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Labour Market Effects of Parental Leave: A European Perspective

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Abstract

We investigate the aggregate-level effects of parental leave legislation on various labour market outcomes of women in 16 European countries for the period since 1970. The paper updates and extends previous findings in the literature. Results show increases in participation rates that diminish with length and generosity of leave schemes. While pure participation numbers may not increase as dramatically as hoped, there is strong evidence of increases in weekly working hours. On the flipside, decreases in wages for high-skilled workers and amplified occupational segregation are likely results of generous leave schemes. We conclude with a discussion of recent debates over extending minimum maternity and parental leave rights on the European level.

Keywords: Parental leave, gender gap, labour force participation, wages

JEL classification: J13, J18, J22

1. Introduction

Within Europe, leave schemes for parents have been going through a steady evolution. Maternity leave has existed for most of the 20th century, reinforced by the 1952 ILO convention on maternity protection. In 1992, the EU adopted directive 92/85/EEC on paid maternity leave, making 14 weeks of paid maternity leave the minimum in the EU member states, though many countries already had more generous schemes. In 1996, directive 96/34/EC of the European Council obliged member states to introduce unpaid parental leave that enables parents to care full-time for their child over a period of three months. More recently parental leave legislation was again on the EU scene, as a 2010 directive repealing directive 96/34/EC increased the length of (unpaid) parental leave to four months, extended its application to atypical employment contracts and made at least one month of parental leave exclusive to each parent. Further legislations at the EU level are being debated in the European Parliament with regards to increasing paid maternity leave from 14 weeks to 20 weeks and introducing paid paternity leave for a minimum of two weeks.

The changes in maternity and parental leave legislation appear to be in line with the emphasis on increasing the female participation rate as articulated in the Lisbon agenda. At the same time, there seems to be little knowledge on the aggregate labour market effects of parental leave legislation. An earlier study by Ruhm (1998), covering eight EU countries and Norway and using data from the period between 1969 and 1993, found positive effects of paid leave on female labour force participation at the cost of declining wages. Since Ruhm's widely cited study, there has been little aggregate level research on the impact of parental leave legislation on labour market outcomes. An update seems reasonable given that the data used are aging, only a small number of countries are covered and the longer unpaid parental leave is not taken into account. As an update and extension to these issues, this study therefore examines the effects of leave legislation on employment rates, average weekly hours worked, wages, and vertical occupational segregation for the period between 1970 and 2010.

Legislative information is acquired from Gauthier and Brotnik's (2001) "Comparative Maternity, Parental Leave and Child Care Database" and is supplemented by findings from

other sources on maternity and parental leave legislation. The aggregate level indicators for the aforementioned labour market outcomes are collected from the databases of OECD, Eurostat and ILO. The results of our analysis indicate increases in participation rates that diminish with length and generosity of leave schemes. While pure participation numbers may not increase dramatically, there is strong evidence of increases in weekly working hours. Concurrently, according to the effects on proxy indicators, a decrease is observed in high skill wages alongside an increase in vertical occupational segregation.

The structure of the article is as follows. The second section discusses justifications for maternity and parental leave, a theoretical background on the effects of leave legislation on labour market outcomes and the findings of some recent empirical studies. The third section introduces the available data and connects them with the fourth section that presents the difference-in-difference methodology used. The fifth section contains the results of our empirical analysis. Finally, the sixth section concludes.

2. Theoretical Considerations and Literature Review

In leave research, nearly every type of leave has multiple names, making it necessary to clarify the terms used throughout this study. Two different types of leave are usually categorized: on the one hand maternity and paternity leave and on the other parental leave (Henau *et al.*, 2007). Maternity and paternity leaves are typically concentrated around the birth of a child and cover a relatively short period of time with high replacement rates; most maternity leave entitlements cover a period between 14 and 20 weeks. Paternity leave is even shorter, often measured by days. In contrast, parental leave tends to be longer, ranging from an extra 12 weeks to three years, and has lower replacement rates. When not making a distinction, together these two types will be simply called leave.

Leave legislation has effects on three distinct areas of welfare, and most of the research and debate on its effects are concentrated around these. Historically, maternity leave legislation was passed for paternalistic reasons, namely to protect the health and well-being of mothers and new-born babies. As the earliest international legislation on the issue, the 1919

ILO convention on maternity leave states that women are not permitted to work for six weeks after childbirth. The proposed health effects for infants continue to constitute the first section of the research on the impact of leave legislation. As the findings on child health appear to be positive (Ruhm, 2000), this positive externality is often used as a justification for mandating leave. Fertility is the second outcome that leave policy has an impact on. Given the drop in fertility rates, this specific effect has become more important. The general findings tend to be positive, though the combination of short parental leave durations and high fertility rates in some countries give some ambiguity to the results (Gauthier, 2007; Lalive and Zweimuller, 2009). Fertility concerns continue to be a prime driver for leave legislation. The most recent example was in Germany where low fertility of working women led to a switch to an earnings related benefit system for the first year of parental leave. The final area that leave legislation has an impact on is the labour market and, specifically, the labour market outcomes of leave-takers (which in most instances are women). At least some maternity leave is the norm around childbirth and the discussion in Europe focuses more on the optimal length of leave rather than questioning whether or not to have leave legislation at all. This paper studies in specific the effects of leave legislation on female labour market participation (both in rates and in hours worked), the relative wage level and the share of women in high level occupations.

