but only marginally statistically significant.

2.5 An identity approach

In this section, I lay out the basic idea behind the identity approach. I demonstrate that working mothers are viewed less favorably in the German-speaking compared to the French-speaking region. I combine a simple version of the household model inspired by Willis (1973) and Jones et al. (2008) with an identity framework to spell out how the basic mechanism could operate and explore interactions with wages. In light of the education gradient in the language border differences discussed above, it seems relevant to explore whether the model can accommodate these additional patterns. Throughout, I focus on the extensive margin choices in fertility and labor supply, motivated by the empirical results.33

2.5.1 Identity and working as a mother

There is a growing literature in economics investigating cultural explanations of fertility and labor supply patterns (Fortin (2005), Fortin (2009), Fernández and Fogli (2005), among others). Using different approaches, these studies find significant impacts of culture on women’s choices. One such cultural component is “mother’s guilt” (Fortin (2005), Fernández (2007), Fogli and Veldkamp (2011)), i.e. mothers feeling guilty if they work instead of caring for their children, linked to the acceptance of working mothers in soci-

33The justification for focusing on extensive margin fertility might also be given by the following reasoning. In the language of Fortin (2009), rising labor market opportunities increasingly present women with a fundamental choice—whether to pursue a career, i.e. maintain labor market attachment in becoming a working mother or childless, or a housewife focused on home production. If working as a mother is not desired by women and/or accepted by society, the main response can be expected at the extensive margin, since few careers permit a 5-year break, the time it usually takes until a child reaches school age.
Identity, Working Moms, and Childlessness

Feelings of guilt result from behavior not corresponding to one’s own ideal of what a mother should do (Akerlof and Kranton, 2000)—taking care of children full-time. Extensive survey evidence documents the prevalence of the belief that children are harmed if their mothers work, and that the mother-child relationship suffers (Fortin (2005), Fogli and Veldkamp (2011)). This belief is argued to be the result of two factors. First, in early childhood, breastfeeding may be important for the physical development of the child. Second, development of the child’s cognitive and social skills could depend crucially on the mother-child relationship, and not be substitutable with relationships to other caretakers.\(^{34}\)

Whether working as a mother is considered acceptable is different from norms and values related to the optimal division of household tasks, like the traditional role model, which holds that the man is the breadwinner, and the wife the homemaker. In the traditional role model, women should restrict their labor supply in general, to be able to take care of household tasks and support their husband and children. Attitudes regarding working mothers, and the mother-child relationship, on the other hand, only affect women who are mothers of young children, and do not relate to labor supply of women when their children attend school, or when there are no children in the household. Being raised in a culture where the prevalent belief is that mothers should stay at home has theoretically interesting consequences, since women may anticipate this restriction and adjust their fertility accordingly. The prevalence of the belief that mothers should stay at home while the child is below school age is the main channel through which this paper attempts to reconcile the cultural patterns in the labor force participation of mothers and extensive margin fertility of women. This is not the first approach considering this channel. The effect of mother’s guilt on desired fertility is investigated in Ruckdeschel (2009), comparing France and West-Germany using data from the UN Generations and Gender Programme. She finds a negative effect of agreement with the statement “pre-school child suffers with working mother”, on the desire to have children, controlling for demographics and a measure of support for the traditional role model (“taking care of the household is as fulfilling as paid work”).

In 2002 the International Social Survey Programme (ISSP) asked women in Switzerland whether they think that mothers should work when they have a child. Table 2.9 shows their answers, differentiated by language region according to canton of residence. In German-speaking cantons, almost no one thinks that women should work full-time when they have a child under school age, compared to 6.9 percent in French-speaking cantons. The difference is even larger when asked about part-time employment. Whereas

\(^{34}\)Note that this paper does not take a stand on whether mother’s guilt is justified. Fogli and Veldkamp (2011) cite evidence that a child’s human capital is only marginally lower if the mother works. In this paper, I look at consequences of the belief that the child suffers, not whether this belief is justified.
Chapter 2

71.3 percent of Swiss-French think women should do at least some work while having a child under school age, only 48.1 percent of Swiss-Germans do so. The remaining respondents answered that women should stay at home, with a highly statistically significant difference of 28.9 percentage points. When the youngest kid is at school, the differences become much smaller. This strong difference in how the Swiss-French and the Swiss-Germans think about labor supply of mothers shows how culturally distant these two groups of women are in terms of their norms and values. That caring mothers should stay at home and fully invest their time in children is reflected in the broader German culture. Working mothers are labeled “Raven Mothers” (Rabenmutter), and face social pressure if they return to work too early (Ruckdeschel, 2009).

Table 2.9: ISSP 2002 questions on mother’s guilt

<table>
<thead>
<tr>
<th></th>
<th>a. ...w/ child under school age?</th>
<th>b. ...youngest kid at school?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>French</td>
<td>German</td>
</tr>
<tr>
<td>Work full-time</td>
<td>0.069</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Work part-time</td>
<td>0.713</td>
<td>0.481</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.031)</td>
</tr>
<tr>
<td>Stay at home</td>
<td>0.218</td>
<td>0.507</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.031)</td>
</tr>
</tbody>
</table>

Notes: Reported are shares of respondents (women only) selecting the particular category. Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01 No. of observations: 413 for the first and 417 for the second question. Separation into language region by majority language of the canton of residence.

Source: ISSP 2002

Additional survey evidence is found in the European Values Survey, carried out in Switzerland in 2008. Women were asked whether they agree with the statement “A working mother can establish just as warm and secure a relationship with her children as a mother who does not work” and the statement “A pre-school child is likely to suffer if his or her mother works”. Women from German-speaking regions were significantly less likely...
to agree with the first statement, and more likely to agree with the second, compared to their peers from the French-speaking region. Regarding other attitudes stressed to be important for female LFP and fertility in the literature, there does not appear to be a significant difference between German- and French-speaking Swiss women. Agreement with the statement “If jobs are scarce, give men priority”, 18.5% and 23.1% agreed in the French- and German-speaking region, respectively (a difference of 0.05, p-value 0.23). Regarding the statement “Being a housewife is as fulfilling as working for pay”, 57.8% of women in the French-speaking region agreed, vs. 61.4% in the German-speaking region (a difference of 0.04, p-value 0.44). The first question captures egalitarian values, while the second captures support for the traditional household model (Fortin, 2005). These findings correspond to the empirical results at the language border, where the only significant difference in LFP is observed among mothers of young children.

Thus there is strong evidence from aggregate survey data that labor supply of mothers is more accepted in the French-speaking parts of the country, compared to the German-speaking parts, corresponding to the difference between France and Germany (Ruckdeschel, 2009). But do these cultural attitudes change abruptly at the language border or is there convergence? Due to the direct democratic system in Switzerland, how people vote in referenda on policy questions like extension of unemployment insurance or immigration policy is routinely recorded. One particularly interesting vote in the context of this paper took place in 2004 and concerned the introduction of maternity insurance. It passed (at the third attempt) and thus mandatory maternity insurance was introduced at the federal level paying 80% of the last pre-birth wage for a leave of 14 weeks after giving birth. Figure 2.12 shows the share yes-votes in municipalities, by distance to the language border. The jump at the language border is sharp, and there does not appear to be any convergence toward the border, showing that support for maternity insurance is much stronger in the French-speaking municipalities compared to their German-speaking neighbors right across the border.

\[36\] Agreement with the statement could be indicated on a scale from 1 (strongly agree) to 4 (strongly disagree). Mean answers among women in the German- and French-speaking parts of the country to the first question were 2.085 and 1.823, respectively, with a difference of 0.262 (s.e. 0.065). Note that a lower mean indicates higher support for the statement. Mean answers to the second question were 2.290 and 2.442, respectively, with a difference of -0.152 (s.e. 0.063). Number of observations: 146 in the French-speaking and 525 in the German-speaking part. Survey weights used in all calculations.

\[37\] Feyrer et al. (2008) argue that the positive correlation between female LFP and fertility in the cross-country dimension is the result of social norms regarding the division of household work. They show that in high LFP-fertility countries men do a larger share of household work compared to low LFP-fertility countries. I replicated their measure for the division of household work using the same data set (ISSP 2002) and compared the share done by men between the two language regions. Among all women (with partners) the difference in the share household work done by their partners is (German minus French) -0.005 \((t = -0.19, n = 257)\). Among women with children below age 6 the difference is -0.017 \((t = -0.32, n = 47)\).
Figure 2.12: Swiss popular referendum on the introduction of maternity insurance (2004)

Notes: Negative distance=French-speaking, positive=German-speaking municipalities. Depicted is the share yes-votes among all valid votes in a federal referendum on the introduction of mandatory maternity insurance held in 2004 (municipality level, weighted by turnout). The initiative demanded mandatory leave of 14 weeks for mothers, with a replacement rate of 80% of the pre-birth wage (with a cap of CHF 172 per day), for self-employed and employed women, financed by employer contributions. See notes to Figure 2.9 for details regarding construction of the figure.

The yearbook of Swiss politics\(^{38}\) states that the two main issues in the political debate concerned regulatory arguments, i.e. the question whether it is the government’s job to look after mothers and children (opponents coined the term “government kids”), and the general view of the family, i.e. the acceptance of working women. In Chapter 3, we argue that the border difference observed in this referendum is in line with a higher demand for social insurance in regions where Latin-derived languages are dominant. The large difference at the German-French language border might therefore reflect both a difference in norms regarding working mothers and a difference in the demand for social insurance. There is no way to separate the two, but since there is no visible difference in the trends on either side, it seems plausible that both cultural components differ sharply at the border. While it is not possible due to a lack of much more detailed survey data to provide conclusive proof that the only difference in attitudes is in whether mothers should work when there are young children in the household, the results of the empirical section speak a clear language. There is a large and robust difference in LFP of mothers at the border, despite no observable differences in wages or work-family policies. Furthermore, once the youngest child reaches school age, the difference disappears, and is also not found among women without children in the household.

In the next section, I combine identity costs resulting from working as a mother with a

prototype household model to see how rational agents’ choices react to this cost. Throughout, the assumption will be that this cost is inherited and women’s choices do not have a feedback effect on the cost. In that respect, I follow the literature stressing the importance of vertical transmission of norms and values (Bisin and Verdier (2000b), Vella (1994), Fernandez (2007)). To some extent, this is also true in the learning model introduced by Fogli and Veldkamp (2011). In that model, women inherit their parents’ beliefs about the harm done to children by working mothers and update them by observing the outcomes of their neighbors of the previous generation.

2.5.2 Theoretical framework

Economists have long thought about fertility decisions of women. The main theoretical device in this endeavor has been a model of joint optimization within the household, pioneered by Becker (1960) and refined by Willis (1973).\footnote{Gobbi (2013) uses a similar model to study long run dynamics of childlessness.} I combine a simple version of this household model with identity parameters, as suggested in Akerlof and Kranton (2000).

Consider a household consisting of a wife and husband maximizing joint utility from children and the consumption of a composite good: \( u(C, S) = \alpha C + \log(S) \), where \( C \) denotes investment in children,\footnote{As in Willis (1973), I abstract from the distinction between number and quality of children, as the main emphasis of the model will be on extensive margin choices.} \( \alpha \) denotes fertility preferences, and \( S \) is a composite consumption good. This choice of functional form for the household’s preferences is inspired by Becker and Barro (1986). The husband supplies earnings \( E \), while the wife allocates her total available time \( T \) to work \( (L) \) and investment in children \( (T - L) \). The household budget constraint is given by \( S = wL + E \), while children (in the terminology of Becker (1960) the combination of number and quality of children) are “produced” according to \( C = T - L \). This simple parametrization captures the main features of Willis’ (1973) version of the Becker model in that “production” of children (quantity times quality) is intensive in the wife’s time. I will expand below on how my results apply in a more general model.

As documented above, there is evidence that German-speaking women consider working as a mother to be harmful for the child to a greater degree than French-speaking women. Using the terminology in Akerlof and Kranton (2000), German-speaking women have a different sense about what it means to be a “good” mother, and how they define their identity as women and mothers. Their identity concept stipulates that a good mother stays at home when the child is below school age, since she is the only person capable of...
taking good care of her child.\textsuperscript{41} This directly translates into feelings of guilt should she decide to work as a mother (or be forced to). On the other hand, a German-speaking mother who chooses to stay at home feels good about this choice since it conforms to her sense of what a mother should do. Akerlof and Kranton (2000) propose operationalizing identity as a utility cost if a choice does not correspond to the prescribed behavior of a social category.\textsuperscript{42} In the present context, I differentiate between two social categories: mothers and childless women.\textsuperscript{43} Labor supply of mothers is constrained, while childless women are free to work as much as they want.

Identity enters the model as a utility parameter, a utility cost associated with working as a mother. Specifically, I assume that working mothers suffer identity costs $I$, while childless women or mothers who choose not to work are not subject to this cost.\textsuperscript{44}

\textsuperscript{41}In the formulation of the model, I am more precise: The German-speaking women have a higher identity cost than their French-speaking peers. I do not assume that the French-speaking have zero cost.

\textsuperscript{42}As Akerlof and Kranton (2000) note, a woman’s identity is constantly threatened by the observed choices that her peers make. If, for example, a stay-home mother meets a mother who works, her sense of identity is diminished, since after all her choice may not have been the correct one. This inner conflict is resolved by punishing peers who violate the rules associated with good behavior. I lump “self-cost” and peer component together into one parameter, since analyzing different equilibria is not the goal of this paper.

\textsuperscript{43}One margin which I am ignoring here is AK’s social categories of women and men. One could argue that the category woman is associated with the following rule: women should have children. In that case, childlessness would also be subject to identity costs. Another distinction that I abstract from is that women might adopt “career” identities (working mom or childless) vs. “housewife” identities Fortin (2009). Since the only difference in female LFPr at the language border is observed among mothers, is does not appear to be the case that there are differential adoption rates in terms of these margins.

\textsuperscript{44}This parametrization ignores the possibility that, if working as a mother is not viewed favorably in society, firms could be less willing to provide part-time options for mothers. Generally speaking, the firm side of the employment relationship could be responsible for costs associated with combining work and family. This channel does not contradict that cultural factors are responsible for the language border difference—it would just be the boss’ attitudes instead of the woman’s that are the driving force. However, regarding availability of suitable hours jobs, this does not appear to be the case. In the 1992-1995 Labor Force Surveys, mothers of children below age 5 working full-time were asked whether they would prefer to work part-time. In the French-speaking region, 9% said yes, vs. 5% in the German-speaking region. Among mothers working part-time, 47% and 28% said they would prefer to work full-time in the French and German-speaking region, respectively. From these results, it appears French-speaking mothers feel more constrained in the choice of hours than German-speaking mothers. Similarly, mothers not in the labor force were asked whether they would accept an “interesting” job offer. 18% of mothers said “yes” in the French-speaking part, vs. 8% in the German-speaking part. The other possible answers were “given certain conditions” (30% vs. 32%), and “no” (52% vs. 60%).
household maximization problem is then

$$\max_{\{C,S,L\}} \alpha C + \log(S) - I 1 \left( L > 0 \cap L < T \right)$$

s.t. $C = T - L$

$S = wL + E$

$0 \leq L \leq T$

Solution of the model proceeds by setting up the Lagrangean and deriving Kuhn-Tucker optimality conditions. For interior solutions of $L$, the first order conditions yield

$$L^* = \frac{w - \alpha E}{w\alpha}$$

If $L^* \leq 0$, the wife does not work and the household thus fully invests in children. I call this the “stay-home mom” arrangement. If $L^* = T$, there are no children and the household is focused on consumption, which I call the “childless” arrangement. If $0 < L^* < T$, the household chooses a combination of children and labor supply by the wife. I call this the “working mom” arrangement. In this allocation, total utility is decreased by $I$, due to non-conforming behavior to society’s prescriptions of what a mother is supposed to do (stay at home). Due to identity costs entering utility only in the interior solution of the model, a case differentiation is necessary, comparing utility in the interior solution, to utility in the corner solutions.

In terms of social categories and household arrangements, agents in this model thus face the following alternatives.

<table>
<thead>
<tr>
<th>Social category</th>
<th>Household arrangement (H)</th>
<th>$u^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>Stay-home mom</td>
<td>$u^*_H = \alpha T$</td>
</tr>
<tr>
<td></td>
<td>Working mom</td>
<td>$u^<em>_W = \alpha (T - L^</em>) + \log (wL^* + E) - I$</td>
</tr>
<tr>
<td>Childless woman</td>
<td>Childlessness (C)</td>
<td>$u^*_C = \log(wT + E)$</td>
</tr>
</tbody>
</table>

Note that due to the specific functional forms chosen, changes in the wage have clear-cut effects on labor supply in this model. Specifically, increasing wages lead to higher labor supply of mothers, or a switch to childlessness with all time spent working. This is consistent with the wage and labor supply patterns of women observed in recent history: As the gender wage gap decreased due to rising female wages, women in rich countries increased their labor supply across the board. This feature is also consistent with Willis’ (1973) proposition that substitution effects dominate when wages increase.
Comparative Statics In the following I will show how changes in $I$ affect optimal choices. The formal aspects of the model are relegated to Appendix B. To be able to talk in a meaningful way about childlessness and labor force participation, assume there is heterogeneity in fertility preferences $\alpha$ and wages $w$. Then there are sets in $(\alpha, w)$-space at which households are indifferent between any two of the three household arrangements. Let $\tilde{\alpha}_{HW}(w, I)$ denote the implicit function describing the indifference curve between arrangements $H$ and $W$, i.e. all $w$ where $u^*_W(\tilde{\alpha}_{HW}(w, I), w) = u^*_H(\tilde{\alpha}_{HW}(w, I), w)$. Correspondingly, let $\tilde{\alpha}_{HC}(w)$ and $\tilde{\alpha}_{WC}(w, I)$ denote the indifference curves between $H$ and $C$, and $W$ and $C$, respectively. An interior allocation of the model, where any arrangement is chosen by at least one household looks as depicted in Figure 2.13. $\tilde{\alpha}$ and $\tilde{w}$ denote the lowest possible $\alpha$ and $w$ for which arrangement $W$ is attractive (these depend on $I$). As substitution effects dominate income effects due to increasing wages, arrangements where the wife supplies labor to the market ($C$ and $W$) become strictly more attractive as wages increase.

Figure 2.13: Optimal household arrangements

Identity costs determine the locations and slopes of the indifference curves. If identity costs increase, being a stay-home mom or childless become more attractive. Consider Figure 2.14, which looks at the effect of increasing identity costs. As can be seen, both indifference curves related to $W$ rotate and shift inwards, leading households close to these curves to switch to $H$ or $C$. This is the first result of the model directly capturing the language border patterns. If German-speaking women are subject to higher identity costs of combining work and motherhood, more women opt for childlessness and becoming stay-at-home moms instead of working moms, compared to French-speaking women where identity costs are lower. This mechanism thus generates a positive between-group
correlation in fertility and female LFP, while retaining the basic mechanism of a dominating substitution effect due to increasing wages required to rationalize the secular trends (increasing female LFP and decreasing fertility) and within-group cross-sectional pattern (higher wage women have higher LFP and lower fertility).

In the following, I discuss how identity effects interact with wages. This is interesting as it could be seen as a test of the model. While the direct effects on fertility and labor supply are modeled after the language border patterns as an explanatory approach, there is no direct mechanism in the model to capture interaction effects. Still, relative total utility in the three arrangements changes with the wage, so a constant identity cost affects different parts of the wage distribution in different ways. Consider childlessness conditional on \( w \), which is a function of \( \hat{\alpha}_{WC}(w, I) \). I show in Appendix B that higher identity costs unambiguously increase childlessness (for \( w > \tilde{w} \)), and that this effect is increasing in the wage. For higher wage women, childlessness is more attractive than for lower wage women. When the utility cost of being a working mom increases, these women show a higher propensity to opt out and choose childlessness in the model.

Regarding the labor force participation (LFP) of mothers, there are two effects due to higher identity costs. First, due to the shift in \( \hat{\alpha}_{HW} \), working mothers opt out of the labor force and become stay-home moms. Second, there is a selection effect due to the shift in \( \hat{\alpha}_{WC} \). This effect leads working moms not to have children at all. Thus both effects decrease LFP of mothers. Whether the combined effect is increasing or decreasing with wages depends on parameters. To see this note that the first effect operating on \( \hat{\alpha}_{HW} \) always becomes larger in the wage (shown in the appendix), while the second effect goes to zero as LFP approaches one. In the appendix, I show that for plausible values of
the parameters, the effect of higher identity costs on LFP of mothers is always increasing initially (where LFP is low), but might be hump-shaped.

This section has presented a simple model of household fertility choices augmented by an identity parameter as suggested by Akerlof and Kranton (2000). In this simple model, identity costs lead to higher childlessness and lower labor force participation of mothers. Moreover, childlessness is more strongly affected by identity costs the higher the wage. The model is compatible with a stronger effect of identity costs on LFP of mothers the higher the wage, which results in the model if the direct effect of identity costs on the labor supply of mothers, along the margin where working mothers opt out and stay at home, is increasing more strongly in the wage than the indirect effect leading to childlessness. If the converse holds, the model predicts a hump-shaped relationship between wages and the absolute value of the change in LFP due to identity costs.

**Generalization** The model above simplifies the household decision problem considered by Becker (1960) and Willis (1973) in two respects. First, preferences and production have simple functional forms. Second, “production” of children only depends on the wife’s time and does not allow for goods inputs, and the composite good (which includes leisure) only depends on household income, and not the wife’s time. In the following, I discuss how the central result that identity costs lead to higher childlessness, and that this effect is increasing in the wage, generalizes to a more complete model. I maintain some crucial assumptions. First, identity costs are a fixed cost linearly entering utility in the interior solution where \( C > 0 \) and \( L > 0 \cap L < T \). Second, “production” of children requires the wife’s time, and it is not possible for the household to completely “outsource” child production (thus \( C > 0 \) is only possible if \( L < T \)). Third, there are two heterogeneity parameters: \( \alpha \) which captures fertility preferences, and \( w \), which captures the wife’s wage, and there is an indifference curve separating the two household arrangements “working mom” and “childlessness” in \((\alpha, w)\)-space, given by

\[
\bar{\alpha}_{WC}(w, I) : u^*_W(\bar{\alpha}_{WC}(w, I), w) - I = u^*_C(\bar{\alpha}_{WC}(w, I), w). \tag{2.2}
\]

Additionally, I need some structure on the utility function to be able to pin down how this indifference curve is affected by changes in \( I \). I assume the utility function has the CES structure according to

\[
u^*(\alpha, w) = (\alpha (C^*)^\rho + (1 - \alpha) (S^*)^\rho)^\frac{1}{\rho}, \]

with \( \rho \in (-\infty, 1] \) and \( \alpha \in [0, 1] \).

The household in the complete model simultaneously chooses \( C^* \), \( S^* \), and how to produce these optimally using goods inputs and the wife’s time (see Willis (1973) for
the complete statement of the general model). By the Implicit Function Theorem, the derivative of $\bar{\alpha}$ with respect to $I$ is given by (using equality of $u^*_w$ and $u^*_C$ at $\bar{\alpha}(w,I)$)

$$
\frac{\partial \bar{\alpha}_{WC}(w,I)}{\partial I} = \frac{1}{\frac{\partial u^*_W}{\partial \bar{\alpha}} - \frac{\partial u^*_C}{\partial \bar{\alpha}}} = \frac{1}{\rho \left( u^*_W \right)^{1-\rho} \left( C^\rho_W + (S^\rho_C - S^\rho_W) \right)},
$$

where $C^*_W$, $S^*_W$, and $S^*_C$ denote optimal values of $C$ and $S$ in the W and C arrangement, respectively ($C^*_C = 0$). Due to the Envelope Theorem, the derivatives in the denominator of 2.3 depend only on the optimized value of the utility function (and thus $C^*$ and $S^*$), and not on how production occurs. The denominator of equation 2.3 is positive if but not only if $\rho \geq 0$, since composite good consumption when childless is always larger than composite good consumption in the interior optimum, due to specialization. Thus identity costs tend to increase childlessness if children and composite consumption are sufficiently substitutable in the household’s utility function. This shows the first crucial requirement of my results above. At least in the region of $(\alpha, w)$-space where households tend to derive equal utility from specialization in consumption (childlessness) and combining wife’s work with family, preferences need to exhibit sufficient substitutability regarding the two inputs for the result to carry over to the more general specification.

Differentiating equation 2.3 with respect to the wage yields

$$
\frac{\partial \bar{\alpha}_{WC}(w)}{\partial I \partial w} = - \left( \frac{\partial \bar{\alpha}_{WC}(w)}{\partial I} \right)^{-2} \left[ \frac{1-\rho}{\rho} u^*_W \frac{\partial u^*_W}{\partial w} \left( C^\rho_W + (S^\rho_C - S^\rho_W) \right) \right. \\
\left. + \frac{w^{1-\rho}}{w} \left( \frac{\partial C^*_W}{\partial w} C^\rho_W + \frac{\partial S^*_C}{\partial w} S^\rho_C - \frac{\partial S^*_W}{\partial w} S^\rho_C \right) \right],
$$

where the first term in square brackets is positive if $\rho \geq 0$ and involves the shadow price of the wife’s time ($\partial u^*_W/\partial w$).\footnote{Using the first order conditions of the problem and the Envelope Theorem, $\partial u^*_W/\partial w$ is equal to the shadow price of the wife’s time.} As can be seen, this expression tends to be small if $\rho$ is large (close to 1). The second expression in square brackets depends on the household’s elasticities of demand for children and consumption with respect to the wife’s wage. If the substitution effect due to a higher wage dominates the income effect, then $\partial C^*_W/\partial w < 0$, and $\partial S^*_W/\partial w > 0$ ($\partial S^*_C/\partial w > 0$ since there is no substitution effect). Thus the second expression in square brackets may be negative and if it dominates the first expression, the total effect may be positive. Whether this is the case depends on $\rho$ and the household’s production functions. Willis (1973) argued that a model where the production of children is intensive in the wife’s time and thus the substitution effect likely dominates is consistent with evidence that higher wage (or more educated) women tend to work more
and have fewer children, but spend more money per child.\textsuperscript{46} Jones et al. (2008) revisit this prediction, find that it still holds on a broad level, and derive the possible set of assumptions in the household model consistent with this pattern.

Thus identity costs may increase childlessness more among higher wage (or more educated) women if preferences exhibit sufficient substitutability, and if the production of children is intensive in the wife’s time, so that the substitution effect dominates the income effect.

**Interpretation** A simple household model augmented by an identity parameter rationalizes the patterns of higher childlessness and lower labor force participation of mothers on the German-speaking side of the border, compared to the French-speaking side, as a consequence of differences in women’s identity concept. Furthermore, the model accommodates the heterogeneity results where particularly large differences were found among women with the highest educational achievement if the substitution effect from a higher wage dominates the income effect. This is in line with Willis’ (1973) proposition that the production of children is intensive in the wife’s time, needed to rationalize the secular trends of increasing female LFP and decreasing fertility. The first feature represents an explanatory approach to get at the specific identity component responsible for the reduced form results, based on observable differences in attitudes. The second feature—the results regarding heterogeneity—could be interpreted as a test of the model, since identity costs do not interact with wages by construction. Rather, this is a feature that arises from the preference specification required to generate the secular trends. If wages (or human capital) increase, the outside option (childlessness) becomes relatively more attractive, so that a constant psychological cost gives a stronger incentive to opt out as wages increase.

In this analysis, I have ignored the intensive margin of fertility. This is mainly because that is where one expects the main response, and because the empirical patterns do not offer clear guidance for how the intensive margin is affected. The absence of a difference in the number of children among mothers could be the result of two effects. First, there is a selection effect on the extensive margin, as women with lower fertility preferences are more likely to opt out and choose childlessness. This leads to higher fertility preferences among the group of mothers where identity costs are higher and would be expected to lead to more children per woman. Second, identity costs of combining work and motherhood and the associated longer breaks from labor market careers represent higher opportunity costs per child. This would be expected to decrease fertility among those women who

\textsuperscript{46}If production of children is intensive in the wife’s time substituting time from child care to market work leads to a decrease in “child services” (quantity times quality) in Willis’ version of the Becker model. He does not distinguish quality and quantity in this respect, but argues that the net negative effect may be composed of a negative effect on quantity compensated by a (smaller) positive effect on quality.
choose to become mothers. These effects go in opposite directions, and thus a zero effect at the language border is not surprising. If one had a good instrument for extensive margin fertility, it would be possible to isolate the second effect and extend the model in that direction. An additional outcome in the literature is the spacing of births (Newman, 1983), which is also potentially affected by identity costs, but similarly subject to the selection problem. Due to the empirical difficulties in isolating the selection and identity effects, these issues are left for future research.

2.6 Conclusion

In this paper, I presented novel empirical evidence that identity matters for fertility and female labor supply, using a unique set-up in Switzerland. At the language border in Switzerland, German-speaking mothers are significantly less likely to work, and women significantly more likely to be childless, compared to their French-speaking peers. It has been shown that these differences are robust to a wide array of robustness tests, and there is no evidence that they are driven by endogenous mobility. As I have documented, there is strong evidence that work-family policies, and labor market opportunities in general, are similar on the German- and French-speaking side of the border. This hints at an important role for identity in generating the cross-country pattern.

It has been shown that one particularly salient difference between German- and French-speaking Swiss is lower acceptance of working mothers in the German-speaking part. In the German culture, there is a widespread belief that children are harmed if their mothers return to work too soon. I added this cultural aspect as an identity cost to a simple version of the classical household model, along the lines of Akerlof and Kranton (2000). In the model, it has been shown that the negative association between childlessness and labor force participation of mothers can be rationalized by different levels in identity costs on both sides of the border. Furthermore, the model predicts the effect to be particularly strong among women with higher human capital, which is in line with the empirical results, where the largest differences in childlessness and LFP of mothers were found among women with tertiary education.

Overall, the results of this paper represent new evidence that identity matters for the cross-country patterns of fertility and labor supply of mothers, and that a possible solution to the puzzle regarding reconciliation of cross-country patterns and secular trends are differences in norms and values regarding working mothers. In the 2008-2010 edition of the European Values Survey, 45.9% of respondents in European OECD countries agreed that a child suffers with a working mother. Thus this belief is prevalent in many countries.
and not limited to the German-speaking world.\textsuperscript{47} Clearly, more evidence is needed to substantiate this mechanism and show that it matters in a broader context, but this is left to future research.

**Acknowledgments**

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\textsuperscript{47}In West Germany, 63\% agreed (or strongly agreed). In Austria, 64\%. On the other hand, the percentage agreeing in France was 39\%, in Sweden 20\%. 
2.7 Appendix

A Additional tables and figures

This appendix contains figures on bandwidth tests, the sample of women born in bilingual cantons, outcomes by municipality of residence, other fertility outcomes, labor force participation of mothers of other children and women where no child under age 15 is present in the household, outcomes using, and figures of childlessness and labor force participation of mothers in Germany and France.

Figure 2.15: Bandwidth variation, main outcomes

Notes: Figures plot the estimates of the discontinuity corresponding to Tables 2.4 and 2.6, but with additional bandwidths. The same holds for the confidence intervals, which are based on normal approximations using the bootstrapped (and clustered by municipality) standard errors.

Figure 2.16: Childlessness and LFP of mothers, bilingual cantons only

(a) Childlessness (2000)

(b) LFP, child under age 5 in the household (1990)

Notes: Negative distance=French-speaking, positive=German-speaking municipality of birth. Sample includes Swiss women born 1952-1961 in Berne, Fribourg or Valais. In the 2000 census, share of German- and French-speaking residents: Berne 84% German, 7.6% French; Fribourg 29% German, 64% French; Valais 28% German, 63% French. See notes to Figures 2.9 and 2.10 for details regarding RD technicalities and sample selection.


Table 2.10: Border difference in childlessness: bilingual cantons only

<table>
<thead>
<tr>
<th>Dependent variable: never gave birth (1 = childless, 0 = not childless)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>30km</td>
<td>15km</td>
<td>60km</td>
<td>23.7km†</td>
</tr>
<tr>
<td>Intercept (French side)</td>
<td>0.0896</td>
<td>0.0861</td>
<td>0.0907</td>
<td>0.0876</td>
</tr>
<tr>
<td></td>
<td>(0.0056)</td>
<td>(0.0108)</td>
<td>(0.0039)</td>
<td>(0.0069)</td>
</tr>
<tr>
<td>German border difference</td>
<td>0.0337</td>
<td>0.0260</td>
<td>0.0328</td>
<td>0.0344</td>
</tr>
<tr>
<td></td>
<td>(0.0108)***</td>
<td>(0.0174)</td>
<td>(0.0072)***</td>
<td>(0.0124)***</td>
</tr>
<tr>
<td>Observations</td>
<td>30,262</td>
<td>16,647</td>
<td>60,784</td>
<td>22,782</td>
</tr>
<tr>
<td>Municipalities</td>
<td>349</td>
<td>182</td>
<td>594</td>
<td>277</td>
</tr>
</tbody>
</table>

Notes: Sample only includes women born in bilingual cantons (Berne, Fribourg, and Valais). See notes to Table 2.4 for details. Statistical significance (two-sided test against the null hypothesis based on normal approximation) of German border difference ($\beta_1$): * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

† Optimal bandwidth as suggested by Imbens and Kalyanaraman (2012).
Table 2.11: Border difference in childlessness with controls: bilingual cantons only

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: never gave birth to a child (1 = childless, 0 = not childless)</td>
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<td>0.0317</td>
<td>0.0341</td>
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<td>German border difference</td>
<td>0.0108***</td>
<td>0.0087***</td>
<td>0.0088***</td>
<td>0.0093***</td>
<td>0.0107***</td>
</tr>
<tr>
<td>Observations</td>
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<td>30,262</td>
<td>30,262</td>
<td>25,359</td>
</tr>
<tr>
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<td>349</td>
</tr>
<tr>
<td>Individual controls</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Canton fixed effects</td>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Municipality controls</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Partner controls</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes: Sample only includes women born in bilingual cantons (Berne, Fribourg, and Valais). See notes to Tables 2.4 and 2.5 for details. Statistical significance (two-sided test against the null hypothesis based on normal approximation) of German border difference ($\beta_1$): * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 2.17: Childlessness and LFP of mothers by municipality of residence

(a) Childlessness (2000)

(b) LFP, child under age 5 in the household (1990)

Notes: Negative distance=French-speaking, positive=German-speaking municipality of residence. Sample includes Swiss women born 1952-1961, sampled in the 1990 census, with children under age 5 present in the household. See notes to Figure 2.9 for details regarding RD technicalities.

Source: 1990 population census, Federal Statistical Office. Distance data: search.ch map data.
Figure 2.18: Other fertility outcomes

(a) Age at first birth

(b) Age at last birth

(c) Number of children

Notes: Negative distance=French-speaking, positive=German-speaking municipality of birth. Sample includes Swiss women born 1952-1961, sampled in the 2000 census. See notes to Figure 2.9 for details regarding RD technicalities.

Source: 1990 population census, Federal Statistical Office. Distance data: search.ch map data.
Figure 2.19: Labor force participation of mothers of older children and childless women

(a) Youngest child age 5–9

(b) No child under age 15 in the household

Notes: Negative distance=French-speaking, positive=German-speaking municipality of birth. Sample includes Swiss women born 1952-1961, sampled in the 1990 census. See notes to Figure 2.9 for details regarding RD technicalities.

Source: 1990 population census, Federal Statistical Office. Distance data: search.ch map data.

Figure 2.20: Childlessness and LFP in France and Germany

(a) Childlessness

(b) LFP

Source: Childlessness rates from German micro-census, Toulemon and Mazuy (2001), and UN Generations and Gender Programme 2004 wave. LFP: IPUMS (France) and German micro-census.

B Details on the model

This appendix collects technical results regarding the household model outlined in the main text. The properties of the allocation depicted in Figure 2.13 are derived and comparative statics results relating to changes in $I$ are presented.
General properties and distribution of household choices

Assume household fertility preferences $\alpha$ and female wages $w$ follow a joint uniform distribution $\alpha \sim [0, \alpha_b], w \sim [0, w_b]$. Also, assume all parameters are positive: $E > 0, I > 0, T > 0$. Household utility in the three arrangements “Stay-home mom” (H), “Working mom” (W), and “Childless” (C) is given by

$$u^*_H(\alpha) = \alpha T + \log(E)$$
$$u^*_W(\alpha, w, I) = \alpha (T - L^*) + \log(wL^* + E) - I$$
$$u^*_C(w) = \log(wT + E),$$

where $L^*$ denotes optimal labor supply, given by $L^*_W = (w - \alpha E) / (\alpha w)$. This set-up admits an indifference curve $\bar{\alpha}_{HC}(w)$ separating the $(\alpha, w)$-space into households that prefer “Stay-home mom” (H) and households that prefer “Childless” (C), ignoring the possibility to choose arrangement “Working mom” (W) for the moment. This indifference curve is given by

$$\bar{\alpha}_{HC}(w) = \frac{1}{T} \log \frac{wT + E}{E}$$

Note that $\bar{\alpha}_{HC}(0) = 0$ and $\partial \bar{\alpha}_{HC}(w) / \partial w = 1 / (wT + E) > 0$. Arrangement W is increasing in w, as $\partial u^*_W / \partial w = \alpha L^* / w > 0$ ($L^*_W = 0$ is never optimal due to the fixed utility cost $I$). For $w < \tilde{w}$ (derived below), W is not attractive due to the fixed utility cost $I$. Thus $\bar{\alpha}_{HC}(w)$ characterizes household choices for $w \leq \tilde{w}$. For $w > \tilde{w}$, households may prefer W over C if $\alpha \leq \bar{\alpha}_{HC}(w)$, and prefer W over H if $\alpha \geq \bar{\alpha}_{HC}(w)$. Since $\partial u^*_W / \partial \alpha = T - L^* > 0 < T$, while $\partial u^*_H / \partial \alpha = T$ and $\partial u^*_C / \partial \alpha = 0$, there are indifference curves $\bar{\alpha}_{HW}(w) \geq \bar{\alpha}_{HC}(w)$ and $\bar{\alpha}_{WC}(w) \leq \bar{\alpha}_{HC}(w)$ characterizing optimal household choices for $w > \tilde{w}$. Specifically, households optimally choose H if $\alpha > \bar{\alpha}_{HW}(w)$, W if $\bar{\alpha}_{WC}(w) < \alpha < \bar{\alpha}_{HW}(w)$, and C if $\alpha < \bar{\alpha}_{WC}(w)$. $\bar{\alpha}_{HW}(w)$ and $\bar{\alpha}_{WC}(w)$ are defined implicitly by

$$u^*_H(\bar{\alpha}_{HW}(w)) = u^*_W(\bar{\alpha}_{HW}(w), w, I) \quad (2.4)$$
$$u^*_C(w) = u^*_W(\bar{\alpha}_{WC}(w), w, I) \quad (2.5)$$

It can be shown that $\bar{\alpha}_{HW}(w)$ is the solution to
\[ x - \log x = 1 + I, \text{ where } x = E \frac{h}{w} \tilde{\alpha}_{HW}(w), \] (2.6)

subject to \( x \leq 1 \) (so that \( L^* \geq 0 \)) and \( x \geq E \log(wT/E + 1)/(wT) \) (so that \( \tilde{\alpha}_{HW}(w) \geq \tilde{\alpha}_{HC}(w) \), which also ensures \( L^* \leq T \)). \( \tilde{\alpha}_{HW}(w) \) is unique on the permissible domain.

The lowest \( w \) for which \( \tilde{\alpha}_{HW}(w) \) exists (loosely speaking: where at least 1 household is indifferent between \( H \) and \( W \)) is given by \( \tilde{w} \), which (uniquely) solves

\[
\frac{E}{\tilde{w}T} \log \left( \frac{\tilde{w}T}{E} + 1 \right) - \log \left( \frac{E}{\tilde{w}T} \right) - \log \left[ \log \left( \frac{\tilde{w}T}{E} + 1 \right) \right] = 1 + I. \tag{2.7}
\]

Thus \( \tilde{\alpha}_{HW}(w) \) is defined on \([\tilde{w}, w_b]\). Similarly, it can be shown that \( \tilde{\alpha}_{WC}(w) \) is the solution to

\[ x - \log x = 1 + I, \text{ where } x = \frac{wT + E}{w} \tilde{\alpha}_{WC}(w), \]

subject to \( x \geq 1 \) (so that \( L^* \leq T \)) and \( x \leq (wT + E) \log(wT/E + 1)/(wT) \) (so that \( \tilde{\alpha}_{WC}(w) \leq \tilde{\alpha}_{HC}(w) \), which also ensures \( L^* \geq 0 \)). This solution again is unique on the permissible domain and the lowest \( w \) for which \( \tilde{\alpha}_{WC}(w) \) exists is given by equation 2.7. Thus it holds that \( \tilde{\alpha}_{HC}(\tilde{w}) = \tilde{\alpha}_{HW}(\tilde{w}) = \tilde{\alpha}_{WC}(\tilde{w}) \).

Regarding the slopes of these indifference curves, we get

\[
\frac{\partial \tilde{\alpha}_{HC}(w)}{\partial w} = 1/(wT + E) \tag{2.8}
\]
\[
\frac{\partial \tilde{\alpha}_{HW}(w)}{\partial w} = \frac{\tilde{\alpha}_{HW}(w)}{w} \tag{2.9}
\]
\[
\frac{\partial \tilde{\alpha}_{WC}(w)}{\partial w} = \frac{\tilde{\alpha}_{WC}(w) E}{(w(wT + E))}. \tag{2.10}
\]

Using \( S_w^* = wL^* + E = w/\alpha \) and \( S_c^* = wT + E \), we get (2.10)<(2.9)<(2.8). The resulting allocation is depicted in Figure 2.13.

Note that due to imposing bounds on the distributions of \( \alpha \) and \( w \), an “interior” allocation, where each arrangement is chosen by a positive mass of households, requires \( \tilde{w} < w_b \) and \( \log(\tilde{w}T/E + 1)/T < \alpha_b \). Thus \( I \) cannot be too large relative to \( w_b T/E \), which are max total earnings of the wife when childless relative to earnings of the husband.

**Comparative statics**

Here, I investigate how indifference curves shift due to changes in \( I \). I will make a few simplifying assumptions. Since the interest is in changes due to effects on working mothers, which are only found to the right of \( \tilde{w} \), I restrict comparative statics to \( w > \tilde{w} \) (which can be arbitrarily close to the lower bound on \( w \), depending on parameters). It has to

---

48 Obtained by plugging the lower bound on \( x \) into equation 2.6.
be kept in mind though that \( \tilde{w} \) depends on \( I \), but the effects have the same direction as farther to the right of this cut-off, with constrained magnitude. If focus on two statistics: childlessness and labor force participation of mothers. To keep these statistics simple and abstract from boundary considerations, I assume that the household endowed with \((\alpha_b, w_b)\) chooses H in the initial allocation. A sufficient condition for this is \( E \geq w_b/\alpha_b \).\(^{49}\)

**Childlessness** Denote the share of childless households conditional on \( w \) by \( \theta \), which is given by (assuming \( \alpha \sim U[0, \alpha_b] \))

\[
\theta(w) = \frac{\tilde{\alpha}_{WC}(w)}{\alpha_b}.
\]

Totally differentiating equation 2.5 yields

\[
\frac{\partial \tilde{\alpha}_{WC}(w)}{\partial I} = \frac{1}{T - L^*_{WC}} > 0,
\]

where \( L^*_{HW} \) denotes optimal labor supply along \( \tilde{\alpha}_{HW}(w) \), and \( L^*_{WC} \) denotes optimal labor supply along \( \tilde{\alpha}_{WC}(w) \). Thus \( \partial \theta(w)/\partial I = \alpha_b^{-1}(T - L^*_{WC})^{-1} > 0 \). This is the first result stated in the main text: If identity costs of working as a mother increase, childlessness will increase. How does this effect vary with the wage? Differentiating 2.11 with respect to the wage yields

\[
\frac{\partial (\partial \tilde{\alpha}_{WC}/\partial I)}{\partial w} = (T - L^*_{WC})^{-2} \frac{\partial L^*_{WC}}{\partial w}
\]

where

\[
\frac{\partial L^*_{WC}}{\partial w} = \frac{ET - L^*_{WC}}{wT + E} > 0.
\]

Since labor supply is increasing along the indifference curve between “Childlessness” and “Working mom”, the effect of increasing identity costs is increasing in the wage. This results from the fact that the difference in total utility is decreasing along the indifference curve, since higher wages dominate increasing fertility preferences and lead to higher labor supply. In other words, the outside option becomes attractive to a larger mass of households along this indifference curve.

\(^{49}\)To see this, let \( I = 0 \) (which makes this marginal household choosing W over H most likely). Then, the solution to equation 2.6 is \( x = 1 \), which implies \( \tilde{\alpha}_{HW}(w) = w/E \). So \( \tilde{\alpha}_{HW}(w_b) \leq \alpha_b \) if \( E \geq w_b/\alpha_b \).
**Labor force participation of mothers** Denote the share of mothers that choose to work conditional on $w$ by $\gamma$, which is given by

$$\gamma(w) = \frac{[\bar{\alpha}_{HW}(w) - \bar{\alpha}_{WC}(w)]}{\alpha_b - \bar{\alpha}_{WC}(w)}.$$ 

To see how LFP is affected by identity costs, we need to know how the indifference curve between “Working mom” and “Stay-home mom” changes with $I$. Totally differentiating equation 2.4 with respect to $I$ yields

$$\frac{\partial \bar{\alpha}_{HW}(w)}{\partial I} = -\frac{1}{L^*_{HW}} < 0.$$ 

(2.13)

Thus higher identity costs rotate the $\bar{\alpha}_{HW}(w)$ curve downwards ($\partial L^*_{HW}/\partial w < 0$), since labor supply is decreasing along this indifference curve (higher fertility preferences are dominating the effect of higher wages). Differentiating $\gamma$ with respect to $I$ using 2.11 and 2.13 yields

$$\frac{\partial \gamma(w)}{\partial I} = (\alpha_b - \bar{\alpha}_{WC})^{-1} \left( \frac{\partial \bar{\alpha}_{HW}}{\partial I} - \frac{\partial \bar{\alpha}_{WC}}{\partial I} (1 - \gamma) \right)$$

$$= - (\alpha_b - \bar{\alpha}_{WC})^{-1} \left( \frac{1}{L^*_{HW}} + \frac{1 - \gamma}{T - L^*_{WC}} \right) < 0$$

Thus LFP is decreasing in $I$, since both the effect of a downward shift in $\bar{\alpha}_{HW}$ (working moms opting to stay at home) and an upward shift in $\bar{\alpha}_{WC}$ (working moms opting to be childless) decrease LFP. How this effect changes with $w$ depends on interaction effects, since the first effect is increasing in the wage, but the second effect tends to zero as $\gamma$ approaches 1. Intuitively, if the outflow of working mothers to childlessness due to increasing identity costs is large relative to the outflow to stay-home moms, the effect of higher identity costs on LFP of mothers can get smaller with higher wages. It can be shown that $\partial \gamma/\partial I \partial w$ at $\gamma = 0$ is always negative (and thus $\partial \gamma/\partial I$ increasing in the wage in absolute terms) if $wT/E < \approx 2.5$ (a sufficient but not necessary condition).\(^{50}\) This would imply that for the lowest wage woman for whom $W$ is just becoming a possibly optimal solution (the $w$ at which $\gamma = 0$), earnings when childless have to be lower than about 2.5 times her husband’s earnings. This seems to be a plausible restriction on parameters. In that case, the effect of higher identity costs on LFP of mothers is always getting larger in absolute terms initially, but potentially getting smaller for the highest wages. Either a

\(^{50}\)To see this, take $\partial \gamma/\partial I \partial w$, set $\gamma = 0$ and $\bar{\alpha}_{HW} = \bar{\alpha}_{WC} = \bar{\alpha}$. Then, set $\alpha_b = \bar{\alpha}$, the lowest possible value for an interior allocation (the sign of $\partial \gamma/\partial I \partial w$ depends positively on $\alpha_b$). Then, the sign of $\partial \gamma/\partial I \partial w$ corresponds to the sign of $2 \log(1 + wT/E) - wT/E$, which is greater than zero for $wT/E \in (0, 2.5129)$. 

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*Identity, Working Moms, and Childlessness*
situation where this effect is only increasing in \( w \) or hump-shaped in \( w \) is thus compatible with the model, depending on parameters.
3 | THE DEMAND FOR SOCIAL INSURANCE: DOES CULTURE MATTER?

Joint with Beatrix Eugster, Rafael Lalive, and Josef Zweimüller


3.1 Introduction

I have previously remarked that the customs of the people may be considered as one of the great general causes to which the maintenance of a democratic republic in the United States is attributable. I here use the word customs with the meaning which the ancients attached to the word mores; for I apply it not only to manners properly so called—that is, to what might be termed the habits of the heart—but to the various notions and opinions current among men and to the mass of those ideas which constitute their character of mind. (de Tocqueville, 1899, c 17)

Should a society insure individuals against economic shocks and, if yes, what is the optimal extent of redistribution associated with government-provided social insurance? These questions are among the most hotly debated economic policy issues. President Obama’s plan to introduce universal health insurance in the United States divided the population into two camps. Proponents argue that a society should take some responsibility for individuals in need, and that universal health insurance leads to efficiency gains. Opponents (the Tea Party movement, in particular) argue against universal insurance because it curtails freedom of choice, undermines individuals’ responsibility for their own fortune, and creates negative incentive effects.
The tension between redistributing income to the needy mitigating market failures, on the one hand, and respecting consumer sovereignty and preserving incentives to work and savings, on the other hand, is at the heart of every discussion about the proper extent of social insurance provisions. Today, most countries have adopted some form of redistributive welfare state programs to mitigate the consequences of economic shocks to individuals. However, these institutions differ widely across countries and the differences have been persistent. While about 16% of GDP goes to social insurance programs in the United States, Sweden spends almost twice as much – 29.4% – on insuring residents against risks to work and health (OECD 2005). Since these economies have similar levels of economic development, these stark differences in the role of social insurance suggest that cultural differences may help to explain the differences in actually implemented institutions.

In this paper, we ask whether social groups develop different demands for social insurance against risks to health and work. As background, we first ask whether the demand for redistribution varies across countries that have reached comparable levels of economic development. The International Social Survey Programme (ISSP) allows us to answer this question.\footnote{The ISSP regularly interviews random samples of residents of countries that are members of the survey programme. Currently, 45 countries participate in the programme including most OECD countries.} In 1996, the ISSP asked respondents whether they disagree strongly, disagree, are indifferent, agree, or agree strongly with the statement, \textit{Government should reduce income differences}. Fig. 3.1 reports the share agreeing or agreeing strongly that government should redistribute income. The figure shows that opinions differ enormously across countries on this issue. In the US, only about a third of respondents indicated that government should redistribute. In contrast, in France and Spain between 70 and 80\% of respondents are in favour of redistribution by government.\footnote{The clustering of countries corresponds to our expectations. In Anglo-Saxon countries (US, New Zealand, Australia, and Canada), the demand for redistribution is weak, whereas in former communist countries (Poland and Hungary) and continental/Southern European countries (Italy, France, and Spain), the demand for redistribution is very strong.}

Fig. 1 also shows that there is strong within country variation in demand for redistribution in Germany and Switzerland. Alesina and Fuchs-Schündeln (2007) explain differences in the demand for redistribution by socialist policies. East Germany adopted socialist policies between 1945 and 1990 whereas West Germany did not. But note that differences in attitudes towards government redistribution within Switzerland are comparable to variation across OECD countries. In the Latin (French and Italian)-speaking parts of Switzerland, 69\% of respondents indicate that they favour government redistribution. In the German-speaking part, only 46\% indicate such a preference.

Fig. 3.1 suggests that there are strong differences in the demand for redistribution
Chapter 3

Figure 3.1: Government should reduce income differences; world ranking

Notes: Reported is the share agreeing or strongly agreeing with the statement.
Source: ISSP 1996.

across countries but also across regions within countries. We seek to understand whether the demand for social coverage of risk can vary across social groups *ceteris paribus.* As cited above, Alexis de Tocqueville took a clear stand on this question. To what extent does his conjecture hold up to formal empirical testing?

In this paper we argue that the cultural diversity within Switzerland together with its particular political institutions allows us to shed light on the role of culture to explain the demand for redistributive social insurance. *First,* the Swiss case allows us to study cultural differences by comparing the behaviour of language groups. A common language is a mechanism that lets norms and values persist within a group even when there is a geographically close other group that holds quite different norms and values. The native language that an individual is exposed to during childhood and adolescence is likely to be an important predictor of the individual’s values during adulthood to the extent that values are transmitted vertically. Language is central to any type of social interaction. Language is also central to mixing. Novembre et al. (2008) find that genetic markers differ more strongly between people living in Latin Swiss areas and the German Swiss area than within those regions. Hence the native language is also a good predictor of values to the extent that values are transmitted horizontally. Language serves as a medium by which attitudes, values, and beliefs are transmitted from one generation to the next. Language is central to the spreading of beliefs and norms and determines an individual’s social
identity. The language barrier is a cultural barrier.

A second reason why Switzerland is interesting is the fact that language groups are located in separate regions but these regions are geographically close and have a sharp geographic border: Within a distance of 5 kilometres, the fraction of Latin-speaking Swiss residents falls from more than 90% to less than 5% (and vice versa for German native speakers). Yet there is no associated change in geography or politics at this language border as the main geographical border, the Alps, are in East-West direction, while the language border mainly runs in North-South direction, and large parts of the language border run within Swiss states (cantons). This is important since most policies in Switzerland are set at the cantonal (rather than the federal) level. Within-canton contrasts on either side of the border measure to what extent social groups demand different levels of social insurance even if they face identical levels of actual insurance.

Third, a distinguishing feature of Switzerland is the high importance of direct democracy. National referenda and voter initiatives are held on a regular basis where citizens vote over all kinds of issues. Voting results are informative on the regional distribution of citizens’ attitudes and values. This is because voting results are available on a community basis and, on average, communities are small and geographically close to each other. Hence voting results help to understand how cultural differences affect the demand for social insurance within narrowly defined geographic areas.

From an econometric point of view, our empirical strategy is a spatial regression discontinuity design. We exploit the fact that the dominant language changes abruptly within a very small geographic distance. Hence distance to the language border (negative on the German side, positive on the Latin side) can serve as the running variable. When this variable takes the value zero, our measure of culture changes discontinuously. The key identifying assumption is that factors other than culture – that potentially influence the demand for social insurance – do not change discontinuously at the language border. This assumption is plausible for the segments of the language border that run through cantons. Cantons have much discretion in setting legal rules. But the within-canton segments allow us to adopt a within-canton estimation strategy, i.e. to add canton fixed effects. This means that observed differences in voting on social insurance at the language border reflect differences in this demand generated by differences in culture.

Our empirical analysis comes in three parts. Section 1 documents the role of culture for preferences for social insurance using data from the World Values Survey (WVS) and the

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4The introductory quote by de Tocqueville (1899) provides an excellent definition of culture. Guiso et al. (2006) define culture as ...those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.
International Social Survey Programme (ISSP). We first show that significant differences between the Latin Swiss and the German Swiss population in attitudes and norms related to government-provided social insurance exist, even after controlling in detail for the respondents’ individual characteristics and canton fixed effects. For instance, the question “should government reduce income differences” shows a raw Latin-German gap (percentage yes Latin minus percentage yes German) of 23 percentage points. After controlling, the Latin gap reduces to 18 percentage points but it remains economically and statistically significant. We document that significant differences also show up for a variety of other WVS- and ISSP-questions that are related to government-provided social insurance.

Sections 2 and 3 present our empirical analysis based on community-data from voting behaviour in Swiss national referenda or voter initiatives. To concentrate on government-provided social insurance, we consider national votes since 1980 on the following issues: (i) health insurance, (ii) old-age insurance, (iii) maternity insurance, and (iv) unemployment insurance. We consistently find a significant Latin-German gap in the demand for government-provided social insurance, which is both quite stable over time and significant across the various social insurance programmes. Language-group differences in voting are particularly striking with respect to old-age insurance and maternity insurance, but they are also sizeable and significant with respect to unemployment insurance and health insurance.

In section 4, we look for potential channels by which cultural background translates into higher support for redistributive social insurance on the Latin side of the language border. One channel could be that German-speaking Swiss citizens have stronger social networks (family ties, friends, club memberships) that provide them informal insurance as a substitute to formal state-provided insurance. Using data from the Swiss Household Panel, we do not find strong evidence of weaker social networks in Latin-speaking Switzerland. A second possible channel are systematic differences in ideology. We find that Latin speakers are less likely to believe that hard work pays off, and perceive that they enjoy less freedom and control over their lives than German speakers. Hence, our results are consistent with Bénabou and Tirole (2006), who argue that weak beliefs in a "just world" increase the demand for redistribution and social insurance. Finally we look at media exposure across language regions and find very strong segmentation of media markets by language regions. This may explain the lack of convergence in beliefs among social groups that live under similar institutional arrangements. Interestingly, the pattern of results we find for Switzerland is consistent with de Tocqueville (1899)'s conjecture that culture is a first order explanation for why democracy works so differently in the US compared to Europe.

Previous papers investigating the role of culture for the support of redistributive poli-
cies are Luttmer and Singhal (2008) and Alesina and Giuliano (2009), who document a strong impact on immigrants’ preferences for redistribution by the corresponding average preferences of origin countries that is persistent across generations.\(^5\) Alesina and Fuchs-Schündeln (2007) find that after the German reunification, East Germans that lived under a Communist regime have consistently stronger preferences for redistribution than their West German neighbours and suggest that indoctrination of pro-state behaviour during the Communist regime could have caused the differences in preferences. Bénabou and Tirole (2006) present a model where differences in political ideology and support for redistribution arises as a results of differences in beliefs in a "just world", where effort pays off. Alesina and Angeletos (2005) present a closely related model along with empirical results. Alesina and Glaeser (2004) investigate US and European style welfare systems, and argue that the belief that “hard work brings success” dominates in the former and the belief that “success is a matter of luck and connections” is more prevalent in the latter, which may be due to the high political influence of trade unions in Europe. Fong (2001) shows empirically that individuals who prefer more redistribution also think that poverty is caused by circumstances beyond individuals’ control. Algan and Cahuc (2009) argue that cultural differences can explain why some countries implement different mixes of employment protection and unemployment insurance, and Corneo (2001) finds that moral values and ideological principles partly explain differences in preferences for redistribution in Germany and the US.\(^6\) Our paper is the first to exploit votes across a language border to investigate whether culture influences preferences for social insurance.

### 3.2 Background

This section first describes the Swiss language regions and the voting procedure and social insurance that are currently in place in Switzerland. The section then presents evidence

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\(^5\)The literature on the role of culture in economic outcomes derives from a more general discussion of the role of culture in the evolutionary process. Boyd and Richerson (1985) is the seminal contribution in evolutionary biology on cultural transmission. See also the more recent work by Bisin and Verdier (2000a) who introduce rational choice into the cultural transmission framework.

\(^6\)Three additional strands of the literature are strongly related. The first strand discusses the role of institutions in shaping preferences. Bowles (1998) and Bowles and Polanía Reyes (2009) provide surveys. Hoff et al. (2011) show that assignment to the top or bottom of the caste system affects individuals’ willingness to punish violations of a cooperation norm. Stutzer et al. (2011) show that active decisions are important in blood donations. The second strand discusses the role of norms for central economic decisions. Young and Burke (2001) discuss sharecropping contract choice in Illinois and show that contracts are surprisingly insensitive to soil quality. They explain this finding by conformity of producers to the contract choice of their neighbours. See Burke and Young (2010) for an overview of the role of social norms for economic decisions, and Clark (2003) and Stutzer and Lalive (2004) on the role of social norms in unemployment. The third strand discusses the role of social capital in shaping political and economic outcomes. Leonardi et al. (1993) and Putnam (2000) establish correlations between measures of participation in local social life, political participation, and trust.
on attitudes towards the role of government across Swiss language groups.

A Languages in Switzerland

Switzerland has four official languages. The Northeast of Switzerland speaks Swiss German, the West speaks French, the Southeast speaks Italian, and some parts of the East speak Romansh. According to the population census 2000, 72.5% of Swiss citizens speak German, 21.0% speak French, 4.3% speak Italian, 0.6% speak Romansh and 1.6% speak other languages (Lüdi and Werlen, 2005). The Swiss multilingual situation is supported by its education system. Children learn to speak another “Swiss” language as their second language. The empirical analysis contrasts the regions speaking languages derived from Latin – French, Italian, Romansh – with the regions speaking German. Fig. 3.2 displays a map of Switzerland shaded according to the language spoken by a majority of each region’s residents. Areas with light shading are communities with majority German speaking populations. Areas with dark shading are those with a majority speaking either French, Italian, or Romansh. Note that dark lines separate the 26 Swiss cantons, i.e. states.

Note that important parts of the language border correspond to no geographical barrier or border between cantons. The language border between French-speaking and German-speaking regions runs from North to South, whereas the main geographical barrier, the Alps, are in the East-West direction. This fact, together with an efficient (public) transportation system, implies that transport costs within language regions are similar to transport costs across language regions (conditional on distance). People living within one of the four multi-lingual cantons but on different sides of the language border face the same regional set of policies and institutions but belong to different language groups.

Historically, Switzerland was founded by the German-speaking cantons Schwyz, Uri and Nidwalden, located in the centre of the country. The country was successively enlarged by the entrance of Berne, Zurich, Lucerne and other cities of the German-speaking part. Until the French invasion at the turn of the 19th century large parts of French Switzerland were ruled by the German-speaking elites of Berne and Fribourg. In 1848, the new constitution with 26 cantons was established. Four cantons are French-speaking, one

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7The numbers in the text refer to the Swiss citizens. Roughly 20% of residents are immigrants of which 62.3% speak either German, French, Italian or Romansh and 37.7% have some other first language. Romansh is one of the Rhaeto-Romance languages, believed to have descended from the Vulgar Latin variety spoken by Roman era occupiers of the region, and, as such, is closely related to French, Occitan and North Italian.

8This translates into good command of the languages spoken in other parts of the country. Around 73% of the inhabitants of the French speaking regions of Switzerland are able to speak one additional language of the country. The corresponding number is 92% for the inhabitants of the Italian speaking regions, and 85% for the inhabitants of the German speaking regions (see Werlen (2008)).
is Italian-speaking, three are bilingual (French / German) cantons (Berne, Valais, and Fribourg), one canton – Graubünden – is officially trilingual (German, Rhaeto-Romansh, and Italian). The remaining seventeen cantons are German-speaking.  

B Social insurance programmes in Switzerland

It is important to understand what social insurance programmes do exist to understand the demand for more social insurance. Switzerland offers mandatory programmes to insure individuals against major shocks to earnings. In our empirical analysis, we will focus on the following four programmes:

A. Health insurance  Health insurance system is mandatory for all residents. Insurance is provided by private insurance companies, which are highly regulated and offer the same exhaustive list of basic treatments to everyone. Insurance premia vary locally. The...
quality of health services is very good but also expensive. Switzerland ranks after the US and France among OECD countries with the highest health expenditures (See, OECD Health Data 2009).

B. Social security Swiss old-age social security is characterised by a three-pillar system. The first pillar is a pay-as-you-go social security system to which individuals contribute during their working lives and from which they get benefits as soon as they reach the statutory pension age (65 for men, 62 for women). It has a strong redistributive dimension as benefits are capped but contributions are a tax on labour income. The second pillar is a tightly regulated employer based system. Employers and employees pay into a company based pension account which retirees can access once they reach the retirement age. Finally, the third pillar are voluntary pension savings accounts which are tax-deductible.

C. Unemployment insurance The Swiss unemployment insurance system is among the most generous in OECD countries. Depending on age, it grants up to 2 years of unemployment benefits and, depending on family circumstances, a replacement rate of 70-80 % of previous income. The system is designed to prevent long-term unemployment by a strong emphasis on active labour market policies. Individuals are obliged to participate in such programs. Non-compliance with benefit rules and/or refusal to participate in active labour market policies lead to benefit sanctions (Lalive et al., 2005, 2008, see)

D. Maternity insurance Family policies are much less generous in Switzerland than in many other OECD countries. Before 2005, no national mandatory maternity/parental leave system existed.\textsuperscript{10} Beginning in the 1950s, several referenda were held about the implementation of such a system but all referenda failed. The referendum in 2004 was approved by the population. It grants mothers a 12-week job protection associated with full pay. Large private companies typically offer supplementary parental leave provisions.

C Demand for redistribution across language regions

Table 3.1 reports differences across language groups in support for redistribution and/or government-provided social insurance programs using ISSP 1996 and the World Values Survey (WVS) data for 1996. All results focus on Swiss nationals whose interview language is either German, French, or Italian, so that language serves as a proxy for cultural

\textsuperscript{10}The canton of Geneva introduced a mandatory system in 2000 after the national maternity leave program was rejected.
background.\footnote{We take interview language as a proxy for the native language of the respondent. We have no information that would allow us to calculate the reliability of this proxy. Yet note that survey institutes typically choose the interview language to match native language of the majority of a respondents municipality of residence and – with few exceptions – municipalities are segregated with respect to language. This suggests that the interview language is a fairly good proxy for native language.} Table 3.1 reports agreement for each particular item separately in the Latin-speaking part and the German-speaking part. The second-to-last column reports the raw difference, and the last column shows the coefficient of the Latin dummy in a linear regression that includes education, age, gender, and canton fixed-effects as control variables.\footnote{According to the Swiss political scientists Bonoli and Häusermann (2009), education, age, and gender are thought to be the most important dividing lines in votes on redistribution. In exit polls, they find age to be the most important factor explaining voting patterns.} Hence, the Latin coefficient in the last column of Table 3.1 reports the \textit{within canton} difference in support for redistribution and social insurance. Since individuals within cantons are subject to identical institutional arrangements, this difference is not driven by differences in policies.

Results suggest that agreement with the statement that ”government should reduce income differences” remains 18 percentage points higher in Latin-speaking Switzerland even when we control for background characteristics and canton fixed-effects. Very similar patterns emerge with respect to questions whether governments should create and provide jobs, help the unemployed, and increase social spending. In all issues, Latin Swiss residents support a more active government providing more social insurance and redistribution, and the gap is significant in all cases.