Ruhm's (1998) study explains the labour market effects of mandated leave within a supply and demand framework. The effects are realized both before and after motherhood. Before pregnancy, the opportunity for future leave increases the supply of prospective parents.[1] After leave has been taken up, it provides a continuing labour market attachment. Combined, these effects lead to a shift of the supply curve to the right. At the same time, the training and replacement costs for firms cause a contraction in demand. If parental leave increases employment rates, the contraction in demand should have a smaller effect on employment. Figure 1 shows the situation:

- Figure 1 Here -

In figure 1, the introduction of leave legislation leads to an increase in employment from E1 to E2.[1] Meanwhile wages decrease due to lower demand and higher supply; the actual impact in terms of employment and wages being dependant on the slope of the demand and supply curve. A more positive outlook on parental leave could argue that the demand curve also shifts to the right as firm-specific human capital is protected and workers become more productive. A sufficient shift may even lead to an increase in wages alongside employment.

Ruhm's framework, at least in the post-birth analysis of leave effects, is implicit in other research (see below) predicting positive supply side effects from leave legislation. Starting point is that in the absence of job guarantees parents will drop out of the labour market for a longer period of time. In this case, parental leave facilitates swifter and higher rates of return to work because the job security provided eliminates future search costs and the loss of firm-specific human capital. Additionally, the job security provided by parental leave may have a positive effect on participation and wage gaps between men and women. Protecting firm-specific human capital during early years of motherhood could lead to better opportunities for women to continue their careers. This would be consistent with the demand curve in figure 1 shifting to the right as a result of increased human capital and productivity.

Contrary to the above framework, there are findings pointing towards a negative participation and productivity effect of parental leave take-up (Ondrich et al. 1996; 2002). Mandated leave can lengthen time out of work and create artificial interruptions. This would have an adverse effect on supply, because parents take leave instead of continuing to work, and on demand, because time out of work deteriorates leave-takers' human capital and productivity. Hence, both wages and employment are likely to drop. It is worth stressing that while the drop in wages is uniformly predicted by both viewpoints, one of increased supply and the other of decreased demand and supply, the starting points are different. In the latter, wages drop due to longer periods out of work and decreased productivity of leave-takers.

Empirically, there exist a number of studies utilizing individual level data to determine the effects of leave legislation on wages, employment and occupational

segregation. Using data from Germany, Ondrich et al. (2002) find a substantial decrease of 18% in wages for every year spent on parental leave. Buligescu et al. (2008) conclude that the negative effects of parental leave take-up on wages are fairly minimal or non-existent in the long run while being substantial in the short run. The rebound in wages after an initial decrease upon return from parental leave seems faster than other types of career interruptions. Using data from Nordic countries, Datta Gupta et al. (2008) find negative effects from the presence of long-term parental leave legislation on wages and consequently for career opportunities of women. Supporting the job security approach, Waldfogel (1998) observes that leave coverage diminishes the wage penalty on return for returning women. Long-term absence from work of any kind has negative effects on wages, but it is not clear whether parental leave decreases or amplifies these effects during early motherhood.

The findings with regards to the impact on employment are rather positive. Among aggregate level studies, Jaumotte (2003) has similar findings to those of Ruhm (1998). Female employment rates seem to increase in response to leave legislation, but the positive effects diminish as leave duration is increased. Pronzato (2009) also finds positive effects from leave as the provided job security increases the proportions of mothers returning to work. Making leave paid, however, decreases participation in the first year after birth. The positive labour supply effects of job security found by Pronzato (2009) also diminish with the duration of leave. Leave periods lasting more than a year may have an adverse effect on the return rates, both in terms of lengthening time out of work and decreasing the hazard rates of return in the long run (Ondrich et al., 1996). Despite the generally positive results on participation, there are findings that increased participation rates through generous welfare schemes come at the cost of increased occupational segregation (Mandel and Semyonov, 2005). Occupational segregation as used by Mandel and Semyonov, and examined in this paper, is vertical rather than horizontal. Vertical occupational segregation in a gender context limits career opportunities of women. Mandel and Semyonov (2005) argue that policy induced higher labour force participation among women may lead to a “less selective” female

labour force; increasing statistical discrimination faced by women, which in turn damages career opportunities and wages.

3. Data

Data used in this study is a combination of several sources for EU-15 countries and Norway. Legislative information on leave is a combination of the Comparative Maternity, Parental and Childcare Database (Gauthier and Bortnik, 2001), ILO (2010) legislation archives and a number of articles and previous studies (Plantenga and Remery, 2005; OECD, 2009; Nyberg, 2004). Data conflicts in several cases, usually as a result of differing definitions of maternity and parental leave. In such cases, the definitions laid out in the previous section were used to infer what constitutes different types of leave in a given country. Additional checks on maternity leave were done using the *Social Security Programmes Throughout the World* series. The values for some years were missing between 1999 and 2010, but the years with changes in leave could be found from Eurofound's European Industrial Relations Observatory (2010). In cases where no reforms were registered into Eurofound's observatory, it is assumed that no changes took place.

The basic characteristics of any leave legislation can be summarized through its length, the level of benefits during leave, flexibility options such as part-time leave and eligibility criteria. While it would be ideal to combine and measure the effects of all these characteristics, the focus inevitably shifts to benefits and length. Maternity leave varies little across Europe, with high replacement rates and durations of 14 to 20 weeks. The benefit difference between parental leave and maternity leave can and does vary considerably. One example is provided by the Danish reforms in 2002 which give mothers the right to 18 weeks of maternity leave with a wage replacement rate of 100% and 32 weeks of parental leave with benefits equaling 80% of last earned wages. On the other end of the spectrum, Austrian legislation includes 16 weeks of maternity leave with 100% replacement of last earned wages and 104 weeks of parental leave with low flat rate benefit for the first 78 weeks and no benefits for the last 26 weeks. Benefit levels are important, more so for parental leave,

because they are the main determinant of the take-up rates, which in turn determines the actual impact of leave. The most straightforward method in taking into account these factors would be weighting duration with benefits. Unfortunately, data is difficult to find for benefits in earlier years and longer unpaid leave would be completely ignored. Instead, benefit thresholds are used for weighting parental leave. As summarized in table I, following Plantenga and Remery (2005) leave is weighted by 33% if the replacement level is between 0% and 33%, by 66% if the replacement rate is between 33% and 67% and 100% if the replacement rate is above 67%. Appendix I shows the results of weighing for 2008. The purpose is to capture the increase in take-up rates as a result of increase in benefits. For maternity leave, data on benefit levels in nearly all years is available and is used directly for weighting. As a result the weighted (maternity and parental) leave is calculated as: (Maternity Leave Duration*Maternity Leave Benefits%)+(Parental Leave Duration*Weight%)

- Table I Here -

Several countries' benefits were or currently are flat rate. The lack of data with regards to the benefit amounts requires some interpolation for weighing that may cause under or overestimations. While there are a large number of missing values, Gauthier and Brotnik's dataset puts the flat rate benefits of Belgium and Germany below 33% of the average previously earned wages for most years. For two countries, Austria and Luxembourg, the benefit amount of 2006 and 2007 is calculated as a percentage of the real median wage of the total working population as reported by OECD statistics. In earlier years until 1999, Gauthier and Brotnik's dataset shows no benefits for Austrian parental leave. The 2007 benefit amount is above €600 in Austria and €1840 in Luxembourg. While both values are close to 33% and 66% thresholds respectively, Austrian parental leave is weighed by 33% and Luxembourg's by 100%. This weighted leave variable combining both maternal and parental leave is used as the main independent variable in the analysis section.

There are a few country specific peculiarities in parental leave legislation that should be mentioned. In Sweden and Finland, maternity leave and parental leave legislations are combined in the dataset since their legislation makes little distinction between them. French legislation provides parental leave benefits for second or later child. These benefits are ignored and French parental leave is considered unpaid in the present dataset. Some countries, including Spain and Italy, provide family based parental leave rather than individual entitlements to leave. In such cases all leave is assumed to be taken by the mother. The available figures for take-up rates of men are small for most countries, 5% in Italy and Spain and merely 1% in France (Fagan and Walthery, 2007). Unlike the case in many other international comparisons, individual entitlements to leave are not multiplied by two to arrive at total leave due to the marked difference in take-up rates. Since the interest is on the effects on female labour, the amount available to the mother is the only leave right taken into account.

It is worth stressing the focus on national legislation leaves out employer inputs in designing leave facilities. Collective agreements play a large role in determining the benefits levels in several countries (Plantenga and Remery, 2005). As an extreme example, Dutch legislation for parental leave is unpaid while civil servants are entitled to a 75% of last earnings benefit during their leave. In this case, if women are more concentrated in public sectors which are more likely to use supplementary collective agreements for leave, the effects captured by the changes in official legislation in this study may not be identical to the effects of leave facilities in general.

Figure 2 shows the average durations over time of the three leave variables for EU-15 and Norway. The first is the duration of maternity leave, second of the weighted (maternity and parental) leave and the last line of the longer parental leave.

- Figure 2 Here -

While most leave legislation started with a short maternity leave right of about 3 months, introduction of parental leave policies has complicated the legislative landscape. Some clusters with regard to parental leave legislation are nevertheless visible. Countries like Finland, Sweden and Denmark assume a dual earner family and support their leave legislation with generous allowances. The male breadwinner model was more active in Germany (at least until 2007), Austria, Portugal and Spain. These countries have long durations of leave with low allowances, where one partner can take care of the newborn and the other stays in the labour force. United Kingdom, Ireland and Greece have more market oriented legislations and the state mandated leave duration is short. Netherlands diverges from this minimalistic approach through greater use and rights for part-time work that allows a combination of leave and care, fitting the needs of the prevalent one and a half earner family.

Gendered employment to population rates were drawn from OECD (2010) statistics database. Statistics are available for the entire period between 1970 and 2010 except for missing data in several countries between the years 1970 and 1982. A major problem in studying the impact of parental leave through aggregate participation data is that OECD counts parents on parental leave as employed. This may lead to some overestimations of the labour market effects. OECD database also provides the usual weekly hours worked data for women between the ages 25 and 54. Finally, absolute numbers of working age populations from the OECD database are used in weighting.

Gendered wage data are from ILO statistics (2010) and cover a period between 1970 and 2008. This relatively complete dataset is available only for the manufacturing sector. Data were drawn from both 'Key Indicators of the Labour Market' (KILM), a research tool prepared by ILO, and the underlying database LABORSTA, which has data from years that are not yet in KILM. In general, the data from KILM are used and some additions were made from LABORSTA if no changes to measurement, definitions or surveys were visible between a given country's KILM and LABORSTA data. Unfortunately, no gendered wage data could be found for Spain and Italy. There are also a large number of missing years for each country's dataset. While the manufacturing wage data is the most complete for the period

under study, it comes with strong limitations. The high level of horizontal occupational segregation indicators observed across Europe stems mostly from the concentration of women in public sector or service jobs (Bettio and Verashchagina, 2009). Thus manufacturing wages give a wage indicator for only a small portion of employed women. Furthermore, it is a sector that has downsized considerably in recent years, making it a rather unstable one.

For a small number of countries, namely United Kingdom, Portugal, Finland, Netherlands, Luxembourg and Denmark, there are wage data from different sectors in the period between 1994 and 2008. Out of these sectors, "financial intermediation" has the highest wages in all countries and data drawn from LABORSTA for this sector is used as a proxy for high skill wages. Once again there are some, though fewer, missing years of data. All wage data used in regression analyses have been deflated by the consumer price index and multiplied by the purchasing power parities found in the OECD database to make the values comparable across years and countries. The base year used by OECD in calculating the consumer price index is 2005.