Table 3.1 also provides evidence based on two questions in the World Value Survey concerning the role of government versus the role of the individual: (i) Should individuals take more responsibility vs. should government take more responsibility, and (ii) Is it justifiable to claim government benefits to which you are not entitled? Both questions are answered on a scale from 1 to 10. Controlling for other factors, the average government-responsibility score of Latin Swiss respondents is 1.9 points (!) higher than the score of Swiss-German speakers. The difference is also quite striking in the benefit-claim score, where the Latin-gap is 1.2 points.\footnote{Algan and Cahuc (2009) discuss this measure of civic virtue and its link with labour market institutions in detail.} In sum, the evidence of Table 3.1 is consistent with the hypothesis of a potentially important impact of culture on the demand for redistributive social insurance.
Table 3.1: Survey questions on attitudes towards redistribution in the welfare state

<table>
<thead>
<tr>
<th>question</th>
<th>number of survey respondents</th>
<th>share agree / mean answer</th>
<th>coef. Latin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Latin</td>
<td>German</td>
</tr>
<tr>
<td>(1) ...reduce income differences</td>
<td>ISSP 2,206</td>
<td>0.689 (0.018)</td>
<td>0.460 (0.013)</td>
</tr>
<tr>
<td>(2) ...finance projects to create new jobs</td>
<td>ISSP 2,229</td>
<td>0.801 (0.015)</td>
<td>0.745 (0.011)</td>
</tr>
<tr>
<td>(3) ...provide jobs to everyone</td>
<td>ISSP 2,210</td>
<td>0.640 (0.019)</td>
<td>0.507 (0.013)</td>
</tr>
<tr>
<td>(4) ...provide decent standard of living for unemployed</td>
<td>ISSP 2,215</td>
<td>0.831 (0.015)</td>
<td>0.653 (0.012)</td>
</tr>
<tr>
<td>(5) ...spend more on social services even if this means higher taxes</td>
<td>ISSP 1,707</td>
<td>0.451 (0.023)</td>
<td>0.371 (0.014)</td>
</tr>
<tr>
<td>(6) ...keep spending on social services constant even if the national deficit/debt stays as high as it is</td>
<td>ISSP 1,945</td>
<td>0.654 (0.020)</td>
<td>0.564 (0.013)</td>
</tr>
<tr>
<td>(7) People should take more responsibility (1) vs. Government should take more responsibility (10)</td>
<td>WVS 1,181</td>
<td>4.003 (0.123)</td>
<td>3.017 (0.097)</td>
</tr>
<tr>
<td>(8) Claiming gov. benefits to which you are not entitled is never justifiable (1) vs. always justifiable (10)</td>
<td>WVS 1,180</td>
<td>3.167 (0.113)</td>
<td>1.701 (0.066)</td>
</tr>
</tbody>
</table>

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. † Table entries are share of respondents that agree (agree or strongly agree) for questions 1-6 and the mean response in the scale from 1 to 10 for the other questions (weighted). ‡ Estimate on Latin coefficient in regression of mean answer (or share agree) on age, sex, education (low, medium, high) and canton fixed effects. Separation into language regions by interview language, German = Swiss German, Latin = Swiss French/Italian. The exact WVS question (7) was: “People should take more responsibility to provide for themselves vs. The government should take more responsibility to ensure that everyone is provided for” Please place your views on this scale: 1 means you agree completely with “People should take more responsibility”; 10 means you completely agree with “The government should take more responsibility”, and if your views fall somewhere in between, you can choose any number in between.
3.3 Identification and estimation

This section discusses the empirical challenges to identifying the pure effect of being a member of a language group on the demand for social insurance. The section then discusses the empirical framework adopted in this paper – a spatial regression discontinuity approach.

### A Identification

This paper investigates whether different language groups develop different attitudes towards social insurance, *ceteris paribus*. It is useful to introduce notation from the treatment effects literature to clarify the parameter of interest (Imbens and Wooldridge, 2009). The Rubin model of potential outcomes consists of two pieces of information. The first piece of information refers to the treatment $D$. Let $D_i = 1$ if individual $i$ is a member of the Swiss Latin language group, and $D_i = 0$ if individual $i$ is a member of the Swiss German language group.\(^{14}\) We are interested in the effects of group membership on a set of outcomes $Y$ – attitudes towards the role of government, voting decisions, beliefs about the payoff to work, etc. Associated with each type of socialisation is a potential voting decision $Y_D$, i.e. $Y_i$ is individual $i$’s decision if $i$ is a member of the Latin-speaking group, and $Y_0$ is individual $i$’s decision if $i$ is a member of the Swiss-German speaking group. For simplicity, we omit the subscript $i$ henceforth.

The individual causal effect of group membership on voting decisions can now be defined. It is simply the group membership difference in voting decisions $Y_1 - Y_0$. The fundamental problem of causal inference is that this individual effect cannot be observed. In the real world, individuals are either a member of the Latin-speaking group or a member of the German-speaking group, but not both.

Can averages of the individual causal effect be identified? For instance, $E(Y_1 - Y_0 | D = 1)$ is the average effect of being a member of the Swiss Latin-speaking group for individuals speaking either French, Italian, or Romansh. The effect could be identified, for instance, if group membership were randomly assigned.\(^{15}\) Unfortunately, actual group membership is far from random. Further, the Latin-speaking regions of Switzerland are located in areas

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\(^{14}\)The treatment effects literature highlights that only those causes that could be experimentally manipulated can be regarded as proper treatments (Holland, 1986). Being a member of a particular language group is clearly a treatment that can be manipulated. For instance, children that are adopted by non-biological parents are typically also moving across language borders (Björklund et al., 2006).

\(^{15}\)Note that the mean counterfactual outcome, $E(Y_0 | D = 1)$ is not directly observed in the data. But the effect could be identified, for instance, if group membership were randomly assigned, thus providing information on the mean counterfactual outcome for the treated in the control group.
Chapter 3

with fairly mild climate, with an important services sector, high levels of immigration, etc. All these factors could by themselves affect the need for social insurance and regulation.

The empirical strategy will entail contrasting residents of border municipalities on either side of the so-called Roesti border.\textsuperscript{16} This strategy is intuitively appealing. Contrasting residents on either side of the language border preserves variation in group membership. But since spatial distance can be made arbitrarily small, any confound that varies with spatial distance will lose importance in the local contrast. For instance, policies set at the cantonal level will confound contrasts at the national level but will not confound the local contrast. Also geographic factors such as weather, altitude, and access to highways and lake-view, that could affect firms’ and individuals’ location decisions, are likely to be balanced on either side of the language border (we test this formally below).

How do we implement the local border contrast? Implementation involves two steps. The first step defines each municipality’s distance to the language border $F_j$. We use data on the driving distance in kilometres to proxy for economic distance between any pair of municipalities in Switzerland.\textsuperscript{17} We allocate municipalities to three groups. The first group are Latin border towns. These municipalities are majority Latin-speaking and their nearest neighbour municipality is majority German-speaking. Distance to the language border is set to zero for Latin border municipalities, i.e. $F_j = 0$. The second group of municipalities is composed of mainland Latin-speaking municipalities. We set distance to language border equal to the kilometer distance between any mainland Latin-speaking municipality and the nearest Latin border town, i.e. $F_j > 0$. The third group is composed of German majority municipalities with distance to the language border equal to the negative of kilometer distance of that municipality to the nearest Latin border municipality, i.e. $F_j < 0$.

The second step involves contrasting mean voting outcomes on either side of the border. Under what conditions does this contrast inform us on the role of culture in shaping voting decisions? Let $E^r(X) \equiv \lim_{\epsilon \to 0} E(X|F_j = 0 + \epsilon)$ denote the limit of the mean of a variable $X$ when approaching the language border (at distance 0) from the right (r), i.e. when approaching the border from Swiss Latin territory. Equivalently, let

\textsuperscript{16}The cultural gap is associated with a geographical language border and is called Röstigraben, referring to Rösti, a popular potato-dish in the German-speaking (but not in the Latin-speaking) part of the country. For an interesting recent contribution that describes the origins and persistence of this cultural gap, see Büchi (2000).

\textsuperscript{17} Kilometer distance is certainly a better proxy for economic distance than Euclidian distance since Switzerland is quite a rugged country. Kilometer distance is also quite clearly dominated by a driving time distance measure. For instance, Lalîve (2008) uses driving time to proxy for economic distance between pairs of municipalities in Austria. Nevertheless, kilometer distance is likely to be a good proxy for economic distance for pairs of municipalities that are located on the central, highly populated economic centre of Switzerland (Mittelland). Kilometer distance may be more problematic proxy for economic distance for pairs of municipalities involving distances driven across the Alps, etc.
\[ E_l(X) \equiv \lim_{\epsilon \to 0} E(X|F_j = 0 - \epsilon) \] denote the limit of the mean of \( X \) when approaching the language border from the left (l), i.e. from Swiss German territory.

To make things concrete, consider \( E_l(D) \) and \( E_r(D) \), i.e. the share of native Latin speakers just to the left of the language border as opposed to the share of Latin speakers in Latin border municipalities. Fig. 3.3 allows guessing these quantities because it plots the share of Latin speakers at distances to the language border not exceeding 100 kilometres (62 miles). The limit share of Latin speakers in municipalities located on Swiss German territory is on the order of \( E_l(D) \approx 0.10 \). In contrast, the share of Latin speakers in Swiss Latin border towns is on the order of \( E_r(D) \approx 0.85 \). This means that group membership changes sharply between municipalities located no further than a couple of kilometres apart. Since group membership changes sharply, we can learn about the role of group membership for voting decisions by contrasting them at the language border.\(^{18}\)

Note that our discussion focuses exclusively on the language border (vertical line at zero distance). This is because only that part of the graph informs on the causal role of group membership. The remaining segments of the graph provide interesting description of the spatial patterns in voting in Switzerland but have no causal interpretation.

Contrasting the outcome \( Y \) at the language border measures the average effect of language group membership on voting decisions under certain assumptions.\(^{19}\) The Appendix discusses the three assumptions along with evidence that is consistent with them. The identification strategy is a fuzzy spatial regression discontinuity approach (RDD; see Hahn et al. (2001) for a general discussion of sharp and fuzzy RDD).

How can we estimate the average effect of language group membership on voting outcomes? It can be shown that the border contrast in the share speaking the Latin language equals \( E_r(D) - E_l(D) = \text{Prob}(D_r = 1, D_l = 0) \), where \( D_r \) denotes language group membership of individuals residing in the Swiss Latin territory, and \( D_l \) is language group membership of individuals residing in the Swiss German territory. This means that identification of the average effect of language group membership on voting decisions requires dividing the border discontinuity in voting by the border discontinuity in outcomes. Our preferred estimate of the border contrast in language is 0.7535 (see Table 3.7, row 1). This

\(^{18}\)In technical terms, the Swiss language border is a fuzzy spatial regression discontinuity design. Lee and Lemieux (2009) discuss problems with spatial regression discontinuity designs mainly related to endogenous mobility across the language border. While we cannot exclude endogenous residential mobility, its quantitative magnitude is arguably too small to be strongly driving results.

\(^{19}\)The effect is for residents of Latin border communities who are members of the Swiss Latin language group but who would be members of the Swiss German language group if they moved across the border multiplied by the share of language region compliers. This effect is a so-called local average treatment effect for the population at the language border. See Imbens and Angrist (1994) for a formal discussion of identification of local average treatment effects, and Hahn et al. (2001) for a formal proof of identification in a regression discontinuity setting. Lee and Lemieux (2009) discuss the key behavioral assumptions as well as a range of settings with discontinuous assignment of treatments.
Notes: Dots show the share Latin (French, Italian or Romansh) speakers in the Swiss population at or above age 18 (eligible voters) speaking a Swiss official language (German, French, Italian or Romansh) for “bins” of communities. Communities are collected in bins by their distance to the language border, in 5km intervals. Negative distances correspond to majority German-speaking communities, positive distances correspond to majority French-, Italian-, or Romansh-speaking communities. The vertical line indicates the language border, as detailed in the text. Also shown is a LOWESS fit to the bin-level shares, a locally weighted regression using 80% of the data to smooth each point.

Culture and Demand for Social Insurance

means that the border contrast in voting outcomes $E^r(Y) - E^l(Y)$ needs to be inflated by roughly 33% (i.e. multiplied by $1.327 = 1 / .7535$) to back out the average effect of language group membership on voting outcomes $E^r(Y_1 - Y_0|D_r = 1, D_l = 0)$.

B Estimation

To measure the effect of culture at the language border we estimate the following equation

$$Y_j = \alpha_l + \delta L_j + \beta_{l1} F_j + \beta_{l2} F_j^2 + \beta_{r1} L_j \cdot F_j + \beta_{r2} L_j \cdot F_j^2 + X_j^\prime \gamma + \epsilon_j \quad (3.1)$$

where $L$ is the Latin dummy coefficient (= 1 if the majority of the community population speaks a Latin language, and 0 otherwise).

The key parameters in this regression are $\alpha_l$ and $\delta$. To see this, consider $E(Y_j|F_j = 0, L_j = 1) = \alpha_l + \delta$ and $E(Y_j|F_j = 0, L_j = 0) = \alpha_l$. This shows that $\delta$ estimates the border contrast in $Y$, i.e. $E^r(Y) - E^l(Y)$, and $\alpha_l$ measures the mean outcome in Latin border towns if they were German speaking. The parameters $\beta_{l1}, \beta_{l2}$ measure the spatial trend in voting and other outcome measures in Swiss German territory, while the parameters $\beta_{r1}, \beta_{r2}$ allow for a completely different spatial trend in Swiss Latin territory. The data vector $X_j$ contains background information on the municipalities, and – importantly – a full set of canton dummies. Canton dummies ensure that the parameter $\delta$ is identified by contrasting German and Latin border towns within the same canton. The parameter vector $\gamma$ captures the predictive power of background municipality characteristics. We will use equation (3.1) as our baseline regression specification to estimate the border contrast in $Y$. In all cases, we report standard errors that allow for clustering at the municipality level when working with individual data and heteroscedasticity robust standard errors when working with municipality data.

3.4 Culture and the demand for social insurance

This section discusses the causal effect of cultural background (as measured by the dominant language within a community) on the demand for social insurance (as measured by

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20 We confine the analysis on the municipalities located not more than 50 kilometres from the language border. We adopt this ad-hoc bandwidth because optimal bandwidth choice is complicated. We also report the sensitivity of our results to changes in the bandwidth, adopting, for instance a bandwidth of 25 kilometres. See Imbens and Kalyanaraman (2012) for a recent discussion of optimal bandwidth choice.

21 See Lee and Lemieux (2009) for a comprehensive discussion of this regression specification.

22 We have also explored clustering standard errors with respect to distance to the language border – our so-called forcing variable. This type of clustering has been suggested by Card and Lee (2008). Our conclusions are not affected by a change in the level of clustering.
voting behaviour on major reforms to the social insurance system) in Switzerland. In the first part of this section, we give descriptive evidence on major referenda that took place in Switzerland over the last three decades. We then apply our spatial RDD methodology described in the last section to analyse the causal effect of cultural background on voting behaviour.

A Voting on social insurance

National votes and referenda are held on a regular basis on all kinds of issues in Switzerland. To ask for a referendum, voters collect signatures (50,000 within three months for a referendum on a government policy, 100,000 for a voter initiative on a new amendment to the constitution) and the parliament checks if the initiative is consistent with existing laws. A national vote is held on the issue if the parliament agrees on holding it. Swiss nationals aged 18 and older are eligible to vote. For most referenda and initiatives a simple majority rule is applied. International treaties need to be approved by the majority of the people and the cantons.

These national votes provide a wealth of data on the opinions of Swiss voters. The voting data since 1980 are publicly available. Voting data contain information on the number of eligible voters, number of votes cast, number of valid votes, and number of votes in favour ("Yes") or not ("No"). The data cover each of the roughly 2,700 Swiss municipalities.

Table 3.2 provides a list of all votes studied in this paper along with results in the two language regions. All these votes are national referenda and intended to change national law. All voters in Switzerland decide on the same issue.

We start with health insurance because health risks are, arguably, the most broadly relevant risk to a person’s human capital. Panel A of Table 3.2 contains the results of three votes on health insurance. The 1994 vote on the introduction of mandatory health insurance constituted a major change in the health insurance system. It introduced mandatory basic health insurance for all residents, subsidies for the poor, and abolished the possibility to demand different premia based on age, pre-existing conditions, and gender. The referendum was accepted with a narrow 50.9 % yes-votes. While Swiss-Germans rejected the referendum with 46 % yes-votes, Latin voters strongly supported this referendum. The gap between the two language regions was almost 20 percentage points. In 2007, a referendum on the introduction of single-payer health care was rejected by the majority of the population. This referendum proposed a single government-run insurance company for basic health insurance (which is quite comprehensive in Switzerland) and premia based on income and wealth of the insured (instead of equal premia for everyone). In this vote, the German-Latin gap was even stronger with 22 percentage points more support for the
### Table 3.2: Selected referenda in Switzerland

<table>
<thead>
<tr>
<th>Panel</th>
<th>Issue</th>
<th>Year</th>
<th>Vote</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Latin</th>
<th>German</th>
<th>Difference (Latin-German)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. 1</td>
<td>Health insurance (expand)</td>
<td>1994</td>
<td>398</td>
<td>41.56</td>
<td>58.44</td>
<td>68.88</td>
<td>31.12</td>
<td>37.76</td>
</tr>
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<td></td>
<td></td>
<td>1999</td>
<td>1197</td>
<td>41.72</td>
<td>58.28</td>
<td>66.33</td>
<td>33.67</td>
<td>32.05</td>
</tr>
<tr>
<td>A. 2</td>
<td>Introduction of single-payer health care</td>
<td>2007</td>
<td>397</td>
<td>52.88</td>
<td>47.12</td>
<td>68.25</td>
<td>31.75</td>
<td>13.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2009</td>
<td>367</td>
<td>45.60</td>
<td>54.40</td>
<td>62.00</td>
<td>38.00</td>
<td>12.40</td>
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<tr>
<td>B. 1</td>
<td>Reduction in retirement age</td>
<td>1988</td>
<td>352</td>
<td>34.84</td>
<td>65.16</td>
<td>47.10</td>
<td>53.00</td>
<td>26.00</td>
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<td></td>
<td></td>
<td>2000</td>
<td>470</td>
<td>38.35</td>
<td>61.65</td>
<td>61.40</td>
<td>38.60</td>
<td>24.20</td>
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<td>B. 2</td>
<td>Flexible retirement age</td>
<td>1999</td>
<td>458</td>
<td>38.45</td>
<td>61.55</td>
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<td>2004</td>
<td>513</td>
<td>54.57</td>
<td>45.43</td>
<td>73.00</td>
<td>27.00</td>
<td>38.00</td>
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<td>B. 3</td>
<td>No increase in women's retirement age</td>
<td>2000</td>
<td>469</td>
<td>38.77</td>
<td>61.23</td>
<td>54.98</td>
<td>45.02</td>
<td>13.20</td>
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</tr>
<tr>
<td>C. 1</td>
<td>Introduction of maternity insurance</td>
<td>1984</td>
<td>323</td>
<td>15.55</td>
<td>84.45</td>
<td>46.46</td>
<td>53.54</td>
<td>31.00</td>
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<td></td>
<td>1999</td>
<td>458</td>
<td>38.45</td>
<td>61.55</td>
<td>63.20</td>
<td>36.80</td>
<td>25.60</td>
</tr>
<tr>
<td>C. 2</td>
<td>Introduction of maternity insurance</td>
<td>2004</td>
<td>513</td>
<td>54.57</td>
<td>45.43</td>
<td>73.00</td>
<td>27.00</td>
<td>38.00</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. 1</td>
<td>Reduction of unemployment benefits</td>
<td>1993</td>
<td>398</td>
<td>67.68</td>
<td>32.32</td>
<td>66.33</td>
<td>33.67</td>
<td>3.65</td>
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<tr>
<td></td>
<td></td>
<td>1997</td>
<td>437</td>
<td>48.03</td>
<td>51.97</td>
<td>52.70</td>
<td>48.30</td>
<td>0.80</td>
</tr>
<tr>
<td>D. 2</td>
<td>Shorter potential benefit duration</td>
<td>2002</td>
<td>492</td>
<td>54.56</td>
<td>45.44</td>
<td>47.02</td>
<td>52.98</td>
<td>9.11</td>
</tr>
</tbody>
</table>

**Notes:** Column "Latin" reports the average voting pattern for municipalities where a majority of Swiss nationals speak either French, Italian or Romansh, column "German" reports the average voting pattern for the remaining municipalities. There are slight variations in total turnout and share 'yes' with respect to official statistics due to omitted votes from non-resident citizens voting by letter. Vote numbers according to official Swiss referendum chronology by the Federal Chancellery.
vote by Swiss Latins. The 2009 vote had as its purpose to include alternative medicine into the list of treatments that have to be paid by mandatory health insurance. This expansion of health insurance was accepted by a majority of voters, with much higher support in the Latin region.

Several important referenda were held also with respect to the second important field of social insurance, the old-age social security system. Panel B of table 3.2 shows three referenda on old age insurance that were rejected by a majority of Swiss voters. In all three votes the issue was whether to decrease the statutory retirement age of the pay-as-you-go pillar of the Swiss old age insurance (AHV). This first pillar is in place since 1947 and provides the main source of income after retirement for low-wage workers. Lowering the eligibility age without a corresponding (marginally) actuarially fair discount of benefits clearly implies a redistribution of income from high wage to low wage workers and from young to old individuals. Even though all three referenda were turned down at the polls, the Latin-speaking population of Switzerland would have accepted both referenda in 2000. In all three votes, the Latin-German-gap was as large as 15 and 22 percentage points.

Panel C in Table 3.2 depicts voting results on three federal referenda on the introduction of maternity insurance. Both in 1984 and 1999 introduction failed. Switzerland introduced maternity insurance only in 2005. The Latin-German-gap is striking in all three votes but particularly so in 1999 and 2004.23

Unemployment insurance is a national program that has been reformed several times since 1980. Panel D shows two votes introducing more restrictive rule and one vote that changed rules in both directions. The main component of the 1993 vote was a reduction in unemployment benefits. Voters were less aware of the fact that this reform also proposed to extend unemployment benefit duration. In this vote, eventually accepted by the majority, no significant Latin-German-gap shows up. However, there were large differences in the other two votes, both of which made the unemployment insurance system less generous. The vote about a reduction of unemployment benefits in 1997 was turned down; and the vote on shorter benefit durations in 2002 was accepted. The Latin-German-gap was 9 % in the 1997 vote, and 19 % in the 2002 vote.

B The Latin-German gap in demand for social insurance

We start by plotting the relevant outcome variable (percentage yes-votes) with respect to distance to the language border. Doing so provides a graphical indicator for the presence of a discontinuous jump in the outcome variable at the language border, i.e. distance zero. To estimate the border contrast in voting outcomes, we implement equation 3.1 and report the

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23Language regions also differ in terms of the role of women (Chapter 2).
estimate of the parameter $\delta$. This parameter is identified by a change in majority language within cantons, holding distance to language border, canton of residence, and a wealth of municipality background characteristics constant. This parameter therefore measures the causal effect of language group membership on voting decisions at the language border.

Fig. 3.4 provides distance-to-border graphs for 12 national referenda on social insurance. We grouped the votes according to the type of insurance. Panel A in Fig. 3.4 shows three referenda related to health insurance. The 1994 vote introduced universal mandatory basic health insurance for all residents, subsidies for the poor and ended the possibility to demand different premia based on age, pre-existing conditions, and gender. There is a strikingly clear discontinuity in support for the proposal (Fig. 3.4A.a.). Whereas this proposition tended to please barely more than half of the residents of German language border towns, 7 out of 10 Latin border voters tended to voice support for universal social health insurance. In 2007, voters decided on a proposal to introduce single-payer health care. This proposal gathered support from roughly 3 in 10 voters in German border towns. In contrast, more than 4 out of 10 voters in Latin border towns tended to favour this proposal (Fig. 3.4A.b.). In 2009, the catalogue of covered treatments was to be extended to include alternative medicine. 2 out of 3 German border town voters supported this proposal, compared to almost 3 out of 4 Latin border town residents. Overall, there is a striking discontinuity in the demand for social health insurance at the Swiss language border.

Panel B in Fig. 3.4 shows three referenda on old-age social security. All three votes the issue intended to expand social security by lowering (or keeping constant) the age of early retirement. In all three cases, there is a clear difference in terms of the proportion of voters favouring a reduction (or maintaining) the statutory age of retirement. While roughly 3 to 4 out of 10 voters in German speaking border towns support reductions in the official retirement age, the corresponding share attains a level of 5 out of 10 voters supporting lower retirement ages in the Latin speaking border towns (Figures 3.4B.a.-B.c.).

Panel C in Fig. 3.4 depicts voting results on three federal referenda on the introduction of maternity insurance. Both in 1984 and 1999 introduction failed. Switzerland did not introduce maternity insurance until 2004. The pattern of voting is quite striking, with large discontinuities at the border in 1999 and 2004 (Figures 3.4C.b. and 3.4C.c.).

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24 Brügger et al. (2009) provide a related analysis for referenda related to working-time issues that overlap with the subset of votes related to early retirement. However, Brügger et al. (2009) do not discuss whether the graphical discontinuity survives a more thorough econometric analysis that controls for the key determinants of voting outcomes on social insurance related issues.

25 Note that Latin and German residents also differ with respect to their view regarding the role of women. For instance, 23.7% of German region residents agree with the ISSP 2002 survey item "A man’s job is to earn money; a woman’s job is to look after the home and family." The corresponding share in
Figure 3.4: Voting on social insurance

A. Health insurance
   a. Introduce (1994)
   c. Alternative Medicine (2009)

B. Social security

C. Maternity leave
   b. Introduce (1999)

D. Unemployment insurance
   b. Reduce Benefits (1997)
   c. Shorten Duration (2002)

Notes: See notes to Fig. 3.3. Dots show the percent Yes-votes of all valid cast votes, per 5km-bin of communities. Year the vote was held is in parentheses. Negative=German-speaking part; positive=French-/Italian-/Romansh-speaking part.
Panel D in Fig. 3.4 proposed three votes on unemployment insurance. The 1993 referendum entailed both a reduction of the benefit replacement rate from 80% to 70% for job seekers with no dependents who earned high pre-unemployment incomes, and also an extension of the potential benefit duration. There is no visible discontinuity (sub-graph 3.4D.a.). This is probably due to the fact that the issue at hand neither clearly extended nor clearly tightened unemployment insurance. In contrast, both the 1997 and 2002 votes discussed issues related to tightening UI. The 1997 vote reduced the benefit replacement rate, while the 2002 vote shortened benefit duration. There are strong discontinuities in support for these two votes (sub-graphs 3.4D.b. and 3.4D.c.).

So far, we have looked at only a graphical description of voting at the language border. Do these results withstand the addition of canton dummies and control variables? Table 3.3 presents estimates of the causal effects of language group membership on voting outcomes. The table reports a series of 5 different estimation results. Column (1) shows the border contrast adopting a 50 km window around the language border, with a quadratic two sided trend (equation 3.1 without the $X$ vector). Column (2) adds canton dummies – shifting to within canton identification – and municipality background controls (see Table 3.7 Panels A and B and Table 3.8 Panel C for the full list of controls). Column (3) adds controls for risk factors associated with the respective referenda in order to control for the underlying risks potentially affecting the demand for certain kinds of insurance. The risk controls are cholesterol levels of Swiss army recruits in Panel A, the raw death rate (deaths over population age 50+) in Panel B, the raw fertility rate (births over population) in Panel C, and the unemployment duration and share of long-term unemployed in Panel D (all risk controls on the community level). Columns (4) and (5) keep the $X$ vector and assess sensitivity to functional form using the two approaches recommended by Lee and Lemieux (2009). Column (4) adopts a local linear approach, i.e. reduces the bandwidth to 25 km and shifts to a linear spatial trend on both sides of the language border. Column (5) adopts a polynomial approximation approach introducing third order terms in distance to border.

Panel A in Table 3.3 provides results on the role of language group membership for the demand for social health insurance. Results in Row 1, column 1 suggest that the Latin-German gap in support for universal coverage is about 7.4 percentage points. Including canton dummies (shifting to within canton identification) and a full set of control variables (in column 2) reduces the estimated Latin-German gap to just barely below 5 percentage points. Columns 3, 4 and 5 provide sensitivity analysis for column 2. Column 4 discards all municipalities further than 25 km away from the language border and adopts a linear spatial trend. The resulting Latin-German gap in support for universal health

Latin regions is 19.4 %. See Chapter 2 for further discussion of this issue.
insurance increases somewhat to 5.5 percentage points. Column 5 assesses sensitivity to mis-specified spatial trends by adding two third order terms in distance to language border (one for each language region) to model (3.1) while keeping the original 1,177 municipalities located at 50 km distance from the language border. Results indicate that Latin border municipalities are 4.9 percentage points more in favour of universal health care than would be expected from their German counterparts. Thus, the baseline result of a Latin-German gap of 4.6 percentage points (column 2) for the 1994 vote do not appear to be sensitive to misspecified functional form.

Row 2 in Panel A reports results for the proposal to introduce single-payer health care. The health insurance market is currently characterised by a large number of private health insurers that are regulated by the government. The 2007 proposal, elaborated by Pascal Broulis – a politician from the Latin speaking part of the country – suggested nationalizing the entire industry. Results in column 2 suggest that Latin border municipalities were 11.7 percentage points more likely to support this proposal than their German counterparts. This result is, again, not sensitive to mis-specified functional form (columns 4 and 5). Row 3 in Panel A reports results on extending the basic health catalogue to alternative medicine (homeopathy, etc.). Latin border municipalities were 4.8 percentage points more likely to vote for this extension of social insurance than their German counterparts. Results hold up in columns 3 and 4 but are insignificant in column 5. Overall, results in Panel A of Table 3.3 consistently identify stronger support for universal health insurance in Latin border towns despite facing identical actual levels of social insurance (section 3.2).

Panel B in Table 3.3 discusses changes to the old age pension system. The first vote in 1988 proposed to reduce the statutory retirement age, i.e. an expansion of coverage. Results in column 2 indicate that support for this proposal is 6.1 percentage points higher in Latin border towns compared to their German counterparts. This result is robust to mis-specification of spatial trends (columns 4 and 5). The second and third vote proposed both to give workers more freedom to choose when to retire and to keep women's retirement age at 62 years (instead of gradually increasing it to match men’s retirement age of 65 years). Both proposals are consistently more strongly supported in Latin border towns compared to their German counterparts. The Latin excess support is on the order of 10.2 percentage points for the proposal to have a flexible system and 9.4 percentage points for the proposal to keep women’s retirement age constant according to our baseline specification (column 2). Both results hold up to sensitivity analyses in columns 3, 4 and 5.

Panel C in Table 3.3 reports results on three proposals to introduce maternity leave. The first proposal, while rejected in 1984, got 3.3 percentage points more support in the Latin border community than would be expected from their German counterparts. The
second proposal, while rejected in 1999, yielded 9.7 percentage points more support in the Latin border community than would be expected from their German counterparts. The final proposal, which led to the decision to introduce universal paid maternity leave of 12 weeks was, yet again, favoured by 9.2 percentage points more voters in the Latin border towns than expected from the German border community. With the exception of one vote (1984), results hold up to the sensitivity analyses in columns 3, 4 and 5.

Panel D in Table 3.3 reports results on three proposals to reform unemployment insurance (UI). The first proposal in 1993 entailed a reduction of the benefit level but an extension of unemployment benefit duration. This proposal was opposed by 3.9 percentage points more voters in Latin border communities compared to their neighbours in majority German speaking territory. After a surprise reduction of benefits was introduced by the Government in early 1997, unions organized a national referendum on this decision and managed to overturn it. In line with our earlier findings, support for the reduction in benefits was 3.6 percentage points stronger in German border towns than in Latin border towns. The third proposal, voted in 2002, was to reduce benefit duration for any job seeker aged 55 years or less. This clear reduction of UI coverage was opposed by 2.8 percentage points more voters in Latin border towns compared to their neighbours at the fringes of mainland German speaking territory. Results hold up to the sensitivity analyses reported in columns 3, 4 and 5.