The final labour market outcome studied, vertical occupational segregation, is based on an indicator constructed from data provided by Eurostat (2010). Through labour force surveys, the number professionals, managers, legislators and senior officials are made available. The number of women between the ages 15 and 39 in these jobs as a share of total number of persons working in these jobs within the same age group is used as an indicator for vertical occupational segregation. Data exists for the period between 1992 and 2008. There are only a few missing cases in earlier years.

The evolution of the averages of three of the labour market outcomes studied in this study can be found in figure 3, which shows the gender gaps in wages and employment, and vertical segregation. Wage data used is nominal manufacturing wage data. The results for wages should be interpreted with care because missing cases in various years for different countries can cause a false impression of large changes in the average wage gap. The employment gap shown is between men and women aged 25 to 34. Interestingly, the decline in the employment gap is not fully reflected in a decline in the wage gap, which seems to have

stabilized around 20%. Various demand side and institutional explanations, such as the role of workplace characteristics, have been offered for the puzzling persistence in the pay gap despite decreases in experience and education gaps (Rubery et al., 2005). Lastly, the trend for the shares of employed women working as managers, legislators, senior officials and professionals as an indicator of vertical occupational segregation is mapped out. While there are no dramatic changes, there is a steadily rising trend.

- Figure 3 Here -

4. Methodology

The model setup used is nearly identical to Ruhm's (1998) original DDD model. This section simply provides a summary and describes any changes with regard to the data and model used. The starting difference-in-difference model exploits changes in leave over time. Subscript j denotes country and t time while f and m refer to female and male respectively.

$$Y_{fjt} = a_1 S_f + \beta_1 C_j + \beta_2 T_t + \delta L_{jt} + \gamma_1 S_f C_j + \gamma_2 S_f L_{jt} + \gamma_3 S_f T_j + \varepsilon_{fjt} \quad (1)$$

$$Y_{mjt} = a_1 S_m + \beta_1 C_j + \beta_2 T_t + \gamma_1 S_m C_j + \gamma_3 S_m T_t + \varepsilon_{mjt} \quad (2)$$

Where, Y_{fjt} is the log natural form of a labour market outcome for women, C_j is a country effect and T_t is a time effect. The effects of leave, L_{jt}, are assumed to be exclusive to the treatment group of women. Finally, S_f is the gender specific intercept. To remove endogenous country and time effects, a DDD model is estimated by subtracting equation (2) from (1), which results in:

$$\Delta Y_{jt} = a_1(S_f - S_m) + \gamma_1(S_f - S_m)C_j + \gamma_3(S_f - S_m)T_t + \gamma_2(S_f - 0)L_{jt} + (\varepsilon_{fjt} - \varepsilon_{mjt}) \quad (3)$$

$$\Delta Y_{jt} = Y_{fjt} - Y_{mjt}$$

Simplifying and adding country-specific time trends to avoid biases resulting from gender specific time effects, the final estimation is reached. Ruhm (1998) notes that keeping the age groups constant across men and women would account for cohort effects. Additionally, in all the regressions in section 5, a quadratic term is added along with lags for both leave and leave squared. The quadratic term is added to allow for diminishing or increasing effects depending on the length of leave, rather than limiting the results to linear effects over all lengths of leave.

$$\Delta Y_{jt} = a + \beta_1 C_j + \beta_2 T_t + \delta_1 L_{jt} + \delta_2 L_{jt}^{\ 2} + \delta_3 L_{jt-1} + \delta_4 L_{jt-1}^{\ 2} + \beta_3 C_j T_t + \varepsilon_{jt} \quad (4)$$

For a correct interpretation of the outcomes, a few caveats of the methodology need to be taken into account. So far the notation used is for men as the control group and women as the treatment group. This may not be completely accurate as father's use of available parental leave days has reached nearly 20% in Sweden, up from around 2% in 1978 (Nyberg, 2004). If the take-up of leave has the same effects for men as for women the assumption of $\delta(S_f - 0)L_{jt}$ will not hold and there may be an underestimation if the effect of leave is identical for men and women. Furthermore, households can make decisions jointly, and a decision to work or take leave can have an impact on the labour supply of the partner. Instead of an identical impact on men and women, men could lower their labour supply using parental leave if the participation effect is positive for women. The overall bias, if any, can then be positive or negative. To correct for this bias, older men in the age range between 45 and 54, who may be less likely to use parental leave, are used as the control group. There is no data on the fatherhood distribution of men, and this is simply a guess at the age group where it may be low. Due to differing availability of data between indicators, the age difference

between women and men was only incorporated into the analysis of participation rates. For women, total fertility rates are known for different age groups. Despite heterogeneity, the fertility rates seem to peak either in the 25 to 29 or 30 to 34 age range across European countries. While helping to target the investigation to those who are most likely to be affected by leave legislation, using the rather narrow age range of 25 to 34 leaves out women giving birth on a later age. Since education and motherhood age have been shown to be positively correlated (Hank, 2002), the sample may be skewed towards the less educated. If such women are more responsive to the supply side incentive leave legislation offers or benefit more from job security, this can cause an overestimation of short-term participation effects.

The final point that needs to be mentioned is on weighing. Heteroskedasticity is certain given the difference in population sizes. The results are reported using both ordinary least squares (OLS) with robust standard errors and weighted least squares (WLS) as an additional check. The second uses the weighting procedure employed by Ruhm (1998) that was first worked out by Blackburn (1997).

5. Results

5.1. Participation and Leave

Two different dimensions of economic participation will be taken into account. The first is labour market participation, captured by the employment to population ratios. The second dimension is intensity, referring to weekly hours worked. The results in table II show the effects of weighted leave on the employment to population ratio of women between the ages 25 and 34 and 15 and 64. For the former, the control group used is men between the ages 45 and 54 though results using a control group of men between the ages 25 and 34 are also presented. For the latter, the control group is men aged between 15 and 64; whatever effect parental leave may have on recent fathers, it should be fairly minimal on the full working age sample. Leave variables are lagged twice and lagged variables account for a large portion of the effects. This is most likely because changes in leave legislation might happen mid-year and it takes some time until the labour market fully absorbs their effects.

- Table II Here -

Table II presents the sums of the coefficients for current and lagged leave and leave squared from six different models. The top row shows the age group of women and the control group used. For each combination of treatment and control groups, two models are fitted using robust and WLS specifications indicated in the second row. The final row shows the ρ-values for a joint F-test on all leave related variables including both lagged and current variables for leave and leave squared. The difference between the robust and WLS specifications is small. In all models, the ρ-values show significant positive effects from the leave variables with significant negative effects from the quadratic terms, at least at the 10% level. The positive effects, combined with negative coefficients on quadratic terms, means that participation increases with leave, but the effects diminish with the length of leave. Note that the standard errors presented in parentheses underneath the sums of coefficients are for current leave and leave squared. There is some evidence of a lagged effect as the significance of effects is mostly due to two year lagged leave variables. Models fitted using men between ages 25 and 34 as the control group instead of men aged between 45 and 54 results in positive, but smaller effects. The significance does not change. The smaller effects may be due to underestimation if male labour market behavior in this age group is affected similarly to that of women by leave legislation.

Based on the regression coefficients, it is possible to calculate the estimated effects of different lengths of weighted leave. This gives a rough idea about the optimal levels of leave. Figure 4 plots the effects. The coefficients from the robust standard error estimations are used.

- Figure 4 Here -

Figure 4 shows that the main participation effect of leave is for the fertility concentrated group. The impact on the total employment to population ratio declines

proportionally if the entire female labour force is taken into account. The optimal amount of weighted leave, combining both maternity and parental leave, to maximize employment is 28 weeks for the age group between 25 and 34. The effect at this point is more than 2.5%. The optimal length is slightly smaller, about 6 months, for the 15 to 64 age group and results in an increase in participation of 1.8%. It is unclear how large of an overestimation[2] there is due to counting employees on leave as employed while collecting data for employment to population ratios. According to 1992 data from Denmark, 1.25% of female employment was on maternity leave, including other family reasons this number becomes 2.6% (OECD, 1995). Earlier macro level studies of Ruhm (1998) and Jaumotte (2003) had found about 20 weeks of leave to be optimal. The optimal duration found here may be longer due to the inclusion of unpaid leave rather than only paid leave.

Parental leave may also have an effect on hours worked, if without a period of leave women would prefer shorter working hours to balance their work and family lives. Intensity of work could be measured through several indicators including the rate of part-time work, annual hours worked and weekly usual hours worked. In this paper, weekly usual hours worked is preferred. Part-time work does not differentiate between numbers of hours of work while annual hours worked may be influenced by differences in sectors' vacation lengths. The treatment group is women between the ages 25 and 54. The control group is men between 25 and 54. Table III presents the results.

- Table III Here -

Table III uses the same format as table II. The sums of the lagged and current leave variables show positive effects. The negative effects for the quadratic leave variable indicate diminishing returns. Under both specifications, the effects are significant at the 1% level. A right to 30 weeks of paid leave increases working hours of women by about 6%. Increasing leave duration from 13 weeks to 30 weeks results in a 3% increase in weekly hours worked. The positive results reinforce the notion that without paid parental leave as a time out of

work, women may be pushed into combining work and care through shorter working hours. This can have long lasting effects, considering evidence of strong attachments to contract types whether it is a part-time or full-time contract (Blank, 1989). Parental leave thus provides a policy tool to promote more full-time labour market attachment.

5.2. Wages, Occupations and Leave

Previous studies hint that the positive effects of leave on participation may be overshadowed by its impact on wages and career opportunities. The aggregate effects are studied through three dependent variables; wages in manufacturing, wages in financial intermediation and share of women working as professionals, legislators, senior officials or managers. The former is an indicator for low skill wages, the second for high skill wages and the final for occupational segregation. All three dependent variables are once again in the log-natural form. No differentiation between age groups can be made for the wage data, but the occupational data is for the group aged between 15 and 39. The results of OLS and WLS estimations for all three dependent outcomes are presented in table IV.

- Table IV Here -

Table IV shows results for weighted leave related variables from six different models, once again using the two specifications for each of the measures that are used and indicated on the top row. In all cases the control group is made of corresponding males. The ρ-values on the bottom row indicate significance at least at the 10% level for effects on high skill wages and occupational segregation, with the exception of the WLS specification for occupational segregation. No significant effects could be found for manufacturing wages. In general, the effects on wages and occupations are more concentrated on current leave rather than lagged leave. Compared to supply side factors, demand controlled factors seem to respond faster to legislative change. Figure 5 shows the predicted effects of different durations of leave using coefficients from the robust standard error estimates.