In sum, we find strong evidence for higher demand for social insurance and redistribution by individuals of Latin-speaking communities compared to their neighbours just across the language border. Thus, results are consistent with a significant role of culture in determining the demand for social insurance of risks to health and work.

\[26\text{Stutzer and Lalive (2004) discuss the political context of this referendum and use this referendum to proxy for the norm to live off one's own income.}\]
Chapter 3

Table 3.3: Voting on social insurance

<table>
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<tr>
<th>Bandwidth Distance</th>
<th>50km quadratic</th>
<th>50km quadratic</th>
<th>50km quadratic</th>
<th>25km linear</th>
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<td>Risk controls</td>
<td>no</td>
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<td>Year</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
</tbody>
</table>

**Panel A. Health Insurance**

Introduction of mandatory health insurance 1994 7.42 4.63 3.95 5.52 4.89
(1.23)*** (1.08)*** (1.20)*** (1.18)*** (1.81)***
(1.04)*** (0.99)*** (1.02)*** (1.12)*** (1.37)***
Include alternative medicine 2009 6.91 4.75 4.89 4.11 3.03
(1.69)*** (1.45)*** (1.46)*** (1.75)** (2.27)

**Panel B. Social Security (Expand / Keep Status Quo)**

Reduction in retirement age 1988 9.56 6.06 6.06 7.56 4.58
(1.35)*** (1.04)*** (1.04)*** (1.16)*** (1.53)***
Flexible retirement age 2000 12.95 10.16 10.18 11.14 8.54
(1.36)*** (1.13)*** (1.13)*** (1.18)*** (1.63)***
No increase in women’s retirement age 2000 12.46 9.43 9.42 10.18 8.31
(1.14)*** (0.89)*** (0.89)*** (0.97)*** (1.30)***

**Panel C. Maternity Leave (Introduce)**

Introduction of maternity insurance 1984 5.01 3.31 3.32 3.59 2.02
(0.84)*** (0.81)*** (0.80)*** (0.86)*** (1.32)
Introduction of maternity insurance 1999 11.87 9.70 9.74 10.25 6.96
(1.55)*** (1.45)*** (1.45)*** (1.32)*** (2.32)***
(1.62)*** (1.37)*** (1.38)*** (1.39)*** (2.11)***

**Panel D. Unemployment Insurance (Tighten)**

Change in unemployment benefits 1993 -3.34 -3.94 -3.87 -3.17 -6.02
(1.83)* (1.60)** (1.51)** (1.41)** (2.24)***
Reduction of unemployment benefits 1997 -5.30 -3.57 -2.79 -3.72 -4.84
(1.36)*** (1.09)*** (1.10)*** (1.26)*** (1.67)***
Shorter potential benefit duration 2002 -4.33 -2.81 -2.76 -3.65 -4.53
(1.51)*** (1.03)*** (1.04)*** (1.17)*** (1.54)***

Notes: Table entries are estimates of the Latin dummy coefficient (equal to 1 if majority of community population speaks a Latin language, 0 otherwise). Dependent variable in all columns: percent yes-votes. Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. All regressions include distance, distance squared and interaction terms with the Latin dummy. Column (2) is based on equation 3.1. Control variables on community level are canton dummies, age, gender, and education structure, population size of community, share Protestant, Catholic, foreigners, unemployment rate, sector structure, wealth level, and geography (agglomeration, touristic, altitude, land use (arbiculture, culture, alps, forest, unproductive, constructed), proximity to lakes). Risk controls are cholesterol levels of Swiss army recruits in Panel A, death rates in Panel B, raw birth rate in Panel C, unemployment duration and share long-term unemployed in Panel D. The number of observations in the first two columns are 1,177. Risk controls are available for a varying selection of communities. No. of observations in columns (3) to (5) are 782, 384 and 782 in Panel A, 1,177, 562 and 1,177 in Panel B, 1,176, 562 and 1,176 in Panel C, and 1,170, 559 and 1,170 in Panel D.

Source: data from Federal Statistical Office, Neuchatel and from the State Secretariat for Economic Affairs SECO, Berne.
3.5 Possible explanations

This section discusses three competing explanations of the Latin-German gap in support for social insurance: informal insurance, beliefs, and the media.

A Informal insurance

The demand for publicly provided social insurance and work regulations depends importantly on the availability of informal insurance (Bloch et al., 2008). Informal insurance can come from the family or close friends, where insurance is more strongly based on bilateral links between network members; or from insurance groups, where the group collectively insures the network member. The degree of insurance depends crucially on norms regarding mutual help. In the present context, it could be that norms with respect to mutual help are lower in the Latin region of Switzerland, leading to less stable social networks and less informal insurance. As a result a higher demand for social insurance could emerge.\(^{27}\)

A related argument holds that social capital creates informal insurance. There is no single definition of social capital. However, Durlauf and Fafchamps (2005) argue that there are three underlying main ideas: (i) social capital is beneficial for members of a group; (ii) these benefits arise through shared norms and values, which influence expectations and behaviour; and (iii) these norms and values evolve through informal organisation, such as associations.\(^{28}\)

We explore the relevance of informal insurance and social capital by exploiting data from the Swiss Household Panel (SHP).\(^{29}\) Panels a and b of Fig. 3.5 show the number

\(^{27}\)Angelucci et al. (2009) present evidence from a quasi-experimental study on transfers within extended family networks. Studying cash transfers from the state in Mexico, they show that ineligible individuals that are members of an extended family network do profit more from cash transfers within a village than ineligible individuals that do not have such a family network. There is a larger literature on risk pooling within ethnic groups and within families in developing countries. Udry (1994) develops a model of risk sharing within ethnic groups and tests it with data from Tanzania. He finds substantive but imperfect risk pooling between families. Fafchamps and Lund (2003) stress the importance of family ties and networks of friends in smoothing income shocks in rural Philippines. They show that risk pooling is not done at the village level but rather within personal networks.

\(^{28}\)Carter and Castillo (2004) provide evidence on the effect of differences in social capital across communities in Honduras in recovering from a hurricane catastrophe. Communities with stronger social norms rebuilt their houses more quickly than communities with weaker norms. However, only members of the respective networks profited. Narayan and Pritchett (1999) proxy for social capital in their study of Tanzania an index based on the number of club memberships and some characteristics of the respective clubs. They argue that greater associational activity is linked to greater sharing of household risk. Putnam (2000) claims that being member of an association or a club that meet regularly is (besides contact with family, friends, neighbours,...) a sign of developed social capital. He especially states that a decrease in social capital in the US over the last years has led to a significant decrease in club memberships.

\(^{29}\)The SHP is a yearly conducted panel survey in Switzerland that aims to asses a broad range of
of an individual’s relatives and friends (strong ties), and the number of an individual’s neighbours and colleagues (weak ties). Since the SHP offers detailed information on individuals’ location of residence, we can apply the spatial regression discontinuity approach. Panels a and b reveal that neither the number of strong social ties nor the number of weak social ties shows large differences at the language border. Latin Swiss individuals have somewhat stronger family ties but German Swiss individuals are better connected to neighbours and colleagues (more "weak social ties"). The evidence on social networks is mixed.

The SHP also contains information on club membership in eight different kinds of associations. Panel c of Fig. 3.5 presents evidence on active club memberships in these different associations. Respondents who live in Latin border municipalities appear to be members of fewer clubs than their neighbours living in German border municipalities. This evidence suggests that a higher demand for social insurance in the Latin side could partly result from membership in fewer clubs.

Figure 3.5: Social networks and social capital

(a) Strong ties (relatives and friends)  
(b) Weak ties (neighbours and colleagues)  
(c) Club membership (active member)

Notes: negative=German-speaking part; positive=French-/Italian-/Romansh-speaking part. Strong ties: Sum of number of relatives and number of friends (32,004 valid observations). Weak ties: Sum of number of neighbours and colleagues (31,360 valid observations). Club membership: Count number of clubs that a person is an active member in. Maximum number of clubs is eight. (32,259 valid observations).


notes linked to living in Switzerland. Among others, it asks about labour market participation, financial situation, social networks, social participation, and values in different fields. The SHP started in 1999 with a random sample of 5’074 households. In 2004, 2’538 households were added to the original sample because of attrition problems. The sample was constructed containing only Swiss citizens since birth, because specific Swiss cultural traits that are transmitted by family and social networks should be strongest for individuals with a Swiss family. Furthermore, only individuals that have a Swiss mother tongue were kept in the sample, because language is important for integration to social networks. Finally, only individuals aged 18 or older are investigated, so that our sample can be compared to the voting age population (only Swiss nationals are allowed to vote). This yields a final sample of 8’107 individuals in 5’211 households. Note however, that not all individuals answer to all questions.

This vocabulary draws from the work of Granovetter (1973) on strong and weak ties. He argues that weak as well as strong ties are important to spread information.
Table 3.4 provides a detailed econometric analysis of the possible role of social networks and social capital. Column 1 of Panel A shows that respondents have, on average, 7.4 relatives and 5.7 close friends. Columns (1) to (4) report the estimated discontinuity at the language border. Regressions control for age, education, gender, and an extensive set of municipality characteristics.\textsuperscript{31} Using these controls, we find that strong social ties are significantly higher for Latin speakers. For weak ties, we do not find statistically significant differences among language groups.

A fact that could confound the analysis in columns (1) to (2) is that unemployment is higher in Latin regions than in Swiss-German regions. Unemployed individuals might have more need for (informal) insurance and also more available time to spend to see friends. Column (5) conducts the same analysis as column (2), using only observations of employed individuals. Differences in social networks vanish if looking at employed individuals only.

Panel B of table 3.4 shows evidence on active membership in an association or a club. “All clubs” is a count variable that can take values between zero and eight, depending on the number of different clubs in which the individual is active. We subdivided the eight club-categories into clubs with a redistributive goal (parents’ organization, syndicate, charitable organization, women’s organization, tenants’ rights), and clubs without such a goal (sport or leisure, culture, protection of the environment). Results show that Latin individuals are significantly less frequently members of a club. This is true for the whole sample as well as the sub-sample of employed individuals. The difference is quantitatively important. The estimated gap at the language border is as large as one fourth of the mean of club memberships directly at the language border.

\textsuperscript{31}Permanent population, percentage of Protestants and of Catholics, percentage foreigners, municipal unemployment rate, economic sector composition, agglomeration, tourist area, altitude of the municipality, lake border, surface, and land use.
Chapter 3

Table 3.4: Language border contrasts in social ties

<table>
<thead>
<tr>
<th>Sample</th>
<th>Mean</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>Employed</td>
</tr>
<tr>
<td>50km</td>
<td>50km</td>
<td>50km</td>
<td>25km</td>
<td>50km</td>
<td>50km</td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>no</td>
<td>quadratic</td>
<td>quadratic</td>
<td>linear</td>
<td>cubic</td>
<td>quadratic</td>
</tr>
<tr>
<td>Control variables</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

A. Strong ties (no. persons)

| | 13.10 | 1.335* | 2.305*** | 1.487* | 1.824* | 0.728 |
| | (0.107) | (0.791) | (0.825) | (0.783) | (1.067) | (1.058) |
| Relatives | 7.400 | 0.591 | 1.216* | 0.611 | 1.096 | 0.550 |
| | (0.0866) | (0.623) | (0.631) | (0.517) | (0.728) | (0.847) |
| Close friends | 5.696 | 0.744* | 1.090** | 0.875* | 0.728 | 0.178 |
| | (0.0498) | (0.414) | (0.430) | (0.476) | (0.621) | (0.548) |
| Observations | 16,791 | 16,791 | 16,791 | 6,671 | 16,791 | 11,532 |
| Individuals | 3,106 | 3,106 | 3,106 | 1,301 | 3,106 | 2,488 |

B. Weak ties (no. persons)

| | 10.78 | -0.706 | 0.128 | -0.160 | -0.505 | -1.929 |
| | (0.121) | (1.119) | (1.226) | (1.400) | (1.603) | (1.479) |
| Neighbours | 3.347 | -0.366 | 0.238 | 0.399 | -0.428 | -0.208 |
| | (0.0380) | (0.329) | (0.328) | (0.342) | (0.527) | (0.381) |
| Colleagues | 7.434 | -0.340 | -0.110 | -0.559 | -0.0766 | -1.720 |
| | (0.106) | (0.986) | (1.098) | (1.271) | (1.365) | (1.339) |
| Observations | 16,486 | 16,486 | 16,486 | 6,580 | 16,486 | 11,311 |
| Individuals | 3,101 | 3,101 | 3,101 | 1,295 | 3,101 | 2,476 |

C. All clubs (active members)

| | 0.862 | -0.210*** | -0.161** | -0.178** | -0.125 | -0.231*** |
| | (0.00820) | (0.0683) | (0.0468) | (0.0698) | (0.101) | (0.0828) |
| Redistributive clubs | 0.266 | -0.108*** | -0.0798*** | -0.0222 | -0.0392 | -0.0856* |
| | (0.00449) | (0.0360) | (0.0368) | (0.0389) | (0.0546) | (0.0443) |
| General clubs | 0.596 | -0.102** | -0.0809* | -0.156*** | -0.0861 | -0.145** |
| | (0.00574) | (0.0461) | (0.0446) | (0.0499) | (0.0707) | (0.0575) |
| Observations | 16,923 | 16,923 | 16,923 | 6,723 | 16,923 | 11,579 |
| Individuals | 3,119 | 3,119 | 3,119 | 1,303 | 3,119 | 2,494 |

Notes: Standard errors in parentheses (clustered by municipality and year). * p < 0.10, ** p < 0.05, *** p < 0.01. Estimate on Latin coefficient in regression of dependent variable on individual characteristics (age, sex, education), municipality characteristics (population, religion, foreigners, unemployment, sector structure, agglomeration structure, area usage, area, altitude, lake border), year and cantonal fixed effects. Strong ties: Sum of number of relatives and number of friends. Weak ties: Sum of number of neighbours and colleagues. Sums the membership of the following clubs: local or parents / syndicate / charitable organization / women / tenants’ rights (redistributive) and sports or leisure / culture / protection of the environment (general) with equal weighting. Separation into language regions by ethnicity, German = Swiss German, Latin = Swiss French/Italian. Source: Swiss Household Panel (1999-2008). Individuals are repeatedly surveyed.

We conclude that the evidence in favour of the social-network / informal-insurance channel to explain the differential demand for social insurance is mixed. If there is a difference at all, the Latin Swiss are better informally insured through closer family ties, whereas with respect to weak ties we do not see a major difference. On the other hand, we find that Latin Swiss individuals participate in significantly fewer clubs and associations. While the difference in this dimension is sizeable, memberships in clubs and associations is unlikely to explain all of the enormous differences in the demand for redistribution.
B  Ideology

Bénabou and Tirole (2006) argue that strong *Beliefs in a Just World*, that is, believing that one gets what one deserves, leads societies to adopt welfare systems with little redistribution and social insurance, and that welfare systems with little indirect redistribution can foster these beliefs in a just world.\(^{32}\) This interplay of beliefs and real-life experience may generate multiple equilibria, such as an "American equilibrium" with strong beliefs in the "American dream" and low redistribution, and a "European equilibrium" with weak beliefs in a just world and a large welfare state.

In Fig. 3.1 we saw that the German-Swiss are quite close to Anglo-Saxon countries when asked whether they are in favour of income redistribution through the government. Using data from the World Value Survey 1996, we can dig deeper. In this wave, individuals were asked (on scale between 1 and 10) whether they think they have freedom of choice (10) or no control at all over the way life turns out (1). This survey item is designed to measure an individual’s locus of control (LOC).\(^{33}\) Fig. 3.6a shows that most German Swiss think they have high freedom and high control over their lives. While also a majority among Latin Swiss thinks this way, a non-negligible fraction Latin-Swiss answers that freedom and control over life is much weaker. Similarly, the World Value Survey 1996 asks individuals whether they think that hard work brings a better life (1) or success is a matter of luck and connection (10). Fig. 3.6b shows that a majority of German Swiss thinks that working hard pays off, but this fraction is considerably smaller among Latin Swiss. In particular, a substantial fraction of Latins think that success is almost purely driven by luck and connections.

Table 3.5 reports regression results that for these two questions and reproduces the differences across the language regions when controlling for individual characteristics and canton fixed-effects.\(^{34}\) Latin-Swiss respondents are significantly less convinced that they have the freedom of choice and that they can determine the way their life turns out. Taking account of all controls, the isolated reduction in freedom/control score is 0.56 among the Latin Swiss. The contrast is even stronger for the question more directly related to the belief in a just world. When asked whether hard work pays off or whether success is a matter of luck and connection, Latin Swiss have a luck/connection score that is 1.20 points higher. These results suggest that beliefs diverge profoundly in a situation

\(^{32}\) Earlier important contributions focusing on the divergent beliefs concerning upward income mobility include Piketty (1995) and Bénabou and Ok (2001).

\(^{33}\) Verme (2009) studies the relationship between happiness and locus of control using World Values Survey data.

\(^{34}\) Regression is a simple tool to understand how membership of a language group shifts the cumulative density function in Fig. 3.6a and b. Ordered probit analysis are consistent with the simple regression analysis reported in Table 3.5.
Figure 3.6: World Values Survey evidence on beliefs

a. Freedom of choice and control over the way your life turns out

b. Success is a matter of hard work vs. success is a matter of luck and connections

Notes: Panel a: 1 = non freedom of choice and control over the way my life turns out, 10 = a great deal of freedom of choice and control over the way my life turns out. Panel b: 1 = in the long run; hard work usually brings a better life, 10 = hard work does not generally bring success - it is more a matter of luck and connections. Separation into language regions by interview language.

Source: WVS 1996.

with identical actual levels of social insurance – clear empirical evidence of ideology.

Table 3.5: Culture and beliefs

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of respondents</th>
<th>Mean answer †</th>
<th>Coefficient on Latin ‡</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Latin</td>
<td>German</td>
</tr>
<tr>
<td>1. Freedom of choice and control over the way your life turns out</td>
<td>1,190</td>
<td>6.833</td>
<td>7.475</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.087)</td>
<td>(0.076)</td>
</tr>
<tr>
<td>2. Success is due to hard work (1) vs. a matter of luck and connections (10)</td>
<td>1,150</td>
<td>5.028</td>
<td>3.898</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.126)</td>
<td>(0.105)</td>
</tr>
</tbody>
</table>

Notes: Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01. † Table entries are the mean response in the scale from 1 to 10 for both items. ‡ Estimate on Latin coefficient in regression of response to survey item on a full set of canton dummies, age, sex, education (low, medium, high). Separation into language regions by ethnicity, German = Swiss German, Latin = Swiss French/Italian. Questions are from the World Values Survey carried out in 1996.

Where do these different views and ideology come from? An important argument is that the Latin Swiss were the minority for centuries, suppressed by the elites of Berne and the aristocracy of Fribourg. Being a suppressed minority may have contributed to the adoption of values which are based less strongly on the belief in a just world. Repeated experience of suppression is likely to foster the belief that one’s own fortune is more driven by status and ancestry than by individual effort.

Yet there is a key problem with this explanation. In the models of Piketty (1995) and Bénabou and Tirole (2006) there is a feedback mechanism. Actual differences in
social insurance lead to individual choices that reinforce diverging beliefs on the payoff to hard work. This feedback mechanism is missing in our setting. Actual levels of social insurance are identical on either side of the language border. Can media exposure provide the missing reinforcement link?

C Media exposure

*I am far from denying that newspapers in democratic countries lead citizens to do very ill-considered things in common; but without newspapers there would be hardly any common action at all. So they mend many more ills than they cause.* (de Tocqueville, 1899)

Arguably, public media play an even more important role in the formation of opinions and beliefs in modern societies. Does media exposure differ across language regions? Table 3.6 shows that the market for newspapers is almost completely segregated between the two language regions. Among the four major newspapers in the French-speaking part of the country – Le Matin, 24 heures, Tribune de Geneve, Le Temps – three are basically not present outside the language region and only LeTemps gets some attention in the German-speaking part. Similarly, the major newspapers in the German-speaking area – Blick, Tagesanzeiger, Mittellandzeitung, Berner Zeitung and Neue Zürcher Zeitung – have a very weak exposure in the Latin-speaking part.

The situation is quite similar for exposure to radio and TV channels. Publica Data AG (2009) publishes market share for TV channels on a regular basis. In each language region of the country there are two public TV channels (TSR1 and TSR2 in French-speaking part, TSI1 and TSI2 in Ticino, and SF1 and SF2 in the German speaking part). However, there is little coordination and overlap in broadcasted programs across these regions. In both language regions, the market share of the public TV channels is roughly 30%. Looking at market shares, the overlap in common TV channels across language regions is almost zero. In the French-speaking part, the remaining channels are dominated by 4 major channels of France (TF1, M6, F2, F3) and in the Italian-speaking part, by 4 major channels of Italy (CAN5, RAI1, ITAL1, RAI2). In both sub-regions, these foreign channels comprise a market share of more than 40%. The situation is quite different in the German-speaking area, where the market not captured by public TV is much more spread out across other channels (private German-Swiss and foreign channels). The four major TV channels of Germany (ARD, ZDF, SAT1, RTL) are less dominant, with a combined market share of not more than 20%. This is consistent with the claim that Latin-speaking Switzerland is more exposed to its large neighbours speaking the same

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35 Note also, that Swiss German journals seem to be slightly more conservative than Latin journals.
language – France and Italy – whereas German-speaking Switzerland has much weaker
ties to its large neighbour speaking the same language.36

Table 3.6: Language segregation of journals in Switzerland

<table>
<thead>
<tr>
<th>Newspaper</th>
<th>Political tendency</th>
<th>Readers</th>
<th>Latin readers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. SWISS-LATIN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Le Matin</td>
<td>independent</td>
<td>283,000</td>
<td>100</td>
</tr>
<tr>
<td>24 heures</td>
<td>independent</td>
<td>230,000</td>
<td>100</td>
</tr>
<tr>
<td>Tribune de Geneve</td>
<td>independent</td>
<td>150,000</td>
<td>100</td>
</tr>
<tr>
<td>Le Temps</td>
<td>independent</td>
<td>123,000</td>
<td>77</td>
</tr>
<tr>
<td>Corriere del Ticino</td>
<td>independent</td>
<td>118,000</td>
<td>100</td>
</tr>
<tr>
<td>B. SWISS-GERMAN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blick</td>
<td>independent</td>
<td>650,000</td>
<td>7</td>
</tr>
<tr>
<td>Tages-Anzeiger</td>
<td>independent</td>
<td>487,000</td>
<td>0</td>
</tr>
<tr>
<td>Mittelland Zeitung</td>
<td>pro-market,independent</td>
<td>459,000</td>
<td>0</td>
</tr>
<tr>
<td>Berner Zeitung</td>
<td>independent</td>
<td>398,000</td>
<td>1</td>
</tr>
<tr>
<td>Neue Zürcher Zeitung</td>
<td>pro-market</td>
<td>291,000</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes: All newspapers are published daily on workdays. List shows the five most read newspaper in the Latin and the Swiss-German region. Data on political tendency from www.printmedia.ch. Data on number of readers and % Latin readers from WEMF 2008.

Persistent differences in attitudes towards redistribution may arise because public political debates are more intensive within rather than across language regions. A thorough analysis of this claim is beyond the scope of this paper. Instead, we provide some tentative evidence by looking at differences in the intensity of information-provision on redistribution-relevant topics in relevant print-media. The idea is that, with a perfectly integrated political debate (with an equally vivid exchange of opinions across and between language regions), the intensity of information-provision on redistribution-relevant topics should not differ across language regions.

To measure the intensity of information provision, we look at the appearance of catchwords that are associated with some of the votes this paper covers: (i) maternity insurance, (ii) unemployment insurance and (iii) single-payer health care. We perform both a pure catchword-count in the above newspapers and a count that is standardized by the redistribution-neutral catchword Tsunami. Our intensity measure is thus the number of

36There is clear voting evidence on this. While the Latin-Swiss overwhelmingly supported joining the European Economic Area in 1992, the German-Swiss were much more reluctant to enter the EEA. The main reason for joining the EEA in the Latin-speaking area was to reinforce economic but also cultural links with its large European neighbours France and Italy. The German-speaking area focused only on economic links. There was no support to entertain tighter links with Germany.
articles containing one of the catchwords divided by the number of articles containing the word “Tsunami” in press articles in the two major language regions.

The results are as follows. The single-payer system occurred 0.49 as many times as Tsunami in German-Swiss newspapers and 0.80 as many times as Tsunami in French-Swiss newspapers. Thus it received much more attention in French-Swiss newspapers. The converse holds for the two other covered topics, unemployment insurance and maternity insurance, which have intensity measures of 0.69 vs. 0.37 and 0.81 vs. 0.44, respectively.

These numbers suggest that the relative intensity in which these issues are discussed in the above print-media do differ across language regions. Notice these numbers do not suggest that redistribution-relevant issues are systematically less intensively debated in the German-speaking part of the country. However, the differences in the intensity of information-provision on these topics between language borders are consistent with the claim of limited integration of the public political debate. In particular, this tentative evidence is consistent with the idea different perceptions of redistribution-relevant topics may be one channel explaining persistent differences in attitudes towards redistribution across language regions.

3.6 Conclusions

In this paper, we investigated whether culture has a role in explaining the demand for government-provided social insurance. Government-provided social insurance programmes are hotly debated in all countries and comprise a large fraction of governments’ expenditures. Yet the way that these programmes are implemented differs widely across countries. In this paper we look at Switzerland, which is divided into two broad cultural groups on the basis of language: the German Swiss, known to focus on individual responsibility; and the Latin Swiss, the historically suppressed minority, who tend to favour a large role of the state and more income redistribution. Voting data from national referenda or voter initiatives provide us with a measure of the demand for social insurance of the two cultural groups.

To isolate the impact of culture, we focus on changes in culture within a narrowly defined geographic area. We exploit the fact that there is a clear language border within Switzerland. Within a distance of 5 kilometres, the fraction of Latin-speaking Swiss residents falls from more than 90 % to less than 5 % (and vice versa for German native speakers). This allows us to adopt a spatial regression discontinuity design to separate the impact of culture from the impact of other potential determinants of the demand for social insurance. Large parts of the language border runs within Swiss states (cantons). This is important since most policies in Switzerland are set at the cantonal (rather than
the federal) level. Hence local contrasts on either side of the border measure differences in the demand for social insurance by language groups that face identical public policies, including those for social insurance.

We provide empirical evidence on the demand for four social insurance programmes that cover the most important risks to health and work-capacity that individuals face over their lifetimes (i) health insurance, (ii) old age insurance, (iii) maternity insurance and (iv) unemployment insurance. We study a wide range of voting results from national referenda or voter initiatives, all of which were related to major changes (introductions and/reforms) of these social insurance programmes. For referenda related to (reforms of) old-age insurance and (the introduction of) maternity insurance, our estimates suggest that the demand for social insurance (as measured by voting results) is up to 10 percentage points higher among the Latin-Swiss population than among the German-Swiss population. We also find consistently higher (lower) support for more generous (restrictive) unemployment and health insurance regulations among the Latin-Swiss than among the German-Swiss population.

To shed light on possible reasons for the increased demand for government-provided social insurance by the Latin-speaking citizens, we investigated three possible channels: social networks, ideology, and media exposure. We find that social networks are unlikely to explain the major part of differences in support for social insurance in Latin-speaking Switzerland. In fact, Latin speakers compared to German speakers have somewhat more ties to family and close friends, but have somewhat fewer ties to colleagues and belong to fewer clubs.

We find evidence that Latin speakers believe less than German speakers that hard work pays off, and they feel they have less freedom and control over their lives. This is consistent with an ideological predisposition that favors redistribution. A reason for such ideological differences may be historical. Latin Swiss have been the oppressed minority for centuries and repeated experience of suppression may have fostered weaker beliefs in a just world. Finally, we have documented the strong segmentation of media markets by language regions. The lack of social communication between language groups via media on important political issues such as the introduction and/or reform of social insurance programs can explain the lack of convergence in beliefs among social groups that live under similar institutional arrangements. Thus, historical factors that shape beliefs can have persistent effects.
Acknowledgments

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3.7 Appendix

This appendix discusses the key identifying assumptions and empirical evidence allowing assessment of the validity of these assumptions.

Let $D_l$ denote language group membership of individuals residing in the Swiss German territory, and $D_r$ is language group membership of individuals residing in the Swiss Latin territory. This notation serves to introduce four types of individuals.

- **Language region compliers** with $D_r = 1$ and $D_l = 0$. These individuals are members of the Swiss Latin group if they live in Swiss Latin territory, and members of the Swiss German group if they live in Swiss German territory.
- **Never-Latin speakers** with $D_r = 0$ and $D_l = 0$. These individuals are members of the Swiss German language group regardless of their residence.
- **Always-Latin speakers** with $D_r = 1$ and $D_l = 1$. These individuals are members of the Swiss Latin language group regardless of their residence.
- **Language region defiers** with $D_r = 0$ and $D_l = 1$. These individuals are members of the Swiss German group if they live in Swiss Latin territory, and members of the Swiss Latin group if they live in Swiss German territory.

Identification requires three key assumptions.

1. $D_r \geq D_l$, i.e. individual language group membership is either fixed or in line with residence. This assumption rules out language region defiers, i.e. individuals who are members of the Swiss German group if they live in the Swiss Latin territory, and members of the Swiss Latin group if they live in Swiss German territory.

2. The limit shares of the remaining types are identical on either side of the language border, i.e. $\text{Prob}^l(D_r = 1, D_l = 0) = \text{Prob}^r(D_r = 1, D_l = 0)$ and $\text{Prob}^l(D_r = 0, D_l = 0) = \text{Prob}^r(D_r = 0, D_l = 0)$ and $\text{Prob}^l(D_r = 1, D_l = 1) = \text{Prob}^r(D_r = 1, D_l = 1)$.

3. The limit mean potential outcomes are balanced for each of these three types, i.e. for compliers $E^l(Y_0|D_r = 1, D_l = 0) = E^r(Y_0|D_r = 1, D_l = 0)$ and $E^l(Y_1|D_r = 1, D_l = 0) = E^r(Y_1|D_r = 1, D_l = 0)$, for never-takers $E^l(Y_0|D_r = 0, D_l = 0) = E^r(Y_0|D_r = 0, D_l = 0)$, for always-takers $E^l(Y_1|D_r = 1, D_l = 1) = E^r(Y_1|D_r = 1, D_l = 1)$.

Are the three identifying assumptions satisfied? Understanding the first assumption necessitates understanding the process of acquiring language group membership. Residents of language border towns are members of the Swiss Latin group if they have Swiss
Latin speaking parents (vertical transmission of language) or if they chose to adopt one of the three Swiss Latin languages later in their life (horizontal transmission of language). Vertical transmission is directly consistent with monotonicity since Swiss Latin parents will be more likely to reside in Swiss Latin territory than vice versa. Horizontal transmission likely reinforces monotonicity since people tend to adopt the majority language later in their life. This assumption can not be tested but it is plausible that it holds.

The second and third assumption boil down to conditional independence of outcome and potential language group membership at the language border. While conditional independence cannot be tested directly, we report the key indirect test (following the suggestions by Lee and Lemieux (2009)) that consists of checking the balance of covariates at the language border.

Table 3.7 discusses local contrasts in culture, composition, and geography. The unit of observation is a municipality. All results are un-weighted. Column (1) reports the mean of a characteristic in the Latin region, column (2) reports the corresponding mean in the Swiss German region, column (3) reports the contrast Swiss Latin vs. Swiss German municipalities, column (4) provides an estimate of the local contrast (using regression 3.1 with each member of the vector $X_j$ as a dependent variable (and without further municipality controls but with canton dummies), and column (5) provides an estimate of the local contrast with cubic spatial trends (allowed to differ on either side of the border).

Panel A in Table 3.7 contrasts language group membership and religious group membership at the border. Row 1 shows that across all municipalities, the share Swiss Latin speakers is 87% in Swiss Latin municipalities, 3% in Swiss German municipalities, the difference amounting to 84 percentage points. At the border, the share Swiss Latin speakers increases by anywhere from 70% (column 5) to 75% (column 4). This means language group membership increases strongly. Rows 2 and 3 indicate that there is a corresponding, but much weaker, change in religious group membership at the language border. Swiss Latin border towns are characterised by between 11 and 14 percentage points fewer Protestants, compensated by a 5 to 12 higher share of Catholics (the remaining and excluded religions making up for the difference). In all our results below we control for religious group membership to disentangle the role of religious group membership from language group membership.

Panel B in Table 3.7 contrasts socio-demographic characteristics of residents at the language border. All information is from the most recent year 2000 census. Results indicate that there are significant but very slight differences in age structure at the language border (rows 1 and 2). There is a slightly lower share of men living in Swiss Latin border towns (row 3). Swiss Latin border municipalities are also characterised by stronger variance in education. Both the low educated and the highly educated groups are larger in
Swiss Latin municipalities than in Swiss German border towns (rows 4-6). Municipalities are inhabited by 4800 (Swiss Latin) to 5800 (Swiss German) residents. Swiss Latin border municipalities are slightly larger (5 to 16 inhabitants more) than Swiss German border towns (row 7). Swiss Latin border municipalities host a higher share of immigrants than Swiss German border municipalities (6 to 9 percentage points more; row 8).

Panel C in Table 3.8 reports differences in geography. The geography controls include information on whether a municipality is located in a larger agglomeration, or whether the municipality is characterised by a large tourism sector. We also measure a municipality’s altitude (in meters above sea level), access to a lake border, and the use structure of its area. While there are some significant differences between border towns (especially for the baseline specification in column 4), none of these differences appears to be robust to including cubic terms in spatial distance. This means that we are not very far from a situation of balanced geographic background of border municipalities.
Table 3.7: How do border towns compare in terms of culture, composition and geography?