- Figure 5 Here –

The difference between the effects on the two wage categories, manufacturing wages and financial intermediation wages, is striking. While the effects on manufacturing wages are insignificant, financial intermediation wages decrease exponentially as leave length increases, dropping around 7.3% at 30 weeks. The insignificance of the effects on manufacturing wages seems surprising given that Ruhm (1998) had found a negative effect from generous parental leave on manufacturing wages. His interpretation is that the increase in supply, the decrease in human capital for longer rights to leave, and replacements costs would drive wages down. Despite downward pressure on wages due to an increase in supply, the insignificant effects on manufacturing wages can perhaps be explained by their proximity to the minimum or starting wages which would constrain how low wages can fall. In explaining the effects on financial intermediation wages, the increase in supply is simply not large enough; while the positive participation effects were small and diminishing, the negative effects on financial intermediation wages are large and exponential.

The second explanation refers to the impact of human capital. If manufacturing jobs are essentially unskilled, any potential negative effects of long-term interruptions due to parental leave on human capital would be insignificant. Employees in skilled sectors are more prone to suffering from human capital effects of leave take-up. While parental leave legislation protects firm-specific human capital to a certain degree by providing job protection, general human capital will depreciate during leave. The different impact of parental leave on general and firm specific human capital is important if firm-specific human capital and general human capital influence wages in different sectors and skill levels to varying degrees. Using German data, Dustmann and Meghir (2005) conclude that low skilled workers benefit highly from firm-specific tenure, but less so from experience while high skilled workers' wages increase with both tenure and experience. This would suggest that firm attachment and job security provided by leave legislation is more relevant for manufacturing wages than for financial

intermediation wages. Or, stated differently, high skilled wages would be more likely to decrease substantially due to depreciation of general human capital during parental leave.

Cost of training and hiring of replacements for leave takers is the last explanation offered for a decrease in wages due to leave legislation. Considering the increased use of temporary contracts and availability of temporary agency workers across Europe, employers may be less likely to have large replacement costs which would be passed on to potential parental leave takers. Nevertheless, replacement costs can still be substantial in high skill sectors, especially if availability is low. According to Eurostat data from 2009, while more than 15% of employees with a highest education level of secondary schooling have temporary contracts in the EU, this proportion is less than 10% for employees with tertiary education. The difference in availability and costs of hiring temporary workers in manufacturing and financial intermediation sectors might therefore also explain part of the differences seen in effects from parental leave on these two sectors.

Figure 5 also significant negative effects on the proportion of women in high skill occupations. The contraction in demand appears to be large enough to decrease employment in high level occupations even if supply was to increase. A supply contraction argument involving self-selection of women into careers with flat wage profiles could be made based on the large decrease in wages, but requires strong assumptions of perfect information and forward-looking rationality. According to our calculations, the effects on the share of women in high level occupations are small, about -1.5% at 30 weeks, but significant. Effect sizes are rather flat across different leave lengths after 12 weeks. Overall, the two significant findings of this section, vertical segregation and drop in high skill wages, signal a strong contraction in demand for female employees in high skill occupations. The negative effects may be signalling scarcer high skill labour in the economy as a whole as a result of leave legislation.

When interpreting the negative effects, it should be noted that in the 40 years and 16 countries that are analyzed in this paper, all countries had some sort of maternity or parental leave. Thus the significant effects, whether on participation, wages or occupations, are based not on the introduction, but of lengthening or increasing the benefits of leave. Clearly, having

no legislation for leave at all may lead to an even worse impact on wages and occupational segregation, especially if the employers do not provide an alternative.

6. Conclusions and Discussion

Based on the history of maternity and parental leave in Europe, leave legislation in the future is unlikely to see any declines, but will go through further optimization. The general impression that female employment to population ratios are improved through more generous leave certainly helps the case for it, especially if one considers the Lisbon targets that focus heavily on participation rates. The results in section 5 support the idea that job-protected leave can draw women to enter the labour market and increase labour supply (though the effects may be overestimated due to data collection methods). The positive participation effect, however, comes at a cost, as women become less likely to work in high level occupations and receive lower wages when they do. As such, negative demand side effects dominate for high skill workers. Even the rough estimates calculated in this study show that the worsening of high skill wages can be substantial. Compared to Ruhm's (1998) previous estimations, results here suggest a slightly lower increase in employment accompanied by a larger decrease in high skill wages while the negative effect on manufacturing wages becomes insignificant. One redeeming factor is the higher number of hours worked by women when leave legislation becomes more generous.

The analysis this paper has presented is undoubtedly rough, given the aggregate and cross-country nature of the data and the inevitability of large number of missing values. The cross-country perspective has meant that portions of leave schemes are effectively ignored because the focus is purely on national level legislation. Since take-up rates remain unknown in many countries and most of the years of all countries in this study, strong assumptions had to be made to allow for cross-country comparisons and to use men as the control group. Data used is only a proxy for high and low skill wages, indicators for which long running gendered datasets are generally difficult to find. Despite these limitations, the aggregate approach helps place parental leave within the more macroeconomic framework of employment, working

hours and wages. The study thus provides a general indication of the effects it has had and may have over the years in Europe.

According to the results presented, leave policy can be approached in two ways. The first is to exploit the non-linearity of participation effects and aim paid leave of about 20 weeks, including both maternity and parental leave. This would both minimize the negative effects on high skill wages and occupational segregation while providing the bulk of the participation benefits. The second would be to purely concentrate on participation. In this case, a paid leave period of about 30 weeks seems to give the best results, which is longer than previous estimates of 20. The longer leave period suggests that unpaid leave, which was not taken into account by Ruhm (1998), may have a stronger effect than expected. Since positive effects were also found for weekly hours worked, the 30 week option would be particularly preferable in countries where part-time work has a lasting and negative impact on future earnings and career opportunities.