<table>
<thead>
<tr>
<th>Distance</th>
<th>(1) Mean Latin</th>
<th>(2) Mean German</th>
<th>(3) Difference All</th>
<th>(4) Difference 50km quadratic</th>
<th>(5) Difference 50km cubic</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Latin speaking</td>
<td>87.25</td>
<td>3.239</td>
<td>84.01***</td>
<td>75.35***</td>
<td>69.99***</td>
</tr>
<tr>
<td></td>
<td>[7.336]</td>
<td>[3.708]</td>
<td>[0.447]</td>
<td>[2.775]</td>
<td>[4.150]</td>
</tr>
</tbody>
</table>

A. RELIGION

% Protestants | 30.27 | 41.38 | -11.10*** | -10.89** | -14.09* |
| | [21.59] | [23.35] | [1.544] | [5.258] | [8.297] |
% Catholics | 49.18 | 41.30 | 7.881*** | 4.583 | 12.55 |
| | [24.93] | [23.77] | [1.712] | [6.420] | [9.802] |

B. SOCIO-DEMOGRAPHIC COMPOSITION

Age: 60 plus | 0.285 | 0.267 | 0.022*** | -0.017* | -0.017 |
| | [0.070] | [0.054] | [0.003] | [0.009] | [0.013] |
Age: 35-59 | 0.469 | 0.478 | -0.009*** | 0.002 | 0.007 |
| | [0.053] | [0.045] | [0.002] | [0.008] | [0.011] |
Male | 0.483 | 0.493 | -0.011*** | -0.010 | -0.025* |
| | [0.029] | [0.022] | [0.001] | [0.007] | [0.013] |
Educ. secondary 1 | 0.488 | 0.532 | -0.044*** | 0.004 | 0.022 |
| | [0.061] | [0.055] | [0.002] | [0.011] | [0.017] |
Educ. secondary 2 | 0.280 | 0.248 | 0.032*** | -0.041** | -0.066** |
| | [0.090] | [0.077] | [0.003] | [0.019] | [0.030] |
Educ. tertiary | 0.155 | 0.144 | 0.011*** | 0.031*** | 0.029* |
| | [0.072] | [0.054] | [0.003] | [0.012] | [0.017] |
Population | 4,796 | 5,781 | -984.1 | 5,460* | 15,785** |
| | [13,229] | [16,713] | [1,005] | [3,283] | [7,902] |
% foreigners | 18.70 | 13.98 | 4.727*** | 8.775** | 5.994 |
| | [10.53] | [8.428] | [0.691] | [3.480] | [5.071] |

continued on next page...
Table 3.8: How do border towns compare in terms of culture, composition and geography? continued

<table>
<thead>
<tr>
<th>Distance</th>
<th>(1) Mean Latin</th>
<th>(2) Mean German</th>
<th>(3) Difference All</th>
<th>(4) Difference 50km quadratic</th>
<th>(5) Difference 50km cubic</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Geography</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agglomeration</td>
<td>0.558</td>
<td>0.521</td>
<td>0.0374</td>
<td>0.432**</td>
<td>0.165</td>
</tr>
<tr>
<td></td>
<td>[0.497]</td>
<td>[0.500]</td>
<td>[0.0347]</td>
<td>[0.214]</td>
<td>[0.299]</td>
</tr>
<tr>
<td>Touristic</td>
<td>0.0498</td>
<td>0.0338</td>
<td>0.0160</td>
<td>-0.0766</td>
<td>0.0513</td>
</tr>
<tr>
<td></td>
<td>[0.218]</td>
<td>[0.181]</td>
<td>[0.0144]</td>
<td>[0.0808]</td>
<td>[0.107]</td>
</tr>
<tr>
<td>Altitude (m)</td>
<td>574.6</td>
<td>530.8</td>
<td>43.81***</td>
<td>-159.1</td>
<td>190.2</td>
</tr>
<tr>
<td></td>
<td>[227.8]</td>
<td>[217.5]</td>
<td>[15.65]</td>
<td>[106.1]</td>
<td>[127.2]</td>
</tr>
<tr>
<td>% area: arboricultural</td>
<td>4.546</td>
<td>2.825</td>
<td>1.721***</td>
<td>2.222</td>
<td>-1.109</td>
</tr>
<tr>
<td></td>
<td>[7.962]</td>
<td>[3.199]</td>
<td>[0.476]</td>
<td>[2.543]</td>
<td>[3.152]</td>
</tr>
<tr>
<td>% area: agriculture</td>
<td>31.16</td>
<td>41.24</td>
<td>-10.09***</td>
<td>-18.03**</td>
<td>-9.035</td>
</tr>
<tr>
<td></td>
<td>[24.10]</td>
<td>[18.03]</td>
<td>[1.558]</td>
<td>[7.141]</td>
<td>[9.762]</td>
</tr>
<tr>
<td>% area: alp</td>
<td>6.264</td>
<td>3.190</td>
<td>3.074***</td>
<td>1.361</td>
<td>5.408</td>
</tr>
<tr>
<td></td>
<td>[10.55]</td>
<td>[8.237]</td>
<td>[0.688]</td>
<td>[4.090]</td>
<td>[4.338]</td>
</tr>
<tr>
<td>% area: forest</td>
<td>30.70</td>
<td>30.28</td>
<td>0.417</td>
<td>-4.659</td>
<td>-4.770</td>
</tr>
<tr>
<td></td>
<td>[20.98]</td>
<td>[12.88]</td>
<td>[1.310]</td>
<td>[6.317]</td>
<td>[7.706]</td>
</tr>
<tr>
<td>% area: unproductive</td>
<td>5.787</td>
<td>4.722</td>
<td>1.065</td>
<td>1.591</td>
<td>-1.055</td>
</tr>
<tr>
<td></td>
<td>[11.71]</td>
<td>[9.883]</td>
<td>[0.778]</td>
<td>[3.740]</td>
<td>[5.218]</td>
</tr>
<tr>
<td>% area: constructed</td>
<td>20.03</td>
<td>16.60</td>
<td>3.433***</td>
<td>15.35***</td>
<td>8.828</td>
</tr>
<tr>
<td></td>
<td>[19.37]</td>
<td>[12.29]</td>
<td>[1.215]</td>
<td>[5.782]</td>
<td>[7.290]</td>
</tr>
<tr>
<td>Lake border</td>
<td>0.256</td>
<td>0.185</td>
<td>0.0712**</td>
<td>-0.0114</td>
<td>-0.138</td>
</tr>
<tr>
<td></td>
<td>[0.437]</td>
<td>[0.388]</td>
<td>[0.0294]</td>
<td>[0.208]</td>
<td>[0.331]</td>
</tr>
<tr>
<td>Municipalities</td>
<td>1026</td>
<td>1543</td>
<td>2569</td>
<td>1177</td>
<td>1177</td>
</tr>
</tbody>
</table>

Notes: Columns (1) and (2) standard deviation in parentheses. Columns (3) - (5) robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Estimate on Latin coefficient in regression of dependent variable on Latin, distance and cantonal fixed effects. German = Swiss German, Latin = Swiss French/Italian. Source: Swiss Household Panel (2000) and Office Federal de la Statistique.
4 Parental Leave and Mothers’ Careers: The Relative Importance of Job Protection and Cash Benefits

Joint with Rafael Lalive, Analía Schlosser, and Josef Zweimüller


4.1 Introduction

Parental leave (PL) regulations are a central element of family policies in most OECD countries. They help new parents in two complementary ways: by guaranteeing the pre-birth job and by offering financial support. A first main goal of PL mandates is to increase women’s employment and earnings in the medium run by encouraging job continuity after birth. Yet, prolonged periods of absence from the workplace might lead to loss of human capital and weaker labor market prospects after returning to work. Hence previous employers, while obliged to re-employ mothers after the baby break, may either remunerate them worse than their colleagues or may dismiss them with a higher probability when job protection has run out. Moreover, longer workplace absences after a birth may lead to lower pay and less stable employment for women that move to new employers.

A second main goal of PL provisions is to mitigate financial hardships associated with the increase in family size and with foregone earnings when the mother needs to stay home with the newborn child. In terms of labor market outcomes, cash benefits are expected to
decrease incentives to return-to-work inducing women to return later after the baby break and worsen medium-run labor market outcomes. However, a longer duration of benefits payments might allow mothers to search for better jobs during the leave improving job stability and earnings. In addition, a longer period shared between mother and child during the first months after a birth might benefit health of the child and of the mother fostering her medium-run labor market performance.\footnote{Australia introduced a PL system as of January 1, 2011. The directive that introduces the system explicitly states that "The objective of the scheme is to provide financial support to primary carers (mostly birth mothers) in order to allow those carers to take time off work to care for the child after the child’s birth, and encourage women to continue to participate in the workforce [...]" (Paid Parental Leave Guide Article 1.2.1.) This shows that PL aims to provide time for care without jeopardizing medium run labor force attachment.}

A PL system that generates time for care without sacrificing labor market attachment of mothers of newborn children is attractive in a setting where mothers value time with their child very strongly right after birth and child care is expensive. Actual PL systems differ strongly across countries. Some countries offer very short leaves without any benefits (like the 1993 Family and Medical Leave Act in the U.S.) whereas other countries offer long leaves associated with government-financed cash benefits (like Germany and France). Despite the widespread prevalence of PL policies and the huge cross-country differences of PL systems, their impact on women’s labor market performance is not well understood. In particular, not much is known about the (isolated and interaction) effects of the two main policy instruments: the maximum duration of job protection and the maximum duration of cash benefits.

The aim of this paper is to shed light on the effects of these two policy parameters. Our aim is twofold. First, we estimate the causal impact of alternative PL systems (in terms of cash benefits and job protection) on return-to-work behavior and labor market outcomes in the medium-run in Austria. Austria provides an attractive experimental environment to study the effects of PL policies. Thanks to the almost universal eligibility of parental leave among working women and the high take-up rates, differences in access or selection problems due to differential take-up are not a concern in our set-up. Moreover, the high eligibility rates combined with the high take-up rates allow us to generate estimates for the causal effects of PL that approach treatment effects for the whole Austrian population. In addition changes to PL rules affect a large variety of women to a large extent given the high eligibility and take-up rates. Finally, the Austrian environment is appealing because PL policy changes were substantial (maximum parental leave durations varied between 1 year and 2.5 years). The various policy regimes in Austria cover a large range of PL durations that are observed in a cross-section of OECD countries.

Austria modified key aspects to its PL system during the 1990s. These successive policy changes allow us to identify the causal effect of alternative PL systems on short- and
medium-run labor market outcomes. To empirically identify the causal effects of alternative PL regimes we exploit variation in PL regulations generated by three policy changes that took place in Austria during the 1990s. The first policy change, implemented on July 1, 1990, extended the maximum duration of both cash benefits and job protection from the child’s first to the child’s second birthday. The second policy change, implemented on July 1, 1996, reduced the maximum duration of cash benefits to the date when the child turns 18 months old, keeping job protection unchanged. The third policy change, implemented on July 1, 2000, increased the maximum duration of cash benefits to the date when the child turns 30 months old, again keeping job protection unchanged. This setting is interesting because we can estimate the effects of (i) a system where cash benefits and job protection last equally long (but their maximum length varies over time); (ii) a system where cash benefits last shorter than job protection (so that part of the job protected leave is unpaid); and (iii) a system where cash benefits last longer than job protection (so that part of the leave is paid but not job protected).

Each of the three policy changes was implemented on July 1 of the respective year. This yields a simple but powerful empirical research design that allows us to compare return-to-work behavior and labor market outcomes of mothers who gave birth in July or August to mothers who gave birth in May or June. A major advantage of this design is that endogenous selection into treatment and comparison groups is quite unlikely. This is because the policy changes could not be anticipated: the children were already conceived when the changes were announced. Moreover, to rule out that our estimates are driven by seasonality we include, as an additional comparison group, mothers who gave birth between May and August of the years preceding the policy changes. Hence our econometric analysis combines a regression discontinuity design with a difference-in-differences approach.

Our empirical analysis relies on a large and informative dataset, the Austrian Social Security Database (ASSD), which covers the universe of Austrian employees and contains information on individuals’ earnings and employment histories and take-up of government transfers. We are able to examine mothers’ employment and earnings starting 2 years before they gave birth and track their post-birth labor market outcomes for a significant number of years.

Our main findings from the empirical analysis can be summarized as follows. Longer PL durations significantly delay return-to-work. Extending PL benefits and job protection by one year (the 1990 reform) increases time at home by 7.8 months. Reducing the duration of benefit payments by 6 months while keeping job protection at 24 months (the 1996 reform) shortens time at home by 3.4 months. Lastly, extending payment duration by 12 months (to 30 months) while guaranteeing job protection for only 24 months (the
2000 reform) extends time at home by 3 months. Nevertheless, despite the significant delays in return-to-work among mothers exposed to the more generous leave regimes, we do not find any detrimental effects on their labor market outcomes in the medium-run.

Yet information on these policy regimes does not allow us to fully disentangle the role of benefits and job protection since Austria always used both. This is why, in a second step, we set up a non-stationary model of job search after birth in the context of a PL system that offers cash and job protection. We consider the decision of a mother who, after interrupting work due to the birth of a child, decides optimally when to return-to-work and whether or not to return to the same employer or to a new employer. Women get job offers from new employers on a continuous basis and have a time-delimited option to go back to the same employer. When a sufficiently attractive job offer from a new employer arrives, women stop the baby break and return to work. Our model features heterogeneity both in wages and in the value that mothers attach to time at home ("home production"). Moreover, the model allows both wage offers and home-production values to change over time. Changing wage offers may account for a possible loss in human capital and/or changes in hours worked. Changing values of home production allow for capturing the idea that staying home with the baby is very important initially but less important later on. In this basic setting, we introduce the two interesting policy parameters: a maximum duration of job protection during which women can return to their pre-birth job at the same wage; and a maximum duration of a fixed amount of cash benefits.

The model builds on Frijters and Van der Klaauw (2006) who structurally estimate a job search model with an outside option. Our structural model goes beyond Frijters and Van der Klaauw (2006) (i) because in our case the outside option (returning to the same employer) is time-delimited (while it is unlimited in their model); and (ii) because the value of home production changes over time.

We use this model to assess to what extent the behavioral framework can predict the impact of the three Austrian PL reforms on mothers’ return-to-work behavior. Conducting out-of-sample predictions on the basis of our structurally estimated parameters, we find that our model predicts return-to-work and return to same employer behavior remarkably well. We also use the estimated parameters to estimate return-to-work behavior under counterfactual policies: a regime with neither job protection nor benefits, a policy with only benefits, and a policy with only job protection. Our simulation results show that a system that combines both policy instruments generates more time for care immediately after birth and more employment in the medium run than systems that use just one or none of the two policy instruments. Thus, cash and protection complement each other in

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2Our data do not allow us to disentangle the two channels as we only observed daily but not hourly wages
ensuring time for care and insuring pre-birth labor market investments.

Most of the previous literature has found that more generous PL provisions tend to delay women’s return-to-work. However, evidence of the relationship between duration of leave and women’s labor market outcomes is mixed. A key empirical challenge has been to find exogenous variation in leave-taking by mothers. Many studies use variation in leave availability across employers or leave-taking by employees. However, most of these studies suffer from several sorts of biases due to unobserved differences between mothers who had access to maternity leave and mothers who do not and between mothers taking longer and shorter leaves. The use of more plausibly exogenous variation in the length of parental leave has been limited.

Studies that focus on the U.S. have examined the impact of the 1993 U.S. Family and Medical Leave Act (FMLA), which guarantees a job protected unpaid maternity leave of 12 weeks to women working for companies with 50 or more employees. These studies find only modest or no effects of mandated protected leave on the length of parental leave and subsequent employment, although they do find some positive impacts on job continuity (see, e.g., Klerman and Leibowitz (1997); Klerman and Leibowitz (1999); Baum (2003); and Waldfogel (1999)). In addition, most of these studies found no significant effects on wages (see, Waldfogel (1999); Hashimoto et al. (2004); and Baum (2003)). Nevertheless, these results are difficult to generalize to other contexts given the relatively short length of job protected leave guaranteed by FMLA and the fact that, in most cases, this policy does not have a significant impact on duration of maternity leave taken by mothers. Moreover, the population affected by FMLA accounts for less than 50 percent of the private sector workers in the US (see Waldfogel (1999)).

PL rules in Canada and Europe are more generous and hence more likely to have an impact on women’s labor supply and career prospects. Baker and Milligan (2005) exploit variation in PL provisions over time and across Canadian provinces and find that both short and long mandates increase job continuity. However, only long leaves appear to increase the amount of time that mothers spend away from work. Ruhm (1998) compares employment rates and wages of men and women using panel data of European countries, and finds that longer leave mandates are associated with higher female employment but lower relative wages. Ejrnaes and Kunze (2006) investigate the role of PL on the family wage gap exploiting exogenous variation in the length of PL generated by policy changes in the German system. They find that longer PL duration leads to detrimental effects on employment and wages for women. In contrast, Schönberg and Ludsteck (2007) study the same German reforms and find only minor effects on employment rates and mixed effects on wages. Lalive and Zweimüller (2009) study the effects of the 1990 and 1996 Austrian reforms and find that extensions of PL increase fertility. They also examine the
impacts on earnings and employment but neither do they analyze the separate effects of benefits and job protection nor do they examine additional labor market outcomes, such as experience, tenure, and unemployment.

This paper goes beyond the existing literature in two main dimensions. First, we examine the relative importance of duration of job protection and cash benefits by studying alternative PL policy mixes exploiting a series of major policy changes in Austria since the early 1990s. Our empirical analysis sheds light on mother’s behavior in the short run, and it also generates evidence on their medium run labor market outcomes through a comprehensive analysis of mother’s outcomes over time since the child’s birth. Second, on the basis of a structurally estimated a non-stationary job search model, we are able to study in detail the impact of cash benefits and job protection both in isolation and in interaction with each other. The model also turns out to be a powerful tool to undertake out-of-sample predictions and to examine the impacts of counterfactual PL regimes.

The remainder of the paper is organized as follows. Section 2 discusses the institutional background and lays out the relevant details of the Austrian PL reforms. In Section 3 we introduce the data and present some descriptive characteristics of our samples. Section 4 discusses identification and presents reduced-form evidence on the impact of policy parameters on return-to-work decisions and medium-run labor market success. Section 5 presents the theoretical framework and a structurally estimated job search model. In Section 6 we use the model to make out-of-sample predictions and counterfactual experiments. Section 7 concludes.

4.2 Institutional background and PL reforms

In this section we briefly describe the institutional background of Austria concerning family policies in general and PL policies in particular. We then discuss the reforms to the Austrian PL systems of 1990, 1996 and 2000. We argue that these reforms provide a quasi-experimental situation allowing us to identify the causal effect of PL duration on labor market outcomes.

A Parental leave policies before July 1990

Austrian family policy rules divide the time immediately before and after the birth of a new child into a period of maternity protection and a period of parental leave. Maternity protection starts 8 weeks before the estimated date of birth and lasts for 16 weeks (24 weeks for premature, multiple, and cesarian-section births). During this protection period mothers get a government transfer that replaces 100 percent of the pre-birth wage (i.e. average labor earnings during the last 3 months prior to benefit take-up). The maternity
The protection rule intends to protect the health of both mother and child by giving mothers the maximum incentive to stay off work around childbirth.

The period of maternity protection is followed by the PL period during which the mother (i) gets a flat government transfer and (ii) enjoys job protection. The government cash benefit amounts to roughly 35-40 percent of female net median income, is independent of household income and not taxed. Cash benefits are conditional on staying at home with the child and are terminated when the mother returns to work before exhausting the maximum PL duration. Job protection means the mother has the right to return to the same job at her previous employer and cannot be fired during the first six weeks after returning from parental leave. Thereafter, the regular advance notice rules apply.

According to the rules that were in place before July 1990, eligibility to PL benefits was tied to employees who had contributed a minimum number of months to the social security system. This work requirement amounted to at least 52 weeks within the two years prior for a first birth; and to 20 weeks within the last year for second and high-order births and for mothers younger than age 25. Self-employed mothers and mothers working in own-family firms and farms were not eligible.

B The parental leave reforms of 1990, 1996 and 2000

While maternity protection rules remained roughly unchanged, the parental leave system underwent major changes since the early 1990s. The first major reform was enacted on July 1, 1990. Before July 1990 the maximum PL duration ended at the day when the child turned one year of age. The 1990 reform extended both the maximum duration of job protection and the maximum duration of cash benefits by one year so that maximum PL duration ended 24 months after birth. The reform also introduced the possibility to share the second year of the parental leave by both parents and/or spend a part-time leave (i.e. reducing work-time by 50 percent and drawing only 50 percent benefits; either both parents during the second year, or one parent during the second and third year). However, while it turned out that mothers reacted strongly to increased leave durations neither take-up of parental leave by fathers nor take up of part-time leave was substantial. The 1990 reform was mainly intended to help young mothers in combining childbearing and working. It was enacted in times when the economy was in a boom and the government did not face any severe budget constraint. Since take-up was unexpectedly high, this reform turned out to be quite costly.

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3 An elevated benefit applies to single mothers and low-income households.

4 The job protection rule of the Austrian PL system generates substantial firing costs. Since the advance notice period is at least 3 months, an employer who does not want to re-employ the mother after her baby-break has to pay her pre-birth wage for at least 4.5 months.
The second major reform was enacted on July 1, 1996. It left the maximum duration of job protection unchanged. While the maximum duration of cash benefits remained unchanged as well, a sharing rule among both parents was introduced so that cash benefits could only be drawn for the maximum duration if each parent took a leave of at least 6 months. In practice, PL take-up by fathers was very low. Hence, the introduction of the sharing rule effectively reduced the maximum benefit duration from the day when the child completed 2 years of age to the day when the child completed 1.5 years of age. The 1996 reform also implemented some minor changes to previous work requirement rules. The work requirement, within the last year prior to the birth, was reduced from 20 to 16 weeks for mothers under age 25; and was increased from 20 to 26 weeks for second and higher-parity births). A major intention behind the 1996 reform was budget cuts. Since the 1990 reform turned out to be quite costly (and since Austria wanted to join the EU and had to obey the EU deficit/debt rules) the government was under severe pressure. The 1996 PL reform was part of a series of changes to welfare programs in an effort of the government to bring down the budget deficit and public debt.5

The third major reform took place when Austria moved from a parental leave system to a child benefit system. The key innovation was that eligibility to cash benefits was no longer conditional on pre-birth labor market history. All mothers (including the self-employed and mothers out of the labor force) became eligible for cash benefits. Like the 1996 reform, the 2000 reform left the maximum duration of job protection unchanged but introduced several major changes to the cash benefit part of the system. It increased the maximum duration of cash benefits until the day before the child completed its third year of age keeping the parental sharing rule. Hence, the maximum duration of cash benefits effectively increased from 18 months to 30 months. Finally, the reform also allowed mothers to draw cash benefits and work – as long as yearly earnings did not exceed 14,600 Euros per year. This policy change was made public on August 7, 2001, and became effective for children born on or after January 1st 2002. In order to ensure equal treatment of parents, parliament also allowed parents who were on parental leave on August 7, 2001 and gave birth after July 1st, 2000 to extend PL payments to 30 months (36 months if shared) provided that their annual income was below 14,600 EUR. While the increase in the earnings threshold for benefits eligibility allowed some post-July mothers to work while receiving benefits after month 18, it is probably of second order importance in analyzing medium-run labor market outcomes.

The three reforms were unlikely to be anticipated at the time of conception for parents who gave birth within a few months around the policy change. For example, the 1990

5It is important to note that none of the other reforms to the welfare system was tied to the child’s date of birth so that they are expected to affect all women equally.
Chapter 4

reform act was first mentioned in November 1989, i.e., 7.5 months before it was implemented. Moreover, this reform only passed the Austrian parliament in April 1990 and in January 1990 it was still unclear whether the reform would be implemented at all (and, if so, when). The 1996 reform followed a similar political history with high uncertainty regarding its details and likelihood of implementation around the last months before it took effect. Hence self-selection into the pre- and post-reform regimes through fertility decisions is highly improbable. Still, parents could self-select into the more generous PL regimes by rescheduling planned cesarian sections or speeding induced labor. We address these issues in the next section where we discuss the empirical strategy.

The situation of the 2000 reform is different, as this reform was implemented retrospectively on January 1, 2002 but the new rules applied for all mothers whose birth took place on July 1, 2000 or later. Therefore, manipulation of conception or delivery dates can be ruled out completely. However, a comparison of mothers who gave birth immediately before and immediately after July 1, 2000 might be affected by other factors. The reason is that mothers who delivered in July/August 2000 may have made their labor supply choices on the basis of pre-July 2000 PL rules (and may have committed themselves towards their employers). A second potential confounder for the 2000 reform is that results might not only be the result of extended PL durations but can also be generated by the introduction of generous earnings limits, that allowed mothers under the new regime to draw benefits while working. Both possible confounders induce mothers to work more under the post-July 2000 rules. While we cannot do much about this, we show in Section B that the group returning to work due to these two factors appears to be rather small. In any case, we note that results obtained from contrasts based on the 2000 reform are most likely to be downward biased (i.e., they provide a lower bound for the PL treatment effect).

C Other fertility related family policies

Besides PL benefits, fertility-related family policies in Austria consist of a broad set of measures that we only briefly discuss here. A further transfer to which parents are eligible are child allowances (Familienbeihilfe). There is universal eligibility to these benefits (meaning that all parents with sufficiently long residence in Austria are eligible) and parents are eligible as long as kids are still in the education system. Benefit levels depend on the age of the child. The tax system has deductions for children (Kinderabsetzbeträge), that increase with the number of children. Furthermore, before 1997, parents were eligible to a birth benefit (Geburtenbeihilfe) of 1,090 Euros, paid out to mothers in several steps upon medical inspections between the child’s birth and its fourth birthday. The supply of child care facilities for small children was rather low in the 1990s and early 2000s.
According to the OECD (Employment Outlook 2001) the proportion of children under age 3 enrolled in child-care arrangements was only about 4% in 1998 which is very low by international standards.\footnote{for Denmark, Norway and Sweden 64\%, 40\%, and 48\%, respectively. Germany, and southern European countries have similarly low levels of child care facilities for kids under age 3. These figures include both public and private child care provision such as group care in child-care centers, residential care, childminders based in their own home, care provided by person who are not a family-member; see OECD Employment Outlook 2001.} In contrast, informal care arrangements or extended family care arrangements are very important for dual earner families in Austria with with children under the age of 3.

While the most significant changes in fertility-related family policies during the 1990s concerned changes in PL legislation, several other minor changes were made with respect to other family policies. In 1997 the birth benefit was abolished. In 1998 there was a major effort by the central government to improve the supply of childcare facilities in public kindergartens (Kindergartenmilliarde). While this was a major effort of the government, it was targeted towards the 3 to 6 years old children rather than children below the age of 3 so that this policy did not directly interfere with changes in PL rules. Moreover, it is important to note that eligibility to none of the additional family policies changed discontinuously on July 1st (the date of PL regime changes). Therefore, they are not expected to confound our estimates for the effects of the alternative PL regimes.\footnote{We also examined how mother’s return to work behavior is affected by other policies to assess whether the PL reforms might have a different effect according to additional policies faced by mothers. For this purpose, we examined whether the abolition of the birth benefit mentioned above affected mother’s time on leave (see Brunner and Kuhn (2011) for more details on this reform). Our results show no significant difference in return-to-work profiles for mothers who gave birth before and after the abolition of the birth benefit. This shows that mother’s time on leave was not affected by the birth benefit.}

\section{4.3 Data}

We use data from the Austrian social security register (ASSD). The ASSD consists of administrative individual register data collecting information relevant for old-age social security benefits. As these benefits depend on individuals’ earnings and employment histories, the data set reports individuals’ complete employment histories since 1972 for the universe of Austrian private sector workers. Furthermore, not only employment histories, but also time with childbearing and rearing ("Kinderersatzzeiten") are relevant for old-age social security benefits. This is why the ASSD also reports high-quality information on the number of births by female employees with previous social security contributions.

The ASSD has several advantages which will be of particular importance for the empirical strategy developed below. First, the data set covers the universe of the private sector employees (about 80\% of the total workforce) in Austria, implying that we can...
rely on large samples, even when very specific groups are considered. Second, the data reports, on a daily basis, the occurrence of a birth and take-up (and durations) of maternity protection and parental leave since the year 1972. This allows us to determine precisely both the PL eligibility status as well as the maximum duration of PL of mothers. Third, as all employment and earnings over an individual’s life cycle are reported in the data, we can look in a very detailed way at the joint distribution of labor supply behavior and earnings of mothers over extended time periods.

To examine the impacts of the PL reforms on return to work behavior and labor market outcomes, we select mothers who gave birth two months before and two months after each policy change. We select all women who are potentially eligible for PL entitlements using the same criteria for all years. Since we are interested in post-birth labor market outcomes of women after a PL we apply a stricter criteria than the PL eligibility required by law, and restrict the sample to women employed in the year prior to giving birth. For each reform we define a treatment and a comparison group (births in May and June vs. births in July and August of the respective year when PL rules changed). We further stratify the sample by parity (number of times a woman has given birth) and perform a separate analysis for women giving birth for the first time and for women giving birth at higher parities. 2005 is the last year available to us with earning records. We therefore limit the analysis on medium-run labor market performance to the fifth year after the child’s birth to provide a common time period to analyze and compare the effects of the three reforms. Because the ASSD covers the universe of all individuals who, at some previous date, paid social security contributions, we end up with a sufficiently large data set: 10,815 mothers who gave birth at parity one (i.e. the first birth in a woman’s life) between May-August 1990; 10,514 mothers who gave birth at parity one between May-August 1996; and 9,103 mothers who gave birth at parity one between May-August 2000. The sample sizes for mothers giving birth at higher parities are 4,449 mothers in 1990; 3,856 mothers in 1996; and 4,351 mothers in 2000. We also add cohorts who gave birth during the same months in the year preceding each reform. This raises our final sample size for parity one to 21,507, 21,146, and 18,345 mothers in 1990, 1996, and 2000, respectively. Our final samples for parity higher than one include 8,575, 7,754, and, 8,541 mothers.

4.4 Reduced form evidence

This section first discusses how we identify reduced form effects of the three policy changes. The section then estimates the effects of the reforms on return to work and medium-run labor market outcomes.
A Econometric method

Using the samples described above, we investigate how strongly duration of PL changes as a function of date of birth. Panels (a)-(c) of Figure 4.1 report average durations of benefit receipt within the first two years after child’s birth for mothers giving birth between May 1 and August 30 in 1990 and in 1996 and for the first 30 months after child’s birth for mothers giving birth between May 1 and August 30 in 2000. The figures show very clearly that benefit take-up is highly responsive to changes in PL regulations.\footnote{While our data set does not report the PL eligibility status directly, we observe actual PL take-up. Note that PL take-up is itself an endogenous variable. However, as most mothers use up the eligibility period, this indicator is informative on the treatment intensity.}

For example, mothers who gave birth before July 1990 received PL benefits on average for 10 months. In contrast, the corresponding number for mothers who gave birth after June 1990 is, on average, about 20 months. Importantly for our empirical strategy, there is no trend in average PL durations within the period before the PL change and within the period after the PL change for none of the three years of policy changes.

Panels (d)-(f) of Figure 4.1 plot benefit take-up for the cohort of mothers giving birth between May 1st and August 30th of the year preceding each of the reforms. As clearly seen, there is no discontinuity in the length of parental leave around July 1st in years when there was no policy change. This suggests that exposure to the new PL regimes is the source of the discontinuous break between June 30th and July 1st and not any type of seasonality in childbearing or labor market behavior of mothers.

We use a regression discontinuity design to assess the average causal effects of duration of PL benefits and job protection on mothers’ return-to-work decisions and subsequent labor market performance. Let $T$ denote the date of birth of a child, $Y$ the labor market outcome of interest (e.g., time to return-to-work, employment status, earnings, etc.) and $D$ a treatment indicator, with $D = 1$ for mothers giving birth under the more generous policy regime in the relevant year (post-July 1st in 1990 and 2000 and pre-July 1st in 1996) and $D = 0$ otherwise. Assignment to treatment is a discontinuous function of the date of birth $T$. That is, $D = I(T >= t_0)$ for the 1990 and 2000 sample and $D = I(T < t_0)$ for the 1996 sample, where $t_0$ is the day of policy change (July 1st of the relevant year).

Evidence presented above shows that assignment to treatment changed discontinuously between June 30 and July 1. Thus $E(D|T = t_0 + \epsilon) = 1$ and $E(D|T = t_0 - \epsilon) = 0$, i.e. assignment to treatment is ”sharp” in the terminology of Hahn et al. (2001).\footnote{Note that in the analysis, we treat time as discrete with the smallest time unit equal to 1 day. This guarantees, that the density of births at $t_0$ is non-zero.}

An intuitively appealing contrast that infers the causal effect of extended PL benefits is the following:
Figure 4.1: Months receiving parental leave benefits

Notes: This figure reports average number of months receiving PL benefits within 24 months (panels a,b,d,c, and f) or within 30 months (panel c) by child’s date of birth for the sample of mothers giving birth at parity one. Panels a,b, and c report benefit take-up for pre- and post-July mothers who gave birth in the reform years: 1990, 1996, and 2000. Panels d,e, and f report benefit take-up for pre- and post-July mothers who gave birth one year before each of the reforms.

\[ E(Y|t_0 \leq T \leq t_0 + \epsilon) - E(Y|t_0 - \epsilon \leq T < t_0) \]

It can be shown that for \( \epsilon > 0 \) sufficiently small, this contrast identifies the average effect of offering extended PL benefits on the outcome of interest Hahn et al. (2001).

In the empirical analysis we report results based on \( \epsilon = 61 \) calendar days. More precisely, we compare between mothers who gave birth in July/August and mothers who gave birth in May/June. To control for any differences in demographic characteristics or labor market performance between mothers who give birth before or after July 1st we also add a pre-reform cohort of mothers who gave birth during the May-August interval. The causal effect of the extension of PL benefits is therefore attained by the difference between the outcomes of mothers who gave birth in July/August versus May/June in the year of the policy change (i.e., 1990, 1996, and 2000) relative to the difference in outcomes of mothers who gave birth in July/August versus May/June in the year preceding the policy change (i.e., 1989, 1995, and 1999). Namely, we identify the causal effects of PL extensions using a \textit{difference-in-differences regression discontinuity (DID-RD)} approach. We estimate the following model for each reform separately allowing all coefficients to
where $y_{imt}$ is the outcome of mother $i$ who gave birth in month $m$ of year $t$; $D_m = 1$ for the months of the more generous leave regime; reform$_t$ equals one for the reform years (1990, 1996, or 2000); $x_i$ is a vector of mother’s characteristics that includes mother’s age at birth and the following indicators of mothers’ labor market performance measured 12 months before child’s birth: tenure, experience, months of unemployment, cumulative income (overall income earned up to 12 months before the child’s birth), and daily wage, and indicators for industry, region, and white collar. We also adjust for changes in macroeconomic conditions at time of re-entry into the labor market by controlling for the local unemployment rate in the region of pre-birth employment. However, since time of re-entry is a choice variable, we focus on differences in conditions at time of re-entry that are driven by exogenous factors. Namely, we control for the unemployment rate at the end of benefit and job protection periods. These covariates are included in vector $z_{imt}$.

Doing so ensures that effects on labor market outcomes are not driven by changes in the business cycle at time of re-entry. In practice, our results (not reported here but available upon request) are not sensitive to the adjustment of macroeconomic conditions at the time of re-entry suggesting that treatment and comparison mothers faced a similar economic environment.

There are several reasons why a comparison between mothers giving birth in May/June and mothers giving birth in July/August is informative on the causal effect of duration of PL benefits. First, observed characteristics of the two groups are very similar. This is what we would expect if assignment to treatment is almost as good as randomly assigned. Table 4.1 shows that the two groups are quite comparable in terms of their pre-birth background characteristics and pre-birth labor market outcomes for the three policy years with the exception of a few characteristics such as age in 1990, for instance. Differences get smaller, however, once we condition on age and include the pre-reform cohort to control for any seasonal differences between mothers who give birth between May/June and July/August. Importantly, pre-birth job characteristics, like average earnings per day and white collar employment are almost identical between the two groups. As shown in

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10 For May to June 1990 mothers and for May to June 1989 mothers, we control for the unemployment rate in pre-birth region of employment 12 months after the child’s date of birth. For July to August 1990, May to August 1995, and May to June 1996 mothers we control for the local unemployment rate 24 months post-birth. For July to August 1996, May to August 1999, and May to June 2000 mothers we control for the local unemployment rate 18 and 24 months after giving birth, and for July to August 2000 mothers we condition on the local labor market situation 24 and 30 months after giving birth. Estimates are not sensitive to including these controls.

11 There are some differences in pre-birth labor market outcomes in 1990. However, these differences
Appendix Table 4.7, we also find no differences between pre- and post-July mothers who gave birth at parities greater than one. Nevertheless, while pre- and post-July mothers are similar, they are not completely identical. Our analysis below will therefore control for these individual pre-birth characteristics.

A second feature that justifies our approach is that not only treated and comparison mothers are similar in terms of pre-birth characteristics, but they also face virtually identical macroeconomic and labor market conditions before and after giving birth. On average, July to August mothers gave birth to the child that defines their treatment status only two months after May to June mothers. Moreover, by including a cohort of mothers who gave birth in the pre-reform year, we further assure that any seasonal differences in labor market conditions or labor supply costs (e.g., holidays, vacations, seasonal work, childcare enrollment, etc.) correlated with month of birth will be differenced out.\(^\text{12}\)

A third reason that justifies the validity of our identification strategy refers to the way the treatment status is assigned to individuals. As we focus on births that took place during a relatively short period (from May until August), this comes close to a process of random assignment to treatment. As described in the previous section, anticipation of the reforms was minimal. However, even if anticipations of the reforms by the time of conception is very unlikely, some parents could still self-select into the more generous PL regimes by rescheduling planned cesarean sections or induced labor. We assess the possibility of such manipulation as follows.\(^\text{13}\) First, we analyze the frequency of births by date during the months of May-August for the years of the policy changes and do not find any evidence of a spike in births on the days surrounding July 1st. Moreover, we find that the distribution of births by date of birth in years of policy changes highly resembles the distribution observed in years where there was no policy change. Second, because manipulation of birth dates is more likely to exist around the reform date, we estimated alternative models where we allowed for differential trends in time to policy change. Specifically, we estimated an additional model from a sample that includes mothers who are small relative to the outcome means and are of inconsistent signs across outcomes. For example, post-July mothers in 1990 seem to have pre-birth daily earnings that are about 1 percent higher relative to pre-July mothers. On the other hand, they are less likely to work in white collar occupations. In 1996 and 2000, we see no differences in pre-wage earnings.

\(^\text{12}\)We find some seasonality as we see that in all years (including those with no reform), pre-July mothers return-to-work a bit earlier. As a result, estimates based on samples that include only mothers who give birth in the reform year (not reported in the paper but available upon request) show that the impacts of the 1990 and 2000 reforms on time until return-to-work are slightly larger while the impacts of the 1996 reform are slightly smaller than the results obtained when using also the pre-reform year. Despite that, estimates for outcomes measured in year 5 after birth, are not sensitive to the exclusion of mothers from the pre-reform year. We therefore prefer to correct for seasonality in our analysis by contrasting differences between pre- and post-July mothers who gave birth in the reform year with differences between equivalent cohorts who gave birth in the pre-reform year.

\(^\text{13}\)Results from these additional tests are not reported here but are available upon request.
Table 4.1: Descriptive statistics of pre-birth characteristics and labor market performance: Treated and comparison groups

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre</th>
<th>Post</th>
<th>Raw</th>
<th>DID</th>
<th>Pre</th>
<th>Post</th>
<th>Raw</th>
<th>DID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>2000</td>
<td>1996</td>
<td>1999</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes: The table reports descriptive statistics of pre-birth characteristics and labor market performance of mothers who gave birth for the first time in May-June and July-August in each of the reform years. Columns (1) and (7) report differences in means between July-August and May-June mothers. Columns (2) and (8) report DID estimates (July-August minus May-June of the reform year minus equivalent cohorts in the pre-reform year) that control also for age. Robust standard errors are reported in parentheses.

- **Significant at 5%**
- **Significant at 1%**

- Average daily earnings
- White collar
- Tenure
- Experience
- Unemployment
- Education
- Age

Observations: 11,425 3,672 10,815 21,507 5,104 5,410 10,514 21,146 4,477 4,626 9,103 18,345
gave birth 3 months around the cutoff date while controlling for differential time trends for births before and after the cutoff date and for births in the reform and the pre-reform year. We also estimated models based on an alternative sample that includes all mothers who gave birth during the year of the policy change and allows for differential quadratic time trends. Estimates from these models are less precise than those reported here but they are highly similar to our main results. In addition, we also re-estimated all models while excluding mothers who gave birth during one or two weeks around the cutoff date. Estimates from these samples are virtually identical to those obtained when using the full sample and reported below. As an additional test for the robustness of our results, we also defined some placebo treatments by assigning a treatment status to cohorts of mothers who gave birth in non-reform years. Estimates from these regressions showed no significant impacts for these placebo treatments. Finally, we estimated alternative models restricting the sample to different cutoffs around the policy change: 1.5 months, 3 months. All estimates are highly similar to our main results.

B Return-to-work decisions

In this section we analyze the effects of changes in duration of the benefit and job protection periods on return-to-work decisions. We begin by reporting results based on mothers of first-born children (parity one). The advantage of focusing on parity one is that PL eligibility is almost universal as most of these mothers were working prior to giving birth. In addition, their pre-birth labor market history is more informative about their skills and earnings capacity. On the other hand, it is important to note that since about half of these women give birth to at least one more child during the period of interest, our results are also influenced by fertility interactions. To assess the relative role of fertility interactions, we also examine the impacts of the PL reforms among women who give birth at higher parities. Results for mothers at higher parities are qualitatively similar to those reported here and are reported in Appendix Tables 4.8 and 4.9.

Figure 4.2 plots Kaplan-Meier failure functions for time until return-to-work for mothers giving birth before July 1990. The vertical line at month 12 denotes the end of the benefit and job protection period. Roughly 10 percent of the pre-reform mothers return-to-work within 3 months after birth. Thereafter, the proportion returning to work increases gradually reaching a level of 18 percent before the child’s first birthday. This implies that more than 80 percent of mothers of newborn children fully exhaust their PL entitlements. At the child’s first birthday, the proportion of mothers back at work increases sharply to 43 percent. Thereafter, the proportion back at work increases steadily reaching a level of almost 80 percent after 5 years.

How does the extension of job protection and cash benefits affect mothers’ return-to-
Notes: This figure shows the proportion who have returned to work at or before $t$ months after child’s birth. The sample includes mothers giving birth at parity one between May 1st and June 30th 1990. Women giving birth before July 1990 are eligible for 12 months of job protection and 12 months of benefit payments.

work behavior? The 1990 reform, which guaranteed job protection for 24 months, had the potential of increasing the fraction of mothers returning to work within the job protected period. On the other hand, since benefits were also extended by the same amount of time, return-to-work dates are likely to be delayed. Figure 4.3 plots return-to-work profiles for mothers giving birth before and after the policy change. The solid line plots profiles of pre-reform mothers and the dotted line plots profiles of post-reform mothers. The vertical lines denote the end of the job protection and benefit period of the two regimes.

As expected, return-to-work behavior of mothers who stay on leave for less than 12 months is almost unchanged by the PL reform. These mothers are strongly attached to the labor market and their return-to-work is not bounded by the PL policies. A sizable gap in the behavior of pre- and post-July mothers appears at month 12 when the two groups of women face a different policy environment. While at the term of 12 months a significant share of pre-reform mothers return-to-work, a sizeable share of the post-reform women delay return-to-work and exhaust the two years of extended leave benefits. At the child’s second birthday, when benefits and job protection end, a large fraction of post-reform mothers return-to-work. Interestingly, the 12-month extension of job protection and benefits leaves the proportion of mothers who return-to-work within the job protected period almost unaffected. Overall, the extension of PL entitlements shifts the return-to-work profile by about 12 months while preserving its original shape. Interestingly, the

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14Return-to-work profiles are adjusted for seasonality. We do this by subtracting from the profile of the comparison group in the reform year the difference in return to work profiles between the comparison and the treated group in the pre-reform year.
return-to-work profile is also shifted for mothers who return-to-work after PL benefits and job protection are exhausted. This shift implies that the share of women who return-to-work is still lower (by about 7 percentage points) for the post-reform group than for the pre-reform group even 60 months after birth. Nevertheless, as we will discuss in Section C, this delay in return-to-work does not translate into a reduction in earnings in the medium run.

Figure 4.3: Return-to-work with extended benefits 1990

Notes: This figure shows the proportion who have returned to work at or before $t$ months after child’s birth. The sample includes mothers giving birth at parity one between May 1st and August 30th 1990. Women giving birth before July 1990 are eligible for 12 months of job protection and benefit payments. Women giving birth after July 1990 are eligible for 24 months of job protection and benefit payments. Return-to-work profiles are corrected for seasonality. See footnote 14 for details.

We have seen in Figure 4.3 that mothers delay their return to work considerably as a response to an extension of PL benefits and the job protected period. A natural question is whether delays in return to work were induced by the extension of the job protected period, by the extension of benefits, or both. The 1996 and 2000 reforms allow us to shed light on this question as both policy changes affected the duration of PL benefits but not the duration of job protection. Figure 4.4 (panels a and b) plots Kaplan-Meier failure functions for return-to-work profiles of mothers giving birth before and after the 1996 and 2000 reforms. The 1996 reform reduced the duration of benefits to 18 months. This reform allows discussing the role of paid job protected leave as opposed to unpaid job protected leave. The 2000 reform extended PL benefits by 12 months thus adding 6 months of paid protected leave and 6 months of paid unprotected leave.

Panel a of Figure 4.4 shows that the shorter benefits after the 1996 reform induced a large fraction of mothers to return-to-work earlier. The return-to-work profile is shifted backwards. However, compared to the expansion of the 1990 reform, the shift is less pronounced. This seems reasonable as the 1996 reform shortened the duration of benefit
payments but left the duration of the job protected period unchanged. About 26 percent of the post-reform mothers return-to-work exactly at month 18 when benefits are exhausted. Still, there is a sizable group of mothers (12 percent) who stay at home beyond the exhaustion of benefits but return within the period of unpaid job protected leave. About 4 percent of the mothers return-to-work exactly at the end of the job protected period. Return-to-work responses to the 1996 reform suggest that while benefits and job protection have independent effects in delaying women’s return-to-work, the impact of benefit duration appears to be more significant. This conjecture is further supported by changes in return-to-work profiles induced by the 2000 reform.

Panel b of Figure 4.4 plots return-to-work profiles for pre- and post- reform mothers in 2000. Post-July mothers received 12 extra months of benefits but only 6 of them were job protected. Clearly, the post-reform cohort displays a return-to-work profile that is consistent with the changes imposed by the PL reform. In this case, the return-to-work profile is shifted forward responding to the extension of the benefit period. Again, we see in this case that mothers respond to both duration of benefits and job protection. We also observe a relatively small proportion of post-July mothers (about 8 percent) who return-to-work exactly at month 18, the first month when the income ceiling was raised enabling mothers to work without losing the right to withdraw benefits. The share returning to work at month 24, when job protection ends, is similar to the corresponding share in the pre-reform group. There is a further sizable group returning exactly when benefits are exhausted at month 30 suggesting that duration of benefits even when not coupled with job protection induced some mothers to delay their return-to-work.

The above figures clearly show that mothers are highly responsive to both PL benefits and job protection, with benefits appearing to play a more important role. A larger proportion of mothers return-to-work when the benefit period ends before the job protection period than when job protection ends before benefits. We will see in section 4.5 that empirical return-to-work profiles match the predictions of our search model: reservation wages appear to be shifted upward to a larger degree by extension of benefits than extension of job protection.\footnote{We have explored whether responses to the parental leave reforms differ by marital status and couple’s education (see Section F in the Appendix). The overall pattern of results is relatively similar to that reported for the overall group for most sub-groups.}

Table 4.2 summarizes the effects of PL extensions on return-to-work behavior by reporting \textit{DID-RD} estimates of the three reforms on total months at home (censored at 60 months), the likelihood of returning to work within 60 months, the likelihood of returning to pre-birth employer, and daily wages at first post-birth job. Each column reports estimates for a specific policy reform (i.e., 1990, 1996, and 2000). Outcome means for the cohort exposed to the less generous leave are reported in \textit{italics}. In all cases, estimates
Notes: This figure shows the proportion who have returned to work at or before $t$ months after child’s birth. The sample includes mothers giving birth at parity one between May 1st and August 30th of 1996 (panel a) and 2000 (panel b). Women giving birth before July 1996 are eligible for 24 months of job protected and paid leave. Women giving birth after July 1996 and before July 2000 are eligible for 24 months of job protected leave but only 18 months of paid leave. Women giving birth after July 2000 are eligible for 24 months of job protected leave and 30 months of paid leave. Return-to-work profiles are corrected for seasonality. See footnote 14 for details.

contrast the cohort with the more generous leave (post-July in 1990 and 2000 and pre-July in 1996) to the cohort with the more restricted leave (pre-July in 1990 and 2000 and post-July in 1996). The table reports estimates for mothers giving birth at parity one; estimates for mothers giving birth at higher parities are reported in Appendix Table 4.8; estimates that control for differential time trends are reported in Appendix Table 4.10.

As seen in the first row of the table, the 1990 extension of PL entitlements by 12 months extends time at home by 7.8 months. In 1996, 6 months of extra benefits extend time at home by 3.4 months. The 2000 reform, which added 6 months of protected benefits and 6 months of unprotected benefits, extended time at home by 3 months.¹⁶

Extending the period over which a person can remain on parental leave can have two conceptually different impacts. The first is a behavioral impact in the sense that parents change their behavior by re-optimizing under the new constraints. This is conceptually different from the case where the policy has no impact on the recipient’s desired outcome but the policy change allows the parent to come closer to their desired outcome.¹⁷ This

¹⁶The 2000 reform had a smaller impact than the 1996 reform for two reasons. First, the 2000 reform came into force only in summer 2001, i.e. after mothers had decided on the duration of parental leave. While all mothers were free to update and change their leave duration, we suspect that a substantial fraction of mothers were unwilling to change the initial arrangement. Second, the 2000 reform introduced a possibility to work while being on parental leave. As long as the total income from employment was below a threshold, women were allowed to get PL benefits and the additional earnings from work. Both factors explain why the extension of benefit duration of the 2000 reform had a smaller impact on time at home.

¹⁷We are grateful to a referee who pointed out this important distinction.
Table 4.2: The causal effects of the reforms on return-to-work

<table>
<thead>
<tr>
<th>Year of reform</th>
<th>1990</th>
<th>1996</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time at home (months)</td>
<td>7.846**</td>
<td>3.409**</td>
<td>2.967**</td>
</tr>
<tr>
<td>(censored at 60 months)</td>
<td>(0.539)</td>
<td>(0.511)</td>
<td>(0.547)</td>
</tr>
<tr>
<td>Time until return to same employer</td>
<td>7.263**</td>
<td>3.517**</td>
<td>3.688**</td>
</tr>
<tr>
<td>(for those back to pre-birth job)</td>
<td>(0.435)</td>
<td>(0.442)</td>
<td>(0.457)</td>
</tr>
<tr>
<td>Time until return to new employer</td>
<td>6.873**</td>
<td>2.804**</td>
<td>2.794**</td>
</tr>
<tr>
<td>(for those back to new job)</td>
<td>(0.645)</td>
<td>(0.641)</td>
<td>(0.722)</td>
</tr>
<tr>
<td>Back within 60 months</td>
<td>-0.071**</td>
<td>-0.023*</td>
<td>-0.009</td>
</tr>
<tr>
<td>(censored at 60 months)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>0.012</td>
</tr>
<tr>
<td>Back to pre-birth employer</td>
<td>-0.038**</td>
<td>-0.003</td>
<td>-0.021</td>
</tr>
<tr>
<td>(censored at 60 months)</td>
<td>(0.013)</td>
<td>(0.014)</td>
<td>0.014</td>
</tr>
<tr>
<td>Daily wage at 1st job after birth (in euro)</td>
<td>1.566**</td>
<td>-0.771</td>
<td>0.546</td>
</tr>
<tr>
<td>(pre-birth employer)</td>
<td>(0.540)</td>
<td>(0.567)</td>
<td>(0.956)</td>
</tr>
<tr>
<td>Daily wage at 1st job after birth</td>
<td>1.008</td>
<td>-0.914</td>
<td>1.236</td>
</tr>
<tr>
<td>(new employer)</td>
<td>(0.764)</td>
<td>(0.722)</td>
<td>(0.947)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>21,507</td>
<td>21,146</td>
<td>18,345</td>
</tr>
</tbody>
</table>

Notes: This table reports DID-RD estimates for the impacts of the 1990, 1996, and 2000 reforms on mothers’ return-to-work. The samples include all mothers who gave birth at parity one between May 1st and August 30th. Regressions compare differences in outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre- and post-July mothers who gave birth in the year preceding the reform. Estimates come from regressions that control for age at birth, and the following indicators for mothers’ labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefit periods. Robust standard errors are reported in parentheses. Means of the comparison group (i.e., the group with access to the less generous regime) are reported in italics. * significant at 5%, ** significant at 1%.
mechanical effect operates on mothers who want to return to the same employer. They are constrained to do so within the period protected by parental leave regulations. Extensions of parental leave duration loosen that constraint and will mechanically increase time at home. We report effects on time until return-to-work for women who return to the pre-birth jobs versus women who take a new job to assess the role of this mechanical effect. Returns to the same employer will largely reflect the mechanical response whereas returns to a new employer will not. Results show that PL extensions delay return-to-work to both pre-birth jobs as well as to new jobs, with a slightly larger impact on delays in returns to pre-birth jobs (see rows two and three of Table 4.2). The mechanical effect is indeed important. Yet the results on returns to new employers suggest that unconstrained mothers are also adapting job search behavior to the reforms.

We also see that the chances that mothers ever return to work within 5 years are somewhat lower in more generous regimes. We discuss this issue in more detail in the next section. An additional interesting finding is that extension of benefits and job protection generated only small changes to the relative chances that mothers return to their pre-birth employer or switch to new jobs after giving birth. We will turn back to this last finding in section 4.6 where we outline a search model to examine the role of benefits and job protection and the interactions between these two policy instruments.

The last three rows of the table report the effects of the three reforms on daily wage at the first job after birth, daily wage at first job for those returning to their pre-birth employer, and daily wage at first job for mothers who started new jobs after birth. These estimates have to be taken with caution as they are affected by selection into employment and selection into pre-birth versus new jobs. In addition, we do not observe hours of work. Nevertheless, it is interesting to see that post-birth wages observed upon re-entry into the labor market are not affected by isolated extensions of benefits or job protection.

C Medium-run effects

The purpose of this section is to discuss the medium run effects of PL extensions on mothers’ labor market performance after childbirth. We begin by presenting in Figure 4.5 DID-RD estimates along with confidence intervals for the effects of PL extensions on cumulative outcomes such as labor market experience, months unemployed, and total earnings. The figure shows the dynamic effects of the reforms on these cumulative out-

18Note that it is not possible to draw causal conclusions from this stratification as the reforms are likely to affect the composition of the groups who return to pre-birth versus new jobs. We are nonetheless confident that this decomposition speaks about the likely magnitude of the mechanical effect since the number of women returning to the same employer does not change much (see below). Moreover, mothers who return to the same employer may also re-optimize given the new constraints. Their choices also reflect a behavioral effect on top of the mechanical effect.
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comes starting from the child’s birth until year 5 after birth. The vertical lines denote the end of the job protection or the benefit period in the pre- and post-July regime. We also report in Table 4.3 the impacts on cumulative outcomes observed in year 5.

The first row of Figure 4.5 plots the impacts of PL extensions on labor market experience accumulated since the child’s birth. It is clear that mothers in the more generous leave regimes accumulate fewer months of employment relative to mothers who gave birth in the less generous regime. However, it is interesting to see that the loss of labor market experience occurs entirely during the period where the two groups face different PL regulations. Namely, we do not observe further losses in labor market experience after both groups have exhausted their PL leaves. Overall, as reported in the first row of Table 4.3, we see that the 1990 reform reduces work experience by 3.2 months, the 1996 reform by 2 months, and the 2000 reform reduces experience by 1.4 months. Interestingly, while extension of leave regulations significantly prolonged the time until return-to-work, the loss in work experience was much smaller.

Why doesn’t extended parental leave crowd out work experience one-for-one? We find that mothers under the less generous PL regimes return-to-work earlier but have less stable employment immediately after birth. Moreover, mothers under the less generous regimes compensate it with higher participation rates in other social insurance programs, such as unemployment insurance, which also provides income replacement while not employed.19 Indeed, as seen in the second row of Figure 4.5 and summarized in Table 4.3, mothers who face the less generous PL regimes claim about 3 additional months of unemployment benefits in 1990 and almost one additional month in 1996 and 2000 relative to their counterparts in the more generous regimes. The gap in months unemployed between the two groups of mothers is generated during the first 36 months after the child’s birth.

The last row of Figure 4.5 plots annual differences in cumulative earnings from work since the child’s birth. The extended time on leave generated an earnings loss of 3,100 and 2,700€ for mothers who gave birth in the more generous regimes of 1990 and 1996. Interestingly, the gap in cumulative earnings from work between mothers in the less and the more generous leave regimes is entirely generated in the first 36 months after the child’s birth.20 From then on, we do not observe any further increases in the gap in cumulative earnings. This finding is important as it suggests that while mothers in the more generous leave regimes suffer from a permanent income loss, this loss is totally generated by forgone

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19 Unemployment insurance is conditional on work experience prior to claiming benefits and treats PL take-up as work experience. Most of the mothers in our sample are eligible for unemployment benefit receipt.

20 Note that income losses in the 2000 reform are smaller as mothers could work while still receiving benefits starting from month 18 after the child’s birth. Still we do see losses for mothers giving birth at parities higher than one as reported in Appendix Table 4.9.
Figure 4.5: Reduced form effects on cumulative outcomes

1. Months employed
   (a) 1990
   (b) 1996
   (c) 2000

2. Months unemployed
   (d) 1990
   (e) 1996
   (f) 2000

3. Cumulative earnings
   (g) 1990
   (h) 1996
   (i) 2000

Notes: This figure plots DID-RD estimates (along with confidence intervals) for the impacts of the reforms on cumulative outcomes by months since the child’s birth. The samples include all mothers who gave birth at parity one between May 1 and August 30. Estimates come from regressions that compare outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre- and post- July mothers in the pre-reform year. Regressions control for age at birth, and the following indicators for mothers’ labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefit periods.
Table 4.3: The causal effects of the reforms on cumulative outcomes in year 5 after child’s birth

<table>
<thead>
<tr>
<th>Year of reform</th>
<th>1990</th>
<th>1996</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Months in employment</td>
<td>-3.224**</td>
<td>-1.989**</td>
<td>-1.4**</td>
</tr>
<tr>
<td></td>
<td>(0.441)</td>
<td>(0.441)</td>
<td>(0.474)</td>
</tr>
<tr>
<td></td>
<td>17.528</td>
<td>20.432</td>
<td>19.167</td>
</tr>
<tr>
<td>Months unemployed</td>
<td>-2.882**</td>
<td>-0.802**</td>
<td>-0.819**</td>
</tr>
<tr>
<td></td>
<td>0.278</td>
<td>0.164</td>
<td>0.163</td>
</tr>
<tr>
<td></td>
<td>7.329</td>
<td>3.398</td>
<td>3.029</td>
</tr>
<tr>
<td>Cumulative earned income</td>
<td>-3,138**</td>
<td>-2,706**</td>
<td>-643.1</td>
</tr>
<tr>
<td></td>
<td>(707)</td>
<td>(790)</td>
<td>(920.4)</td>
</tr>
<tr>
<td></td>
<td>25,468</td>
<td>32,731</td>
<td>31,472</td>
</tr>
<tr>
<td>Number of observations</td>
<td>21,507</td>
<td>21,146</td>
<td>18,345</td>
</tr>
</tbody>
</table>

Notes: This table reports DID-RD estimates for the impacts of the 1990, 1996, and 2000 reforms on mother’s cumulative outcomes observed in year 5 after the child’s birth. The samples include all mothers who gave birth at parity one between May 1st and August 30th. Regressions compare differences in outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre- and post-July mothers who gave birth in the year preceding the reform. Estimates come from regressions that control for age at birth, and the following indicators for mothers’ labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefit periods. Robust standard errors are reported in parentheses. Means of the comparison group (i.e., the group with access to the less generous regime) are reported in italics. * significant at 5%, ** significant at 1%.
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earnings during the leave period with no further consequences on earnings capacity once they return-to-work.

We next turn to examine labor market outcomes observed in the fifth year after the child’s birth. A key potential challenge in examining post-birth labor market performance is differential selection into employment among pre- and post-July mothers. We examine this issue in Appendix A where we compare employment rates of pre- and post-July mothers by year since the child’s birth. We conduct a selection analysis that consists of measuring whether employed mothers have different pre-birth characteristics in the treated and control group. The selection analysis leads us to conclude that not only employment rates of pre- and post-July mothers are similar once both groups have exhausted their PL provisions, but we can also assure that pre- and post-July mothers who are employed come from the same part of the earnings potential distribution starting from year three after child’s birth.\(^{21}\) These two findings are important as they imply that a comparison of labor market outcomes between pre- and post-July mothers in the medium and in the long run is unlikely to be confounded by differences in characteristics across the groups.

Table 4.4 reports DID-RD estimates of the impacts of the three reforms on labor market outcomes observed in the fifth year after the child’s birth. As seen already in Figure 4.11, we find no differences in employment rates between pre- and post-July mothers. We therefore conclude that despite the fact that more generous leave regimes delay mothers’ return-to-work, they do not have any detrimental impact on employment in the medium-run.\(^{22}\)

We also do not find any significant differences in the likelihood that mothers are still working for their pre-birth employer five years after birth. If anything, mothers

\(^{21}\)While we do not find any differences in observed characteristics, there could of course be differences in unobserved characteristics. We cannot entirely rule out this possibility, even though the lack of any differences in observables hints that the presence of large differences in unobservables is very unlikely, especially if these unobservables are correlated with the observed covariates.

\(^{22}\)As noted above, we find a lower return-to-work rate within the first 5 years after birth among mothers who gave birth in the more generous leave regime (treated group) relative to mothers who faced the less generous leave regime (comparison group). At the same time, we see that employment rates of both treated and comparison groups are similar at the end of year 5. These two findings can be reconciled by the fact that a larger share of mothers in the comparison group returned to work earlier but remained employed for only a few months end eventually left their jobs. That is, returning to work is not a permanent state for some mothers and indeed we see that some of them return-to-work only temporarily and leave again their jobs because they give birth again or because they find it difficult to combine childrearing and work. In fact, we find that employment rates and number of months worked during the calendar year are similar in treated and comparison groups starting from year 3 after birth even though more mothers in the comparison group returned to work. When we focus on mothers who return-to-work within the first 2 years after birth we see that comparison mothers who return-to-work within 24 months are more likely to work in the first two years after the child’s birth (because they return earlier) but they are also less likely to remain employed afterwards. This finding also explains why delays in return-to-work are not one-to-one translated into differences in labor market experience observed in year 5 after birth.
in the more generous PL regimes are more likely to continue working for their pre-birth employer five years after the child’s birth (for mothers giving birth at parity one). Another interesting finding is that despite the negative impacts of the extended leave regimes on work experience, tenure with current employer is not significantly affected by the reforms.\(^{23}\) Furthermore, we find that labor market attachment as reflected by the number of months worked in year 5 after the child’s birth is unaffected by the longer leaves taken by mothers in the more generous regimes. More interestingly, we see that despite the delay in return-to-work and loss in work experience, there are no detrimental impacts on daily earnings (neither when we examine all mothers nor when we condition on employment) or on annual earnings.\(^{24}\) This last finding suggests that longer leaves do not generate significant losses in human capital. This will be relevant in the behavioral model presented below.

\(^{23}\)Note that while we observe a marginally negative impact on tenure for the 2000 reform for mothers who give birth at parity one, we do not observe a negative impact for mothers who give birth at higher parities (see Appendix Table 4.9 for estimates for mothers at parities greater than one).

\(^{24}\)We also examine labor market outcomes in the longer run, by looking at the effects of the 1990 and 1996 reforms in year 10 and 9 after birth respectively. Results, not reported here but available upon request, show no significant differences in employment rates or earnings between pre- and post-July mothers.
Table 4.4: The causal effects of the reforms on labor market outcomes in year 5 after child’s birth

<table>
<thead>
<tr>
<th>Year of reform</th>
<th>1990 (1)</th>
<th>1996 (2)</th>
<th>2000 (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>0.002</td>
<td>0.000</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.014)</td>
<td>(0.015)</td>
</tr>
<tr>
<td></td>
<td>0.404</td>
<td>0.513</td>
<td>0.486</td>
</tr>
<tr>
<td>Working for pre-birth firm</td>
<td>0.061**</td>
<td>0.025</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.019)</td>
<td>(0.020)</td>
</tr>
<tr>
<td></td>
<td>0.374</td>
<td>0.388</td>
<td>0.400</td>
</tr>
<tr>
<td>Tenure with current employer</td>
<td>0.677</td>
<td>0.008</td>
<td>-3.475</td>
</tr>
<tr>
<td></td>
<td>(1.754)</td>
<td>(1.587)</td>
<td>(1.836)</td>
</tr>
<tr>
<td></td>
<td>48.683</td>
<td>50.367</td>
<td>53.156</td>
</tr>
<tr>
<td>Months worked</td>
<td>-0.007</td>
<td>0.057</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>(0.147)</td>
<td>(0.157)</td>
<td>(0.160)</td>
</tr>
<tr>
<td></td>
<td>5.033</td>
<td>6.281</td>
<td>6.064</td>
</tr>
<tr>
<td>Earnings per day worked</td>
<td>1.246</td>
<td>1.141</td>
<td>-0.837</td>
</tr>
<tr>
<td></td>
<td>(0.757)</td>
<td>(0.742)</td>
<td>(0.825)</td>
</tr>
<tr>
<td></td>
<td>41.309</td>
<td>43.624</td>
<td>44.962</td>
</tr>
<tr>
<td>Earnings per calendar day</td>
<td>0.847</td>
<td>0.579</td>
<td>-0.303</td>
</tr>
<tr>
<td></td>
<td>(0.639)</td>
<td>(0.736)</td>
<td>(0.754)</td>
</tr>
<tr>
<td></td>
<td>16.691</td>
<td>22.377</td>
<td>21.693</td>
</tr>
<tr>
<td>Annual income</td>
<td>239.7</td>
<td>336.9</td>
<td>-299.9</td>
</tr>
<tr>
<td></td>
<td>(225.2)</td>
<td>(282.6)</td>
<td>(270.0)</td>
</tr>
<tr>
<td></td>
<td>6,977</td>
<td>9,644</td>
<td>9,008</td>
</tr>
<tr>
<td>Number of observations</td>
<td>21,507</td>
<td>21,146</td>
<td>18,345</td>
</tr>
</tbody>
</table>

Notes: This table reports DID-RD estimates for the impacts of the 1990, 1996, and 2000 reforms on mother’s labor market outcomes measured in year 5 after the child’s birth. The samples include all mothers who gave birth at parity one between May 1st and August 30th. Regressions compare differences in outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre- and post-July mothers who gave birth in the year preceding the reform. Estimates come from regressions that control for age at birth, and the following indicators for mothers’ labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefit periods. Robust standard errors are reported in parentheses. Means of the comparison group (i.e., the group with access to the less generous regime) are reported in italics. * significant at 5%; ** significant at 1%.
4.5 Behavioral framework

This section lays out a structural search model to reproduce the empirical return to work patterns of mothers under different parental leave (PL) systems. The objective is to understand the differential roles played by job protection and cash benefits, two time delimited policy instruments, in shaping mothers’ return to work behavior.