Applying the results to the EU level, the case for extending minimum parental or maternity leave is not strong from a purely labour market perspective. The current legislation of 14 weeks of paid maternity leave and 12 weeks of supplementary parental leave seems to capture most of the positive effects for participation rates. Anything beyond the current minimum is likely to have minimal impact on participation while potentially decreasing wages and causing occupational segregation. Nevertheless, it would be imprudent to design leave legislation based only on labour market effects given the large impact parental leave can have on fertility and child health. Instead, the results of this paper should be used in lieu with findings from research on fertility and health effects of leave to consider the full costs and benefits of parental leave.

Notes:

1. A simple way to show the supply increase would be to consider a wage-utility function containing both pecuniary wages and leave opportunities:

$W = U = U(w, L)$ with the usual assumptions $U_w > 0, U_L > 0\ U_{ww}, U_{LL} < 0$.

For the sake of simplicity, if the returns are linear and homogenous under specific levels of leave and pecuniary wages:

$U = w + L$, if $\frac{U_{w^*}}{U_{L^*}} = 1$. A government increasing leave from 0 to L^* will have increased total gain from work even if wages were to drop. The potential for the increase is greater where wages are higher. A similar model is used by Sinn (2003, pp. 95) in explaining the improvement of working conditions.

2. A very rough estimate can be made by considering total female employment and leave duration. Assuming 1.5 children on average, 6 months of leave take-up and an average of 30 years of working life between retirement and market entrance for an employment to population ratio of 50%, leave take up will account for 1.25% of the EP ratio.

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Appendix I: Parental and Maternity Leave Duration/Benefits in 2008

	Maternity / Paid Leave		Parental Leave		Weighted Leave
	Duration	Replacement Rate	Duration	Weight	
Austria	16	100	104	33	50.32
Belgium	15	77	12	33	15.51
Denmark	18	100	32	100	50
Finland [a]	43.5	90 and 66	112.5	33	67.97
France	16	100	156	33	67.48
Germany [b]	14	100	104	66 and 33	83.16
Greece	17	100	13	33	21.29
Ireland	26	80	14	33	25.42
Italy	21.5	80	43	33	31.39
Luxembourg	16	100	26	100	42
Netherlands	16	100	13	33	20.29
Norway	42	100	52	33	59.16
Portugal	17	100	104	33	51.32
Spain	16	100	156	33	67.48
Sweden	60	80			48
UK	26	35.7	13	33	13.57

[a] In Germany, the recent 2007 reform changed the right to parental leave to one year and the replacement rate to 67%. Parents can opt for spreading the benefit over two years. To take into account both options, first year is weighted by 66% and the second by 33%.

[b] In Finland, a recent reform in 2007 increased replacement rates to 90% in the first 56 days of leave.