A A non-stationary search framework

Mothers give birth in $t = 0$ and quit their job earning them wage $w_o$, the pre-birth or protected wage, to go on PL. While on PL, mothers engage in parenting or home production and gain value $c_t$ per period. We assume unobserved heterogeneity in $c_t$. For some time period $\tau_o$ mothers can return to their pre-birth job at wage $w_o$ and they receive cash benefits of $b$ for $\tau_b$ periods, where $b$ is a fixed cash amount equal for all mothers. Thus, high wage mothers have a lower replacement rate than low wage mothers. While on leave, mothers engage in job search receiving a job offer with probability $\lambda$ per period, drawn from the wage offer distribution $F_t(w)$. A period in the model is a week. There are no search costs, jobs last forever, there is no on the job search, and job offers are assumed to be on a take-it-or-leave-it basis for mothers (no recall).

The value of PL at the end of period $t$, $V_t$, i.e. after rejecting any pending job offers, is given by the following Bellman equation:

$$V_t = \max \left\{ \frac{w_o}{1 - \beta} c_t + b_t + \beta V_{t+1} + \beta \lambda \int_0^\infty \max \left[ 0, \frac{w}{1 - \beta} - V_{t+1} \right] dF_{t+1}(w) \right\} \text{ for } t \leq \tau_o,$$

(4.1)

where $\beta$ is the (weekly) discount factor and $b_t = b$ if $t \leq \tau_b$ and zero otherwise. If $t > \tau_o$, the outer max-operator drops out. Under the assumption of perfect foresight regarding the development of all the fundamental parameters, agents are able to solve this Bellman equation recursively.

Mothers decide in $t$ whether to accept job offer $w$ by comparing the value of accepting $w$ to the value of continuing search and the value of returning to the pre-birth job in $t$. Mothers can thus search for new jobs and still return to the pre-birth job in the same

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25 The first eight weeks after birth are not governed by parental leave but maternity insurance, which is mandated time off work by law. Therefore, mothers are only able to consider going back to work at the end of week 8. In the model, we capture this fact by starting to compute reservation wages at $t = 8$. We neglect this detail in the following exposition.

26 A note on the timing. The mother enters period $t$ with a job offer $w$ with probability $\lambda$. She then compares the present discounted value of the new job (if available) to the value of returning to the pre-birth job and the value of staying on PL. If she decides to stay on PL she collects $c_t + b_t$ in $t$ and enters period $t + 1$ facing the same decision problem. If she decides to accept offer $w$ or return to pre-birth job, she starts collecting $w$ or $w_o$ in $t$ but does not receive $c_t$ or $b_t$ in $t$. 

period if no suitable job offer has arrived. Since jobs last forever, equation 4.1 directly leads to the reservation wage \( w_t^* \) as follows.

\[
    w_t^* = \max \left\{ w_o, (1 - \beta) (c_t + b_t) + \beta w_{t+1}^* + \beta \lambda \int_{w_{t+1}^*}^{\infty} (x - w_{t+1}^*) dF_{t+1}(x) \right\} \quad t \leq \tau_o,
\]

where the max-operator is dropped for \( t > \tau_o \). A mother will accept any new wage offer that pays more than the reservation wage. The optimal time of returning to the pre-birth job is the point in time where \( V_t \leq w_o/(1 - \beta) \), or equivalently, \( w_t^* \leq w_o \), i.e. the continuation value of search at the end of period \( t \) is less than returning to the pre-birth job. This is proven for the general case in continuous time in Frijters and Van der Klaauw (2006).\(^{27}\) They further show that there is a unique optimal time of return if the reservation wage is monotonically decreasing over time.\(^ {28}\)

We build on the job search model with nonparticipation laid out in Frijters and Van der Klaauw (2006).\(^ {29}\) Their model extends Van den Berg (1990)’s nonstationary job search model by allowing nonparticipation, an absorbing state. We extend their framework by time-delimiting the outside option, which in our case is return to the pre-birth job. As discussed above, the PL rules in Austria provide mothers with the right to return to their pre-birth jobs for some time after birth. While on parental leave, mothers can engage in search for a new job while retaining their right to return to the pre-birth job at any time, and are entitled to cash benefit payments. Since both the duration of job protection and the duration of cash benefit payments are time delimited, our model features interaction effects between the two policy instruments. This is a novel feature of our model which, to the best of our knowledge, has not been previously studied.

Since returning to the pre-birth job is an absorbing state, the reservation wage is not defined for periods after the optimal time of return. Further, the reservation wage is nonstationary due to the time dependency of cash benefits, job protection, home production

\(^{27}\)In their model, the outside option is not time delimited. However, their Theorem 1 and Condition 5 in the appendix can be extended to include this case. One then needs to differentiate between points in time before the outside option has expired and after.

\(^{28}\)We compute the optimal time of return to pre-birth job by checking when the reservation wage is less or equal to the pre-birth wage. We thus rely on their result regarding uniqueness of time of return and therefore need all reservation wages to be declining. This restricts the parameter space of the model since increasing reservation wages are not ruled out per se. We run the estimation unconstrained and check whether parameters at the solution lead to declining reservation wages for all mothers in the sample.

\(^{29}\)A search model is well suited to study the two policy instruments since job protection has a clear value and interpretation only in a market with frictions. In a neoclassical labor market, mothers would not benefit from job protection since they would offer their labor productivity competitively at any point in time if the value of working would exceed the value of not working. Also note that we see a constant flow of mothers accepting new job offers in the data, pointing to the fact that some fraction of mothers are actively searching for jobs (i.e. those for which search costs are lower than expected gains from search).
and the wage offer distribution. Equation 4.2 shows clearly that the reservation wage and thus also the optimal time of returning to the pre-birth job depend on $\tau_b$ and $\tau_o$, the duration of cash benefits and job protection, respectively. The roles played by these two policy instruments is explored next.

B Cash benefits, job protection, and the reservation wage

Return-to-work behavior of mothers is affected differentially by the two policy instruments, duration of cash benefit transfers and duration of job protection. Figure 4.6 compares the impact of alternative PL-systems on the evolution of the reservation wage\textsuperscript{30}: no PL provisions (panel (a)); 1 year of benefits but no job protection (panel (b)); 1 year of job protection but no benefits (panel (c)); 1 year of both cash benefits and job protection (panel (d)); 1 year of benefits and 2 years of job protection (panel (e)); and 2 years of benefits and 1 year of job protection (panel (f)).

A comparison of panels (a) and (b) shows that, starting from a situation without any PL provisions, the introduction of cash benefits increases the reservation wage significantly during the covered period. Extending PL benefit duration, increasing $\tau_b$, leads mothers to delay return-to-work because their reservation wage is higher.

To see the impact of introducing job protection, compare panels (a) and (c). The reservation wage of the mother in the system with job protection is initially above the pre-birth wage. The reservation wage then decreases since the value of home production decreases with time since birth. Eventually, the mother returns to work for sure in month 7 since her reservation wage hits the floor of 282.9 Euros per week — the wage she gets in her pre-birth job. This speeds up expected time of return-to-work since returning is now certain within 7 months given job protection. In contrast, this mother may still be on PL after 5 years in the baseline situation. Note that the reservation wage during PL in the system with job protection is higher, delaying return to a new employer. The combination of these two effects implies that job protection may either speed up or delay return-to-work.

We have explored more generally how duration of job protection affects average return-to-work. We find that extending job protection initially speeds up return to work, as mothers who want to stay home for some time before returning to work start to take advantage of their right to return to the pre-birth job (which is why they discard their right if protection is too short). After some point (about two years), extending protection

\textsuperscript{30}To illustrate the impact of these PL regimes on reservation wages, we pick one example mother (a particular vector of characteristics, pre-birth wage and sample draw from home production distribution, see notes to Figure 4.6), and use the parameter estimates of the next subsection to calculate behavioral responses.
Chapter 4

Figure 4.6: Reservation wages under different policy regimes

(a) No job protection/cash benefits

(b) Only cash benefits

(c) Only job protection

(d) BD=JPD

(e) BD<JPD

(f) BD>JPD

Notes: BD = benefit duration, JPD = job protection duration. The figures plot reservation wages for a selected Austrian mother with a pre-birth wage of 282.9 euro/week (median) and an initial value of home production of 328.7 euro/week (about 1st quintile of home-productivity distribution). Parameter values for the model are taken from Table 4.5. In this example, the other covariates are fixed at: blue-collar worker, age 27, region west of Austria, working in manufacturing. This gives a job offer probability of 0.029, mean home production of 904.1 (the example reflects one selected draw from this distribution) and median wage offer of 283.0 euro/week.
further starts to delay average return-to-work, due to higher reservation wages and the
delay in return of the mothers who exhaust their protected period. Note further that
cash benefits affect return-to-work behavior of all mothers. In contrast, job protection
does not affect low-wage or high-home production mothers, since their reservation wage
is above the pre-birth wage.

Panels (d)-(f) of Figure 4.6 show how the two policy instruments interact. The same
mother that returned to her pre-birth job in month 7 with only job protection (panel (c))
is induced to exhaust the protected period in the system that also provides benefits (panel
(d)).31 Extending job protection beyond the end of benefit payments (panel (e)) does not
affect her optimal time of returning after 12 months. This is because the expected value of
search is low (cf. panel (a)) and the opportunity costs due to the relatively high pre-birth
wage are substantial. In panel (f), where benefits end after job protection, the mother
does not make use of the right to return to her pre-birth employer. This means that the
expected present discounted value of PL exceeds the value of the pre-birth job at all times
during job protection.

C Structural estimation

In the following, we discuss how we estimate the above model structurally. We assume
that wage offers are generated by

\[ \log w_{i,t} = \mu_{i,t} + \epsilon_{w,i}, \]

where \( \epsilon_w \sim N(0, \sigma^2_w) \) and \( i \) denotes individual \( i \). The mean of this distribution is given
by \( \mu_{i,t} = x_i' \theta_w - \gamma t \) where \( x_i \) is a vector of covariates, and \( \gamma \) measures the evolution of
the mean of the (log) wage offer distribution with time since birth \( t \). Accepted post-birth
wages are subject to measurement error, since structural estimation of job search models
is highly sensitive to outliers otherwise (see Wolpin (1987) for an excellent treatment).
Assume that observed wage \( \hat{w}_i \) is generated by

\[ \log \hat{w}_i = \log \tilde{w}_i + u_i, \quad u \sim N(0, \sigma^2_u) \]

where \( \tilde{w}_i \) is the true accepted wage, and \( u \) is measurement error. In our data, the mea-
surement error also captures the discrepancy between the hourly wage and daily earnings,
e.g. changes in hours of work.

31Note that this is not a knife-edge case. A positive mass of mothers, i.e. a range of values of the home
production distribution, return at benefit/job protection end. This range is calculated in the appendix,
where we derive the likelihood contribution of mothers in the sample who return to pre-birth jobs.
We assume that the value of home production varies across individuals and over time and takes the following form.

\[ c_{i,t} = x_i'\theta_c - \alpha t + \epsilon_{c,i}, \]

where \( \epsilon_c \sim N(0, \sigma_c^2) \). The stochastic component \( \epsilon_c \) introduces unobserved heterogeneity into the model. The offer arrival probability is assumed to be constant over time but is allowed to vary across individuals in line with their observed characteristics \( x_i \).

\[ \lambda_i = \frac{\exp [x_i'\theta_\lambda]}{1 + \exp [x_i'\theta_\lambda]} \]

The logistic specification ensures that \( \lambda_i \) has support \((0, 1)\). Cash benefit payments in the model take the following representation.

\[ b_t = \begin{cases} 
    b \cdot k & \text{if } t \leq \tau_b \\
    0 & \text{else},
\end{cases} \]

where \( b = 101 \) euro per week—the actual flat cash benefit mothers received in the 1996-2000 period. The reduced form results of Section 4.4 showed that the end of PL benefits induces many mothers to return to work.

We introduce the parameter \( k \) to appropriately account for the utility value of PL benefits.\(^{32}\) This parameter captures the fact that one euro of benefits may be worth more—in utility terms—than one euro of wages, for instance, because the marginal utility of consumption is higher when the mother is not working than when she is working. This may arise if there are complementarities in consumption and leisure and individuals do not save (as often assumed in the job search framework). As an example, think about the stress associated with combining child care and work (driving time to nearest child care facility, time constraints due to opening hours, sickness of the child, etc.). In such a situation, mothers place a higher value on 400 euro of monthly PL benefits than on a 400 euro wage associated with stressful working.

There are three possible outcomes in our data. First, mothers can still be on leave at the end of our observation period \( T = 260 \) (5 years). Second, mothers can be observed to return to their pre-birth employer at \( t_i \leq \tau_o \). Third, mothers can start working at a new job at \( t_i \) for observed wage \( \hat{w} \). The likelihood contributions for these three cases are derived in the appendix. We use simulated maximum likelihood to integrate out unobserved heterogeneity. The model is computationally demanding, since we have to

\(^{32}\)In an earlier version of the paper we used the most basic search model with \( k = 1 \) to explain return-to-work behavior of mothers. While the importance of benefits was a bit underestimated, the model was still able to replicate all the reforms qualitatively. Results are not critically dependent on this parameter, but the fit markedly improves.
solve the whole reservation wage paths many times for every observation. To simplify computation of these paths we assume that all parameters of the model are stationary after $T$.

We now turn to discussing identification. The home production component and discount rate of equation 4.2 are not separately identified with unobserved heterogeneity without observing reservation wages (see Flinn and Heckman (1982) and Frijters and Van der Klaauw (2006)). Therefore, we fix the subjective discount rate $\beta$ to 0.999, a value that implies an annual discount rate of 0.95. We also check the sensitivity of our results to different values of $\beta$. To get identification of the wage offer distribution and job offer arrival rate, we follow the common approach in the literature and assume a log normal distribution with a time dependent mean and constant variance for wage offers and a time invariant job offer arrival rate.\footnote{Frijters and Van der Klaauw (2006) allow for nonparametric time dependency in the job offer arrival rate, which is possible with their data since they observe reservation wages. However, they do not find duration dependence in the arrival rate to be significantly different from zero.} Accepted wages identify the distribution and duration dependence of the wage offer distribution while the durations to new jobs identify the job offer arrival rate. The durations until return to pre-birth job identify the home production distribution and duration dependency under the assumption that the distribution is normal. This results from the fact that the reservation wage at the time of return has to be equal to the pre-birth wage, as discussed above. The benefit multiplier is identified separately from the home production components as the duration of benefits in the PL system we use to estimate the model was one and a half years while the duration of job protection was two years. Mothers who return before and after the end of benefits payments therefore provide separate identification of these parameters.

D Results

We estimate the parameters of the non-stationary job search model outlined above structurally from our Austrian data set. From the data we know the exact time of birth, the pre- and post-birth daily earnings, the duration of PL (measured as time to first job after birth) and whether mothers return to their pre-birth jobs. After dropping mothers with missing values in some of the covariates, trimming the top and bottom 1\% of the wage distribution and dropping mothers returning to pre-birth jobs after the end of job protection (about 12\% of the sample)\footnote{In the model, mothers cannot return to pre-birth jobs after job protection has expired. Thus, these mothers have a likelihood contribution of zero (or negative infinity in logs). Their behavior therefore cannot be explained within the model.}, we end up with 99,400 mothers who gave birth between July 1996 and June 2000. These mothers are entitled to 1.5 years of cash benefits.
and 2 years of job protection. We estimate the model on a random subsample of 19,685 (about 20%) mothers to reduce the computational burden of the estimation.\footnote{Running the Fortran OpenMPI program (BHHH optimization algorithm) took about 2 days occupying 128 cores on the University of Zurich’s Schrödinger supercomputer. We ran the optimization program with different starting values and converged to the same optimum.}

Table 4.5 shows the estimation results of the structural model.\footnote{The log likelihood function is locally concave. Starting from different initial values did not change the results. Reservation wages have to be decreasing to get a unique optimal time of return to pre-birth job. We therefore check whether the estimated parameters lead to this outcome, which is the case. Unconstrained estimation of this model allows us to rely on the usual asymptotics when computing the standard errors.} Home production is estimated to have a high mean, a strong dispersion and is decreasing over time.\footnote{We re-scale home production (\(/100\)) to have estimates with similar magnitudes for numerical reasons. Thus $\sigma_c$ and all parameter estimates determining $\mu_c$ have to be multiplied by 100.} Mothers’ time with the child is more important the younger the child is. The high dispersion reflects significant unobserved heterogeneity in home production (and partners’ earnings, which are not in our data).\footnote{Frank and Van der Klaauw (2006) allow for unobserved heterogeneity in wage offers and the offer arrival rate. Since we do not observe reservation wages, this is not possible here, and we would argue that in the case of mothers’ return to work after birth, unobserved heterogeneity is mainly important in the outside option.} The value of home production is increasing in the pre-birth wage. This finding is consistent with Guryan et al. (2008), who show that highly educated mothers spend more time with their children and Gould and Simhon (2011), who show that highly educated parents are more effective in enhancing children’s human capital. Conditional on the wage, home production is lower for white-collar workers, which may be due to career continuity being more important for this group of women. We show age profiles of predicted home production, offer probability and wage offers for the base category in appendix Figure 4.12.

The weekly probability of receiving a job offer decreases with age quite dramatically from about 6 percent for young Austrian blue collar mothers (age 20) to less than 2 percent at age 40 (see appendix Figure 4.12 for a full age profile). Blue collar women are more likely to receive wage offers than white collar women and immigrant women are also more likely to be offered a job than Austrian citizens. Also, job offers arrive somewhat more frequently in Vienna and Southeast Austria.

The log-normal wage offer distribution is centered quite closely around the pre-birth wage with a dispersion of $\hat{\sigma}_w = 0.028$. The dispersion of the measurement error distribution is larger, with $\hat{\sigma}_u = 0.849$. The fact that measurement error has a strong variance reflects primarily changes in hours worked (which we cannot observe in our data), changes in working arrangements due to the presence of a child, and also genuine measurement error. The fact that the dispersion in wage offers is small is because the wage offer distribution varies with the pre-birth wage. This is a unique feature of our data.
Table 4.5: Estimation results of the structural model

<table>
<thead>
<tr>
<th></th>
<th>$\alpha$</th>
<th>$\sigma_u$</th>
<th>$\sigma_\epsilon$</th>
<th>$\gamma$</th>
<th>$k$</th>
<th>$\sigma_w$</th>
<th>$\sigma_{\text{home prod. dist. std.dev.}}$</th>
<th>$\sigma_{\text{wage offer dist. std.dev.}}$</th>
<th>$\mu_{w}$</th>
<th>$\mu_{\text{home prod.}}$</th>
<th>$\mu_{\text{offer prob.}}$</th>
<th>$\mu_{\text{wage offers}}$</th>
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<td><strong>constant</strong></td>
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<td>-1.98386</td>
<td>(0.26705)</td>
<td>5.47055</td>
<td></td>
<td>0.02725</td>
<td>(0.00224)</td>
<td>(0.00224)</td>
<td>1.00299</td>
<td>0.99959</td>
<td>0.99842</td>
<td>0.99842</td>
</tr>
<tr>
<td><strong>age (/10)</strong></td>
<td>3.34193</td>
<td>-1.18975</td>
<td>(0.39781)</td>
<td>140.002</td>
<td></td>
<td>0.07922</td>
<td>(0.00325)</td>
<td>(0.00325)</td>
<td>0.99781</td>
<td>1.00649</td>
<td>0.99669</td>
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<tr>
<td><strong>age$^2$</strong></td>
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<td>0.10274</td>
<td></td>
<td>-0.00009</td>
<td></td>
<td>0.09302</td>
<td>(0.00281)</td>
<td>(0.00281)</td>
<td>0.99842</td>
<td>0.99842</td>
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<td><strong>foreign</strong></td>
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<td>0.15873</td>
<td>(0.12226)</td>
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<td></td>
<td>0.09327</td>
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<tr>
<td><strong>white collar</strong></td>
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<td>-0.22461</td>
<td>(0.15813)</td>
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<td></td>
<td>0.07142</td>
<td>(0.00230)</td>
<td>(0.00230)</td>
<td>0.99842</td>
<td>0.99842</td>
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<tr>
<td><strong>pre-birth wage (log)</strong></td>
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<td>0.16837</td>
<td>(0.08670)</td>
<td>0.96839</td>
<td></td>
<td>0.05544</td>
<td>(0.00288)</td>
<td>(0.00288)</td>
<td>0.99842</td>
<td>0.99842</td>
<td>0.99842</td>
<td>0.99842</td>
</tr>
</tbody>
</table>

**Base region: West Austria**
- Southeast Austria: -1.57540, 0.27890, -0.1501
- Northeast Austria: -1.12400, -0.00099, -0.00854
- Vienna: -2.22379, 0.27915, -0.00996
- Region missing: -0.75902, -0.78634, 0.04304

**Base industry: Manufacturing**
- Wholesale and retail trade: 0.22218, 0.09747, 0.00293
- Accommodation and food service: -0.80145, 0.27473, 0.00894
- Information, communication, financial and insurance services: -0.61659, -0.42380, 0.00639
- Administrative and support service, public administration: -4.45660, -0.17414, -0.00241
- Human health, social work and education: -1.80942, 0.02757, -0.00263
- Professional, scientific and technical activities: -0.32077, -0.31085, 0.01747
- Other industry / missing: -0.72994, 0.17677, -0.00105

Number of observations: 19,685
Log-likelihood: -122,009

Notes: Standard errors in parentheses. Subjective discount rate ($\beta$) fixed to 0.998 (about 10% per year). Home production is divided by 100 for numerical stability. Region is determined by location of the plant where workers are employed. Industry categories are OENACE08 one digit groups as classified by Statistics Austria. About half a percent of observations have missing region while about 11 percent are in “other industry / missing” category.
search models are often estimated without knowledge of the wage at the previous job. The wage offer dispersion then confounds match quality with unobserved productivity.

The mean of the estimated wage offers is slightly increasing over time, but the effect is quantitatively small. This is surprising as one might expect leave-taking is associated with loss of human capital. Notice, however, that our specification – that allows for a shift in the mean of the wage offer distribution over time – is a reduced form for at least three potentially important mechanisms: (i) depreciation of human capital, (ii) employers using information on the time since birth as a signal of effort/career commitment, or (iii) changes in desired hours of work. Depreciation of human capital and career commitment both imply that wage offers should decrease with time since birth. The third mechanism captures the idea that mothers may be willing to work more hours when returning later. Since our empirical specification captures the daily (rather than the hourly) wage, the empirically estimated wage offer distribution cannot capture the hours-component separately. In sum, the estimated specification captures the above three mechanisms in a reduced form. Our estimates indicate that the mean of the wage offer does not change strongly over time. This suggests that, while time since birth may negatively affect wage offers through human capital depreciation and signalling, increases in desired hours have an offsetting effect. Note that this result is consistent with our reduced form results that find no evidence for human capital depreciation among the group of mothers exposed to longer leave regimes.

The parameter $k$ of 4.6 reflects the fact that cash benefits are important in enabling mothers to care for their young children. One interpretation is that the utility value of 1 $ of benefits is 4.6 times higher than the utility value of 1 $ of labor income. Notice, however, that we cannot separately identify the subjective discount factor, so we ultimately do not know whether mothers on average have lower home production and $k$ parameter but a higher subjective discount rate.

Figure 4.7 compares the predicted return-to-work profile of the model to the empirically observed return-to-work profile. The model is able to match the aggregate return to work behavior quite well. The most important features are replicated, mainly some share returning instantly and discrete jumps at the policy endpoints. Also, the proportion of mothers going to new jobs is well captured. The model predicts convex return to new jobs after the end of PL (2 years) which follows from decreasing home production values leading to lower reservation wages. The data, however, show a concave return to work pattern after 2 years, hinting at nonlinearities in the depreciation of home production or decreasing home production but stable partner’s earnings, which may be more dominant.

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39 We estimated the same model with a fixed weekly discount factor of 0.999 and 0.997 (about 5 and 15 percent annual discount rate, respectively) and got similar results in most parameters except for the home production and benefit multiplier components.
Note: Figures correspond to regime 3 (1996–2000) in Austria, where mothers were entitled to 18 months of benefits and 24 months of job protection. The predicted return to work profile is simulated with the parameters of Table 4.5 using a random sample of 1,000 mothers.

in later years after birth.

We evaluate the fit and suitability of the model further by predicting “out of sample” mothers’ reaction to the Austrian PL reforms in the next section.

4.6 Prediction and policy

The objective of this section is twofold. First, we assess to what extent the behavioral framework can predict the impact of the three Austrian PL reforms on mothers’ return-to-work behavior. Second, we use the behavioral framework to examine the impacts of three counterfactual policies: a regime with neither job protection nor benefits, a policy with just benefits, and a policy with just job protection. We contrast return-to-work profiles in these counterfactual systems to understand the relative importance of job protection and cash benefits in shaping return-to-work decisions.

A Predictive capability of structural estimates

This subsection compares a series of simulated return-to-work profiles with their empirical counterparts. We do this by feeding the structural model above with the data underlying the reduced-form evidence of section A. This allows us to simulate how the three

40 The sample for the reforms are mothers giving birth in May-June (pre) vs. July-August (post) in the reform years. For every observation, we draw 25 home production values and calculate reservation wage paths. From these, it is straightforward to get the hazards to new and old jobs and calculate the aggregate failure function.
Austrian reforms affect return-to-work profiles. Figure 4.8 shows the reduced form return-to-work profiles in the left column and the simulated return-to-work profiles in the right column.

The 1990 reform extends job protection duration and benefit duration from 12 months to 24 months (Figures 4.8a and 4.8b). This PL extension induces a delay in return to work that is concentrated in the second year after giving birth according to the empirical return-to-work profile. The simulated return to work profile replicates the delay in return to work in the second year after birth quite well. The key difference between the two sets of profiles occurs from the third year after birth onwards. While the empirical profile shows that fewer women have returned to work even after the end of the benefits and job protection period, the model predicts that the proportion of women having returned to work in the medium-run is not affected by the reform.

The 1996 reform reduces benefit duration from 24 months to 18 months keeping job protection at 24 months (Figures 4.8c and 4.8d). The reduction in benefit duration speeds up return to work primarily in months 18 to 24 according to the empirical return-to-work profile. The model captures this central feature of the data very well. Interestingly, the model also replicates quite well the 5% of women who remain on PL after benefits have run out but return to their pre-birth employer when job protection runs out.

The 2000 reform prolongs benefit duration from 18 months to 30 months again keeping job protection duration unchanged (Figures 4.8e and 4.8f). The model captures the delay in return to work induced by the reform between month 18 (when benefits used to run out) and month 24 (when job protection runs out) well. The empirical return to work profile shows more women returning in month 18 after the extension of PL benefits than the simulated return to work profile. This is because some decisions to return to work were scheduled before the extension of PL benefits was enacted and because some mothers took advantage of the lift in the income ceiling and combined work and benefits starting from month 18 (i.e., after the reform became effective). Since we do not incorporate these features in the model, we do not interpret the differences between observed and predicted shares as a model-fitting failure. Moreover, the model also captures the medium-run difference in the share ever returning to work by month 60 quite well. The model does not work perfectly in predicting how many women return when job protection runs out. The model puts this group at 20% of the total whereas the reduced form puts it around 5%. We see below that mothers were allowed to return to the pre-birth job even after job protection has ended. This discrepancy is due to informal arrangements between mothers and pre-birth employers that allow them to return to their pre-birth job after the end of the job protection period. Such informal arrangements are not captured in our model as they do not derive from the PL legislation.
Notes: This figure shows the empirically observed and simulated return-to-work profiles (using the estimated model of the previous section) for three reforms of the Austrian PL system. (a) shows the empirical profiles and (b) the simulated profiles for the 1990 reform that extended the duration of benefits and job protection from 12 months to 24 months, (c) shows the empirical and (d) shows the simulated profile for the 1996 reform that reduced benefit duration from 24 months to 18 months keeping job protection duration at 24 months, (e) shows the empirical, and (f) shows the simulated profile of the 2000 reform that extended benefit duration from 18 months to 30 months, again keeping job protection duration at 24 months. Empirically observed return-to-work profiles are corrected for seasonality (see section A for details on the seasonality correction).
How well does the model replicate return-to-same-employer profiles? Figure 4.9 displays the empirical (left) and simulated (right) share of women who have returned to the pre-birth employer as a function of time since birth. Results for the 1990 reform indicate that extending both job protection and benefit duration by 12 months induces an horizontal shift in the return-to-same-employer profile. This feature is apparent in both the empirical and the simulated return to work profile. Extending the duration of job protection increases the share of mothers returning to the pre-birth employer. This is due to the declining value of home production: more women assess returning to their pre-birth employer as being attractive if they get to spend more time at home.

The 1996 reform, which reduces benefit duration by 6 months, induces some mothers who would have returned at 24 months to their pre-birth employer, to do so already at 18 months (i.e., when PL benefits run out). This fact is strong both in the empirical profile and is replicated in the simulated profile. In particular, the simulated profiles matches the medium-run proportion returning to the same employer very well.

The 2000 reform, which extends benefits by 12 months, induces most women who would have returned to their pre-birth employer after 18 months to do so after 24 months. There is a second group of women who would have returned to their pre-birth employer after 18 or 24 months but now do so after 30 months. Apparently, these women are able to negotiate a return to the same job even after job protection has run out. The simulated return-to-same-employer profile mimics the shift from 18 months to 24 months but does not replicate the shift to 30 months since the model does not allow for delayed start dates. Yet the model and the data agree that the 2000 reform reduces the share returning to work via their pre-birth employer by month 60. The reduction in returns to the same employer is stronger in the model than in the data because the model does not allow for a return to the same employer after month 24.

Overall, our behavioral framework is capable of replicating the four most important features of both the overall return-to-work profile and the return-to-same-employer profiles. First, both the empirical return-to-work profile and the simulated return-to-work profiles are discontinuous at the dates when benefits end. Second, the model manages to replicate the shares returning to the same employer and going to a new employer quite well. Third, changes to benefit or job protection duration affect return-to-work times more strongly through returns to the same employer than through search for a new job. Fourth, changes to benefit duration affect return-to-work more strongly in the period with a guaranteed option to return to the same employer than in other periods.
Notes: This figure shows empirical and calibrated return-to-same employer profiles for three reforms of the Austrian PL system. a) shows the empirical and b) the simulated profiles for the 1990 reform that extend the duration of benefits and job protection from 12 months to 24 months, c) shows the empirical and d) shows the simulated profile for the 1996 reform that reduces benefit duration from 24 months to 18 months keeping job protection duration at 24 months, e) shows the empirical, and f) shows the simulated profile from the 2000 reform that extends benefit duration from 18 months to 30 months, again keeping job protection duration at 24 months.
B The relative importance of job protection and cash benefits

The structural model of job search suggests that mothers value time with their child very strongly right after birth. Moreover, the time period we analyze is one where there is very little child care for children below the age of 3 years. In this setting, a PL policy can support families of newborn children by generating opportunities for prolonged parental care immediately after birth while maintaining medium-run labor market attachment of parents. How well do job protection and benefits achieve these aims? We simulate return to work profiles in three counterfactual PL systems (Figure 4.10, Table 4.6). In all systems, PL begins after two months of mandatory maternity leave which is fully paid and job protected. The benchmark counterfactual system assumes that there is no PL after the maternity leave period. The second system pays PL benefits until the second birthday of the child but there is no guarantee to return to the previous job. The third system guarantees the option to return to the pre-birth employer until the child turns 2 years old but does not provide benefits. We contrast the return-to-work profiles in these counterfactual systems with the factual system that offers a combination of both PL benefits and job protection until the child turns two years.

Consider first the benchmark case with no PL provisions after the end of maternity leave. In this system, about 41% of all women return to work immediately after maternity leave ends (Figure 4.10a and row 1 of Table 4.6). These women continue working for the pre-birth employer (Figure 4.10b). The remaining women re-enter the labor market looking for a new job. The simulations suggest that 24 months after birth around 56% have returned to work, and 60 months after birth about 82% of all women have ever returned to work.

A system that pays PL benefits but grants no job protection delays return to work for two reasons. The share of women who return to the same employer is smaller. Whereas 41% return to the same employer in the benchmark, only 19% return to the same employer immediately after the end of maternity leave because benefits increase the reservation wage (Figure 4.10b and row 2 of Table 4.6). Moreover, those who re-enter the labor market by looking for a new job return to work at a slower rate during the time when PL benefits are still paid (until month 24) than when PL benefits have run out (month 25 onwards). There is no spike at PL benefit exhaustion since the reservation wage adjusts smoothly with forward-looking agents. Eventually, 16 percentage points less women have returned.

We abstract from a number of additional issues that are central for a comprehensive discussion of PL. For instance, our discussion does not quantify the budgetary incidence of the different systems, neither do we assess the costs on employers incurred due to job protection, nor from the role of maternal care for child development. These issues are clearly important for a comprehensive assessment of PL policies. Nevertheless, we regard knowledge on the role of benefits and job protection for return to work decisions to be of first order importance and focus on providing this evidence.
Notes: The figure shows return-to-work (a) and return-to-same-employer profiles (b) under one factual and three counterfactual policy regimes: 1) benchmark regime with no PL after job protected and paid maternity leave of 2 months, 2) benefits during 24 months but no job protection, 3) job protection during 24 months but no benefits. The fourth profile shows the combined policy (factual) with 24 months of benefits and job protection. The figures depict expected return to work profiles of a random sample of 1,000 mothers from the estimation sample (giving birth between 1996-2000). For each mother in the sample, we fix 25 draws from the home production distribution. Then we calculate reservation wages, hazards and, finally, the aggregate failure function for the different policy configurations.

Source: Own calculations, based on estimates of the structural model.

Table 4.6: Return to work in alternative policy regimes

<table>
<thead>
<tr>
<th>percent back to work after (months)</th>
<th>During leave</th>
<th>After leave</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2m</td>
<td>12m</td>
</tr>
<tr>
<td><strong>Benchmark</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. No job protection/benefits</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td><strong>Deviation from benchmark</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Only 24m benefits</td>
<td>-22</td>
<td>-23</td>
</tr>
<tr>
<td>3. Only 24m job protection</td>
<td>-9</td>
<td>-1</td>
</tr>
<tr>
<td>4. 24m job protection, 24m benefits</td>
<td>-29</td>
<td>-27</td>
</tr>
<tr>
<td>5. Sum of rows 2 and 3</td>
<td>-31</td>
<td>-24</td>
</tr>
</tbody>
</table>

Notes: This table reports how many women have returned to work in the benchmark regime (row 1, only maternity insurance, cf. Figure 4.10), and the deviations from benchmark in the other regimes. Row (2) presents the system with 24 months of PL benefits but no job protection. Row (3) introduces 24 months of job protection without benefits. Row (4) calculates the sum of rows (2)-(3). Row (4) has 24 months of both job protection and benefits. Regimes in (1) to (3) are counterfactual, the regime in (5) is the Austrian regime between July 1990 and June 1995.

Source: Own calculations, based on estimates of the structural model.
returned by month 24 but the difference to the benchmark case with neither benefits nor job protection vanishes by month 60. The benefits-only system generates more time with the child immediately after birth but it reduces the share returning to the same employer during the first 24 months. Moreover, a higher proportion of women stays out of the labor market even after 24 months. This is because the benefits-only system delays return to work not only in the first two years (as intended). This shows up also in the 3rd and 4th year after birth of the child since it takes time until sufficiently attractive job offers induce women still at home to go back to work.

A system that offers job protection without benefits delays return to work only slightly, on average (Figure 4.10b and row 3 of Table 4.6). Immediately after maternity leave, 9 pctp. less women return to their pre-birth jobs compared to the benchmark. The share having returned to work very quickly converges to the baseline share during the first 18 months. Interestingly, the proportion of women taking up their pre-birth job remains considerably higher with job protection than without it. Whereas about 41 % of all women return to the pre-birth employer in the baseline regime, the share is 9 pctp. higher in the system with job protection. The system with job protection therefore generates some time with the newborn child, maintains medium run labor market participation, and increases the number of women who can continue their pre-birth job.

The system that offers a combination of both benefits and job protection delays return to work substantially in comparison with the benchmark (Figure 4.10b and row 5 of Table 4.6). The share that returns to pre-birth jobs initially is 29 pctp. lower. In month 23, just before benefits and job protection end, still 25 pctp. less women have returned. In contrast, when benefits and job protection end, the share having returned is somewhat higher (5 pctp.) than in the benchmark situation without benefits nor job protection. Five years after giving birth to their child, 83 % of women have returned to work in this generous system, even slightly more than in the benchmark with no PL (82 %). 49 % of women return to the same employer compared to 41 % in the benchmark, a substantial difference.

Clearly, the combined system generates more time for care immediately after birth and higher medium-run employment compared to a system that pays only cash benefits or grants only job protection. Consider row 5 of Table 4.6 where we sum the deviations from benchmark of the two isolated policies. This illustrates the importance of interaction effects between the two policy instruments. The combined policy exceeds the sum of applying both instruments in achieving the twin goals of parental leave. The share still on leave in the combined regime relative to the sum of the isolated regimes is 3 pctp. higher after 12 months and 9 pctp. higher after 23 months, while the share back to work is 13 pctp. higher after 2 years and stays higher until 5 years after birth. This finding
shows that cash benefits and job protection complement each other in achieving time for care immediately after birth while maintaining medium run labor market attachment.

4.7 Conclusions

This paper studies the causal effect of alternative parental leave (PL) systems on short- and medium-run labor market outcomes of mothers by analyzing three major changes to PL regulations in Austria. The contribution of the paper is twofold. On the one hand, we provide reduced-form evidence of the causal effect of alternative PL systems on return-to-work, job continuity (return-to-same-employer) as well as on employment and earnings in the medium run. On the other hand, we set up and structurally estimate a behavioral (non-stationary search) framework that sheds new light on the respective impact of the two main PL policy instruments: cash benefits and job protection. Within this framework, we can study how the two policy parameters affect return-to-work and return-to-same-employer behavior, both in the short run and in the medium run.

The reduced-form evaluation exercise reveals that longer PL durations induce a significant delay in return-to-work. Extending both cash benefits and job protection by one year (the 1990 reform) increases the time at home after birth by 7.8 months. Reducing the duration of benefit payments by 6 months while keeping job protection at 24 months (the 1996 reform) shortens time at home by 3.4 months. Finally, extending payment duration by 12 months again keeping job protection at 24 months (the 2000 reform) extends time at home by 3.0 months. We also show that these changes are driven by both delays in return to pre-birth employer and delays in return to new jobs. Despite the significant delays in return-to-work among mothers exposed to the more generous leave regimes, we find no detrimental effects on their labor market outcomes in the medium-run.

The structural model suggests that introducing deterministic PL durations into a search model helps us better understand the role of cash benefits and job protection duration in PL policies. Our non-stationary job-search framework features a changing mean of the wage offer distribution; a changing value of home production over time; and an outside option (return-to-same-employer) which is time-delimited. Using the estimates obtained from this novel structural framework we conduct out-of-sample predictions. We find that our model predicts return-to-work behavior and return-to-same-employer behavior remarkably well, both in the short-run and in the medium-run.

Structural estimates of the model of job search suggest that mothers value time with their child more strongly right after birth than later on in their child’s life. Moreover, the time period we analyze is one where there is very little child care for children below the age of 3 years. In this setting, a PL policy can support families of newborn children
by generating opportunities for prolonged parental care immediately after birth while maintaining medium-run labor market attachment of parents. We simulate return-to-work behavior under counterfactual policies and measure how much time for care and medium-run employment these systems generate. We find that the system that combines both policy instruments generates more care immediately after birth and more employment in the medium run than systems that just use one or neither of the policy instruments. We conclude that the the two PL policy instruments need to be jointly implemented in order to achieve both goals. They interact to subsidize time for parental care immediately after birth while maintaining medium-run labor market attachment.

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4.8 Appendix

A Investigating selection into employment

We examine differential selection into employment in Figure 4.11, panels a, b, and c for the three policy reforms. The first quadrant in each of the three panels shows DID-RD impacts of the reforms on employment rates (along with confidence intervals) by year since the child’s birth. As expected, in the second year after childbirth, employment rates of mothers in the less generous regimes are higher compared to those of mothers in the more generous regimes. Nevertheless, there are no differences in employment rates between pre- and post-July mothers starting from year 3 after child’s birth when both groups have exhausted their respective parental leave provisions. Interestingly, despite the fact that mothers giving birth in the more generous regimes were less likely to have ever returned to work (as seen in Section B), employment rates of mothers in the more and less generous regimes are virtually identical starting from year 3 after birth. The contrasting result in these two outcomes is explained by the fact that a larger share of mothers in the less generous regimes returned to work but only for a short period of time.

The following set of figures in panels a,b, and c of Figure 4.11, check for differential selection into employment in each of the years following childbirth by comparing pre-birth labor market outcomes of pre- and post-July mothers in the reform year relative to mothers in the pre-reform year by employment status. In year 2 after birth we observe that employed mothers who gave birth in the more generous leave regimes are positively selected (i.e., they have better pre-birth labor market outcomes relative to mothers employed in the less generous regimes). Starting from year 3, once employment rates of pre- and post-July mothers equalize, we see no further evidence of differential selection into employment.

B Likelihood contributions

Assume that individual specific home production values follow the distribution $c \sim G(c)$. To derive the likelihood contribution of individual $i$, note that there are three possible outcomes.

1. $i$ is still searching in $T$ (the end of the observation period)
2. $i$ returned to her pre-birth job in $t_i$
3. $i$ found a new job in $t_i$
Figure 4.11: Selection into employment

(a) 1990

(b) 1996

(c) 2000

Notes: This figure shows differences in labor market outcomes, along with confidence intervals, between pre- and post-July mothers in the three reforms relative to pre- and post-July mothers in the pre-reform year by months since child’s birth. In all cases, the outcomes of women in the more generous regime are subtracted from the outcomes of women in the less generous regime. The samples include mothers giving birth at parity one. The first quadrant in each panel shows differences in employment rates by months since child’s birth. The following quadrants check for differential selection into employment between pre- and post-July mothers in the reform year relative to the pre-reform year by comparing pre-birth characteristics of employed mothers relative to unemployed mothers.
Given the parameters of the model, the optimal time of returning to the pre-birth job is uniquely determined by $c$. This follows from the fact that the reservation wage at any point in time is increasing in $c$, i.e. the higher home production, the later mothers return to their pre-birth jobs. Given a continuous distribution for $c$, it is thus possible to derive the bounds on $c$ such that return in $t$ is certain (unless a valuable job offer arrives before $t$).  

Let $c(t)$ denote the lowest possible $c$ such that the mother returns in $t$ but not earlier and let $\bar{c}(t)$ denote the highest possible $c$ such that the mother returns in $t$ but not later. Then all $c \in [c(t), \bar{c}(t)]$ return to their pre-birth jobs in $t$.

The likelihood of outcome (1), mothers still on parental leave in $T$, is jointly given by (a) the probability that $i$ does not return to her pre-birth job at or before $\tau_o$, the end of job protection, and (b) the probability that $i$ did not find a suitable job offer. The probability of not returning in $\tau_o$ or before is given by

$$P(\text{no return to pb job}) = P(c_i > \bar{c}(\tau_o)) = 1 - G(\bar{c}(\tau_o))$$

and the probability of not receiving a sufficiently high job offer in any $t \leq T$ is given by

$$P(\text{still searching in } T) = \int_{\bar{c}(\tau_o)}^{\infty} \prod_{j=0}^{T} \left[ \left( \lambda \Phi \left( \frac{\eta_j}{\sigma_w} \right) + (1 - \lambda) \right) \right] dG(c)$$

where $\eta_j = \log(w_j^*) - \mu_w$. This expression integrates the probability of receiving and rejecting a wage offer in any period (wage offers are lognormal, $w \sim \logN(\mu_w, \sigma_w)$) and the probability of not receiving an offer over all home production values which do not return to their pre-birth jobs (then the probability of observing them still searching would be zero).

The full likelihood contribution of an observation still on leave is thus

$$[1 - G(\bar{c}(\tau_o))] \int_{\bar{c}(\tau_o)}^{\infty} \prod_{j=0}^{T} \left[ \left( \lambda \Phi \left( \frac{\eta_j}{\sigma_w} \right) + (1 - \lambda) \right) \right] dG(c)$$

(4.3)

The likelihood of outcome (2), mothers who returned to their pre-birth jobs in $t_i$, is jointly determined by the probability of return in $t_i$ and the probability of not receiving and accepting a superior job offer at any $t \in [0, t_i]$. The former is given by

$$P(\text{return to pb job in } t_i) = G(\bar{c}(t_i)) - G(c(t_i))$$

Uniqueness of the optimal time of return requires decreasing reservation wages, as proven in Frijters and Van der Klaauw (2006). We check for this condition at the solution.
while the latter is given by

\[ P(\text{still searching in } t_i) = \int_{\xi(t_i)}^{c(t_i)} \prod_{j=0}^{t_i} \left[ \lambda \Phi \left( \frac{\eta_j}{\sigma_w} \right) + (1 - \lambda) \right] dG(c) \]

Finally, the likelihood of outcome (3), mothers who accepted a new job in \( t_i \), is jointly determined by the probability of not returning at any \( t < t_i \) (return in \( t_i \) is possible, since new wage offers are accepted at the beginning of the period), the probability of not receiving and accepting a good wage offer before \( t_i \) and the probability of receiving and accepting offer \( \hat{w} \) in \( t_i \). The former two are analog to the cases above, while the probability of accepting and observing \( \hat{w} \) is more involved.

Note that in all cases so far the likelihoods involved the true unknown wage-offer reservation wage. The probability of \( \hat{w} \) however involves the joint (normal) distribution of wage offers and measurement error. Let \( \xi = \epsilon + u \) be the observed residual given wage offer \( \hat{w}_i \) and \( \mu_{i,t} \). Then, \( u \) and \( \xi \) follow a joint normal distribution with

\[ \sigma_\xi = \sqrt{\sigma_u^2 + \sigma_w^2} \]

\[ \rho = \frac{\sigma_w}{\sigma_\xi} \]

Thus the joint probability of receiving and accepting offer \( \hat{w} \) is given by

\[ P(\text{exit in } t_i \text{ and observe } \hat{w}) = \lambda \Phi \left( \frac{\rho/\sigma_\xi (\log \hat{w} - \mu_w) - \eta_{t_i}}{\sqrt{1 - \rho^2}} \right) \frac{1}{\hat{w}} \phi \left( \frac{\log \hat{w} - \mu_w}{\sigma_\xi} \right) \frac{1}{\sigma_\xi}. \]

This expression is derived and discussed in more detail in Wolpin (1987). The full likelihood contribution of a mother accepting a new job in \( t_i \) with observed wage \( \hat{w} \) is then

\[ [1 - G(\xi(t_i))] \int_{\xi(t_i)}^{c(t_i)} \prod_{j=0}^{t_i-1} \left[ \lambda \Phi \left( \frac{\eta_j}{\sigma_w} \right) + (1 - \lambda) \right] \lambda \Phi \left( \frac{\rho/\sigma_\xi (\log \hat{w} - \mu_w) - \eta_{t_i}}{\sqrt{1 - \rho^2}} \right) \frac{1}{\hat{w}} \phi \left( \frac{\log \hat{w} - \mu_w}{\sigma_\xi} \right) \frac{1}{\sigma_\xi} dG(c) \]

In the estimation, the integrals are approximated by simulation methods. We fix 25 draws from the Uniform distribution for every observation in the sample prior to the estimation. In every estimation round, these draws are converted to draws from the truncated home production distribution and then the whole paths of reservation wages computed. There is bias in the parameter estimates from simulated maximum likelihood, but according to simulations in Börsch-Supan and Hajivassiliou (1993) the bias tends to zero if the number of draws exceeds 20.
C  Age profiles of individual specific parameters

Figure 4.12: Age profiles for results of table 4.5

(a) Offer probability $\lambda$

(b) Home production $\mu_c$

(c) Median log wage offer

Notes: Figures plot predicted $\lambda$, $\mu_c$ and $\mu_w$ for mothers working in manufacturing in West Austria (pre-birth), with median pre-birth wage (287 euro/week).
D  Return to work with no extra child

Figure 4.13: Return to work - failure functions - parity 1 no extra kids

(a) May-June 1990

(b) July-August 1996

(c) July-August 2000

Notes: This figure shows the proportion who have returned to work at or before $t$ months after child’s birth. The sample includes mothers giving birth at parity one between May 1st and August 30th of 1990 (panel a), 1996 (panel b) and 2000 (panel c) who did not have additional children.

E  Results for higher parities
Table 4.7: Descriptive statistics of pre-birth characteristics and labor market performance: Treated and control groups for parities

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>2.199</td>
<td>1.199</td>
<td>0.831</td>
<td>0.841</td>
<td>0.831</td>
<td>0.841</td>
<td>0.831</td>
<td>0.841</td>
<td>0.831</td>
<td>0.841</td>
<td>0.831</td>
</tr>
<tr>
<td>Post</td>
<td>2.197</td>
<td>1.197</td>
<td>0.829</td>
<td>0.839</td>
<td>0.829</td>
<td>0.839</td>
<td>0.829</td>
<td>0.839</td>
<td>0.829</td>
<td>0.839</td>
<td>0.829</td>
</tr>
<tr>
<td>Raw</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
<td>0.863</td>
</tr>
</tbody>
</table>

Notes: The table reports descriptive statistics of pre-birth characteristics and labor market performance of mothers who gave birth in May-June or July-August in each of the reform years. Column (2) and (6) report differences in mean between July-August and May-June mothers. Columns (3), (7) and (11) report DID estimates (July-August minus May-June of the reform year minus equivalent cohorts in the pre-reform year). Robust standard errors are reported in parentheses. *, ** Significant at 5%, 1% level.
Table 4.8: The causal effects of the reforms for mothers giving birth at parities > 1

<table>
<thead>
<tr>
<th>Year of reform</th>
<th>1990</th>
<th>1996</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>Time at home</td>
<td>5.099**</td>
<td>3.887**</td>
<td>4.901**</td>
</tr>
<tr>
<td>(censored at 60 months)</td>
<td>0.873</td>
<td>0.841</td>
<td>0.756</td>
</tr>
<tr>
<td></td>
<td>27.920</td>
<td>26.821</td>
<td>25.793</td>
</tr>
<tr>
<td>Time until return to same employer</td>
<td>6.515**</td>
<td>3.073**</td>
<td>3.073**</td>
</tr>
<tr>
<td>(for those back to pre-birth job)</td>
<td>0.655</td>
<td>0.708</td>
<td>0.590</td>
</tr>
<tr>
<td></td>
<td>12.206</td>
<td>16.693</td>
<td>15.788</td>
</tr>
<tr>
<td>Time until return to new employer</td>
<td>2.330</td>
<td>2.718*</td>
<td>5.181**</td>
</tr>
<tr>
<td>(for those back to new job)</td>
<td>1.247</td>
<td>1.164</td>
<td>1.079</td>
</tr>
<tr>
<td></td>
<td>29.556</td>
<td>29.084</td>
<td>28.727</td>
</tr>
<tr>
<td>Back within 60 months</td>
<td>-0.031</td>
<td>-0.032</td>
<td>-0.04*</td>
</tr>
<tr>
<td></td>
<td>0.018</td>
<td>0.018</td>
<td>0.016</td>
</tr>
<tr>
<td>Back to pre-birth employer</td>
<td>-0.026</td>
<td>-0.047*</td>
<td>-0.036</td>
</tr>
<tr>
<td>(censored at 60 months)</td>
<td>0.020</td>
<td>0.023</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>0.498</td>
<td>0.570</td>
<td>0.573</td>
</tr>
<tr>
<td>Daily wage at 1st job after birth</td>
<td>1.012</td>
<td>-1.727*</td>
<td>-0.402</td>
</tr>
<tr>
<td></td>
<td>0.760</td>
<td>0.866</td>
<td>0.829</td>
</tr>
<tr>
<td></td>
<td>31.700</td>
<td>34.242</td>
<td>31.073</td>
</tr>
<tr>
<td>Daily wage at 1st job after birth</td>
<td>0.432</td>
<td>-2.855**</td>
<td>-0.843</td>
</tr>
<tr>
<td>(pre-birth employer)</td>
<td>0.912</td>
<td>1.032</td>
<td>1.045</td>
</tr>
<tr>
<td></td>
<td>33.713</td>
<td>36.059</td>
<td>31.617</td>
</tr>
<tr>
<td>Daily wage at 1st job after birth</td>
<td>2.124</td>
<td>0.088</td>
<td>-0.454</td>
</tr>
<tr>
<td>(new employer)</td>
<td>1.314</td>
<td>1.518</td>
<td>1.326</td>
</tr>
<tr>
<td></td>
<td>28.019</td>
<td>30.470</td>
<td>29.073</td>
</tr>
<tr>
<td>Number of observations</td>
<td>8,572</td>
<td>7,754</td>
<td>8,541</td>
</tr>
</tbody>
</table>

Notes: This table reports DID-RD estimates for the impacts of the 1990, 1996, and 2000 reforms. The samples include all mothers who gave birth at parities higher than one between May 1st and August 30th. Regressions compare differences in outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre- and post-July mothers who gave birth in the year preceding the reform. Estimates come from regressions that control for age at birth, and the following indicators for mothers, labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefits payments periods. Robust standard errors are reported in parentheses. Means of the comparison group (i.e., the group with access to the less generous regime) are reported in italics. * significant at 5%, ** significant at 1%.
Table 4.9: The causal effects of the reforms on labor market outcomes in year 5 for parities > 1

<table>
<thead>
<tr>
<th>Year of reform</th>
<th>1990</th>
<th>1996</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>A. Cumulative outcomes in year 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Months in employment</td>
<td>-2.792**</td>
<td>-3.256**</td>
<td>-3.908**</td>
</tr>
<tr>
<td></td>
<td>(0.790)</td>
<td>(0.769)</td>
<td>(0.720)</td>
</tr>
<tr>
<td>Months unemployed</td>
<td>-3.037**</td>
<td>-0.771*</td>
<td>-0.696*</td>
</tr>
<tr>
<td></td>
<td>(0.451)</td>
<td>(0.306)</td>
<td>(0.279)</td>
</tr>
<tr>
<td>Cumulative earned income</td>
<td>-2,887*</td>
<td>-3,477*</td>
<td>-4,833**</td>
</tr>
<tr>
<td></td>
<td>(1255.2)</td>
<td>(1427.3)</td>
<td>(1434.3)</td>
</tr>
<tr>
<td>B. Labor market outcomes in year 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>-0.001</td>
<td>0.000</td>
<td>-0.036</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.023)</td>
<td>(0.021)</td>
</tr>
<tr>
<td>Working for pre-birth firm</td>
<td>0.013</td>
<td>-0.032</td>
<td>0.019</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.028)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Tenure with current employer</td>
<td>-0.863</td>
<td>-4.695</td>
<td>0.215</td>
</tr>
<tr>
<td></td>
<td>(2.576)</td>
<td>(2.542)</td>
<td>(2.355)</td>
</tr>
<tr>
<td>Months worked</td>
<td>0.016</td>
<td>-0.142</td>
<td>-0.507*</td>
</tr>
<tr>
<td></td>
<td>(0.236)</td>
<td>(0.250)</td>
<td>(0.227)</td>
</tr>
<tr>
<td>Earnings per day worked</td>
<td>1.213</td>
<td>-0.958</td>
<td>-0.694</td>
</tr>
<tr>
<td></td>
<td>(0.969)</td>
<td>(1.014)</td>
<td>(0.894)</td>
</tr>
<tr>
<td>Earnings per calendar day</td>
<td>0.356</td>
<td>-0.655</td>
<td>-2.002</td>
</tr>
<tr>
<td></td>
<td>(1.018)</td>
<td>(1.175)</td>
<td>(1.051)</td>
</tr>
<tr>
<td>Annual income</td>
<td>66.5</td>
<td>477.7</td>
<td>-1,294**</td>
</tr>
<tr>
<td></td>
<td>(373.3)</td>
<td>(479.1)</td>
<td>(411.3)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>8,572</td>
<td>7,754</td>
<td>8,541</td>
</tr>
</tbody>
</table>

Notes: This table reports DID-RD estimates for the impacts of the 1990, 1996, and 2000 reforms. The samples include all mothers who gave birth at parities higher than one between May 1st and August 30th. Regressions compare differences in outcomes between the cohort exposed to the more generous regime and the cohort exposed to the less generous regime relative to the outcomes of pre-and post-July mothers who gave birth in the year preceding the reform. Estimates come from regressions that control for age at birth, and the following indicators for mothers, labor market performance measured 12 months before the child’s birth: tenure, experience, months of unemployment, cumulative income, daily wages, and indicators for industry, region and white collar occupation. Regressions also control for the unemployment rates in the region of pre-birth employment at the end of the job protection and benefits payments periods. Robust standard errors are reported in parentheses. Means of the comparison group (i.e., the group with access to the less generous regime) are reported in italics. * significant at 5%, ** significant at 1%. 
F  Heterogeneous impacts: Marital status and education

This section discusses descriptive evidence by marital status and education. Unfortunately, we cannot match couples in the ASSD data. We are therefore unable to get information on paternal income. We can, however, match a sub-sample of all birth observations with a birth register dataset. The birth register data contain some information on the mother and the father. Specifically, we can observe marital status of the mother (married, single, divorced, widowed) but there is no information on cohabitation status for single women. We can also observe education level of both mother and father. We therefore use education as a proxy for income.

The matching between the ASSD data and birth records is done based on birth date of the child, region of residence and mother’s month and year of birth. (The social security identifier is not recorded in the birth register data.) The accuracy of these variables is high, so we are able to match most records. However, in some cases we have multiple observations with the same date of birth of the child, month and year of birth of the mother and mother’s city of residence. This occurs with higher frequency in large cities like Vienna. We are left with 83 percent of successful matches after dropping multiple matched records.

Matched records are negatively selected (i.e. matched mothers have worse characteristics and labor market outcomes and there is a lower proportion of married mothers). This is because we lose a higher fraction of mothers from the larger cities due to the multiple matching. However, we do not find differential selection according to treatment. That is, the matching rate of pre- and post-July mothers (and also in the pre- and post-reform year) is similar. Therefore, we are able to provide unbiased estimates for a selected sample. Keeping this in mind, we reproduce the full set of reduced form results stratifying the sample by mothers’ marital status and education of both parents for the sample of mothers giving birth at parity one and the sample of mothers giving birth at higher parities.\(^43\)

The proportion of married mothers in the matched sample is 0.63, 0.60 and 0.56 for the years 1990, 1996 and 2000. These proportions are lower than the equivalent proportions in the population (0.74, 0.71 and 0.70 respectively) due to the matching issues explained above. Widows and divorced mothers account for a small proportion of the population of mothers (as most women have usually a partner by the time they have a child), so they are included in the group of not married mothers in the current analysis. As mentioned above, we cannot distinguish between single and cohabitating mothers. As a result, our

\(^{43}\)We also tried to stratify the sample by father’s employment status by looking separately at women with employed husbands versus those whose husband is unemployed, retired or student. However, the second group turned out to be too small to provide precise results.
ability to learn about paternal choices and the relative importance of father’s income from the comparison between married and single mothers is somewhat limited since we do not know whether not-married mothers are cohabitating. Nevertheless, official microcensus statistics for the years of interest show that most non-married mothers are living alone: 89 percent in 1990 and 74 percent in 2000.

The sub-sample analyses by marital status and couples’ education produce some interesting results (Figure 4.14). For example, we find that married mothers return faster to work than non-married mothers. We also find that the reforms affected return to work behavior of both married and non-married mothers. The impact of the reform was stronger among married mothers, especially for the 1990 reform and for mothers giving birth to their first child. Nevertheless, we do not see a differential impact for mothers giving birth at higher parities, which suggests that some of the differences are explained by subsequent fertility.

The stratification by couples’ educational level shows that high educated mothers return faster to work (Figure 4.15). This is due to the lower income replacement of the benefits for this group. Among high educated mothers, those with high educated husbands have on average higher pre-birth wages and return to work earlier than those with low educated husbands. This implies that women’s forgone earnings are probably more important in shaping mothers’ return to work decisions among highly educated women rather than the availability of other sources of income. Among low educated mothers, we see that those with a high educated husband are more likely to stay longer at home (even though they have higher pre-birth wages than those with low educated husbands). This pattern suggests that among low educated women, other sources of income play a more important role in determining return to work. As expected, low educated mothers with low educated husbands have the largest response to benefits.

Remarkably, our results for the medium term labor market outcomes show that parental leave extensions had no detrimental effects for any of these subsamples. These results reassure that our main findings on the medium run effects reported in the paper are robust to different subpopulations.
Figure 4.14: Return to work - failure functions by marital status

(a) Parity 1: 1990

(b) Parity greater than 1: 1990

(c) Parity 1: 1996

(d) Parity greater than 1: 1996

(e) Parity 1: 2000

(f) Parity greater than 1: 2000

Source: ASSD data, sub-sample with match in birth records.
Figure 4.15: Return to work - failure functions by couples’ education

Notes: Low education includes mandatory education and vocational trained. High education includes college with no matura, college with matura, teacher or vocational university, and university. Source: ASSD data, sub-sample with match in birth records.
G Results with time trends

Our main analysis presents local constant estimates with a very narrow bandwidth of two months. We have also explored additional models including a sample of mothers who gave birth within a wider window around the cutoff date and adding time trends to the model. We report results for the main outcomes in Table 4.10. In the table, we report estimates from a sample that includes mothers who gave birth 3 months around the cutoff date and add to the model differential linear time trends for births before and after the cutoff date and for births in the reform and the pre-reform year. We also estimated models based on an alternative sample that includes all mothers who gave birth during the year of the policy change and allows for differential quadratic time trends. None of our results is qualitatively different from our main results. Yet, the precision of the estimates is lower.
Table 4.10: Results controlling for the forcing variable

<table>
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<th>Year of reform</th>
<th>Specification</th>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
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<td>5.493</td>
<td>5.484</td>
<td>6.228</td>
<td>6.219</td>
<td>6.228</td>
<td>6.219</td>
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<td>1990</td>
<td></td>
<td>(0.823)</td>
<td>(0.823)</td>
<td>(0.823)</td>
<td>(0.823)</td>
<td>(0.823)</td>
<td>(0.823)</td>
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<tr>
<td>2000</td>
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<td>(0.927)</td>
<td>(0.927)</td>
<td>(0.927)</td>
<td>(0.927)</td>
<td>(0.927)</td>
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<tr>
<td></td>
<td></td>
<td>3.537</td>
<td>3.528</td>
<td>4.283</td>
<td>4.274</td>
<td>4.283</td>
<td>4.274</td>
</tr>
<tr>
<td>1990 (censored at 60 months)</td>
<td>(0.797)</td>
<td>(0.797)</td>
<td>(0.797)</td>
<td>(0.797)</td>
<td>(0.797)</td>
<td>(0.797)</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td>2.685</td>
<td>2.676</td>
<td>3.431</td>
<td>3.422</td>
<td>3.431</td>
<td>3.422</td>
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<td>2000</td>
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<td>(0.839)</td>
<td>(0.839)</td>
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<tr>
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<td>2.572</td>
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<td>3.318</td>
<td>3.309</td>
<td>3.318</td>
<td>3.309</td>
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<td>1990 (censored at 60 months)</td>
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<td>2.785</td>
<td>2.794</td>
<td>2.785</td>
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<td>-0.067</td>
<td>-0.062</td>
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<td>-0.036</td>
<td>-0.031</td>
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<tr>
<td>1990 (censored at 60 months)</td>
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<td>(0.019)</td>
<td>(0.019)</td>
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<td>1996</td>
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<td>0.018</td>
<td>0.013</td>
<td>0.018</td>
<td>0.013</td>
</tr>
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<td>-1.946</td>
<td>-1.631</td>
<td>-1.012</td>
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</tr>
<tr>
<td>1990 (censored at 60 months)</td>
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<td>(0.719)</td>
<td>(0.719)</td>
<td>(0.719)</td>
<td>(0.719)</td>
<td>(0.719)</td>
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<tr>
<td>1996</td>
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<td>0.002</td>
<td>0.012</td>
<td>0.019</td>
</tr>
<tr>
<td>1990 (censored at 60 months)</td>
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<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.022)</td>
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<tr>
<td>1996</td>
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<td>-0.000</td>
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</tr>
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<td></td>
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<td>1990 (censored at 60 months)</td>
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<td>(0.031)</td>
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<td>(0.031)</td>
<td>(0.031)</td>
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<td>1.659</td>
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<td>1.598</td>
<td>0.833</td>
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<td>-1.096</td>
</tr>
<tr>
<td>1990 (censored at 60 months)</td>
<td>(1.219)</td>
<td>(1.219)</td>
<td>(1.219)</td>
<td>(1.219)</td>
<td>(1.219)</td>
<td>(1.219)</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td>0.998</td>
<td>0.628</td>
<td>0.565</td>
<td>0.305</td>
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<td>-0.685</td>
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<td>(1.295)</td>
<td>(1.295)</td>
<td>(1.295)</td>
</tr>
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<td></td>
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<td>533.3</td>
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<td>584.8</td>
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<td>(366.9)</td>
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<td>513.9</td>
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<td>(389.3)</td>
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<td>31,949</td>
<td>63,326</td>
<td>31,417</td>
<td>62,280</td>
<td>27,539</td>
<td>54,443</td>
</tr>
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</table>
| Notes: This table reports various robustness checks for the main models reported in Tables 2-4 of the paper. Estimates reported in columns (1), (3) and (5) come from samples that include mothers who gave birth within 3 months around the cutoff date and include differential time trends for mothers who gave birth before and after the cutoff date in the reform and the pre-reform year. Estimates reported in columns (2), (4) and (6) come from samples that include mothers who gave birth during the year of the policy change or during the pre-reform year and include differential quadratic time trends. Robust standard errors are reported in parentheses. * significant at 5%, ** significant at 1%.


Parental Leave and Mothers’ Careers


CURRICULUM VITAE

Personal Information
Place of birth: Zurich.
Nationality: Swiss.

Education
2009-2014  Doctoral studies and research associate
Chair of Macroeconomics and Labor Markets of Prof. Dr. Josef Zweimüller
Department of Economics, University of Zurich

Fall 2012  Visiting Student Researcher, CLE, UC Berkeley (Sponsor: David Card)

2008-2012  Master of Science in Economics
University of Zurich

2005-2008  Bachelor of Arts in Economics
University of Zurich

1998-2002  Academic high school (Matura), Typus E (Economics)
Kantonsschule Hottingen, Zurich.

Professional Experience
2007-2008  Research assistant
Chair of Macroeconomics and Labor Markets of Prof. Dr. Josef Zweimüller
Department of Economics, University of Zurich

2003-2004  All-round Traineeship
UBS AG Wealth Management and Business Banking, Switzerland.