Figures

Figure 1: Economic Consequences of Leave

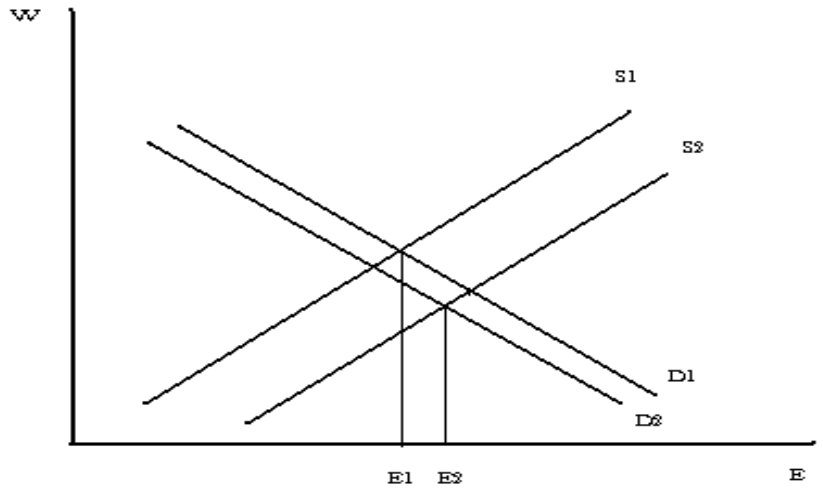


Figure 2: Development of Leave in EU-15 and Norway

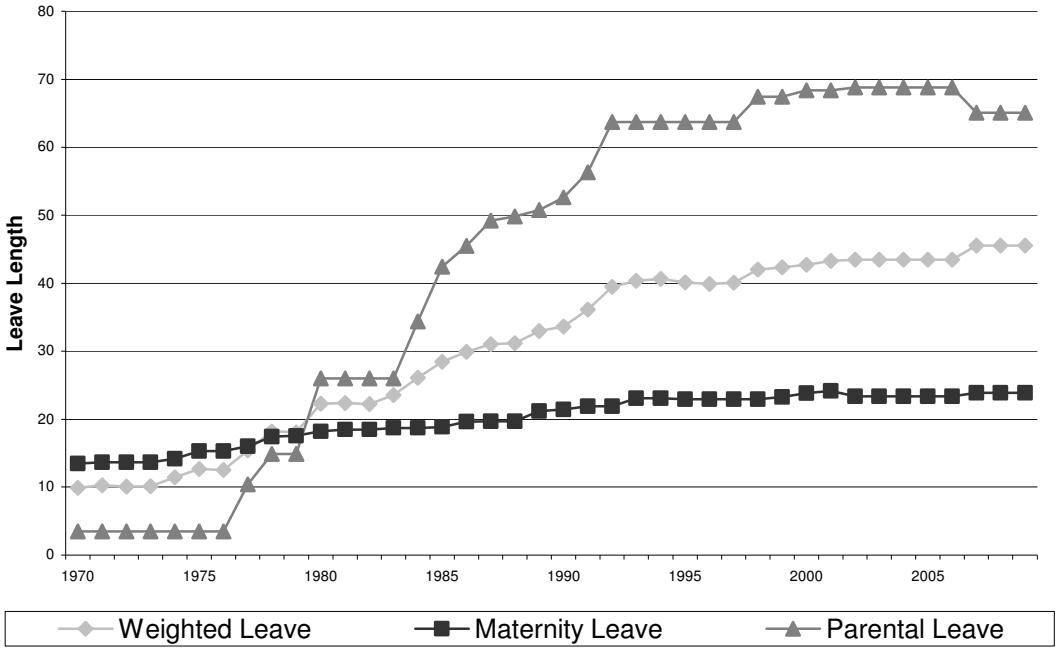
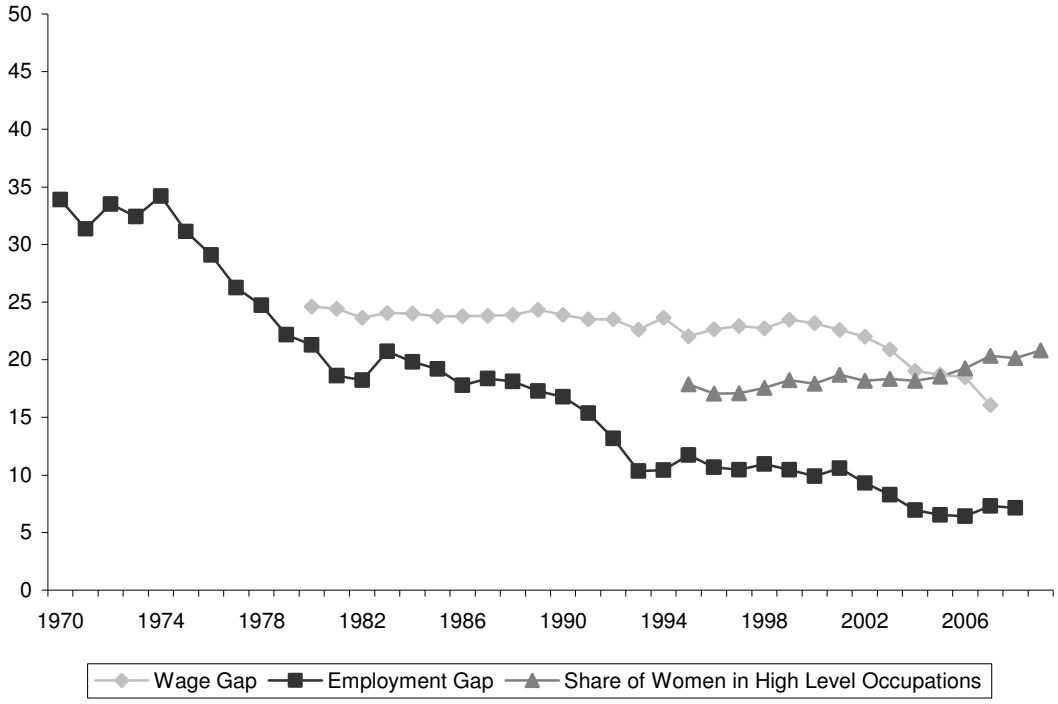


Figure 3: Evolution of Labour Market Outcomes in EU-15 and Norway



Wage gap calculated as the difference between genders as a proportion of male wages: $\frac{(Wage_f - Wage_m)}{Wage_m} * 100$

Employment gap calculated as the difference between genders as a proportion of male employment to population ratio: $\frac{(E_f / P_m - E_m / P_m)}{E_m / P_m} * 100$

Share of women in high level occupations calculated as: $\frac{High_f}{High_{f+m}} * 100$

Figure 4: Participation and Leave

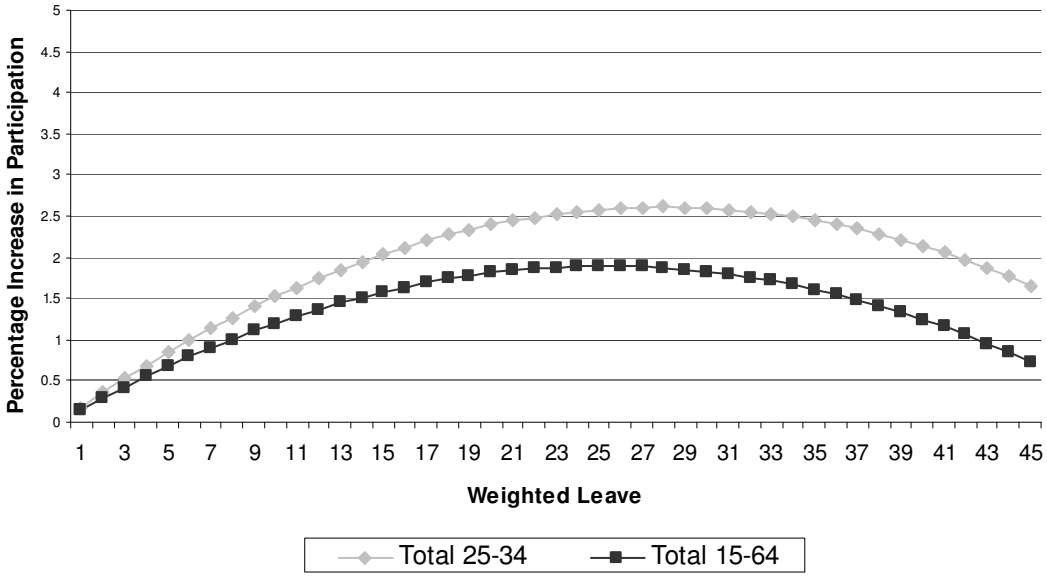
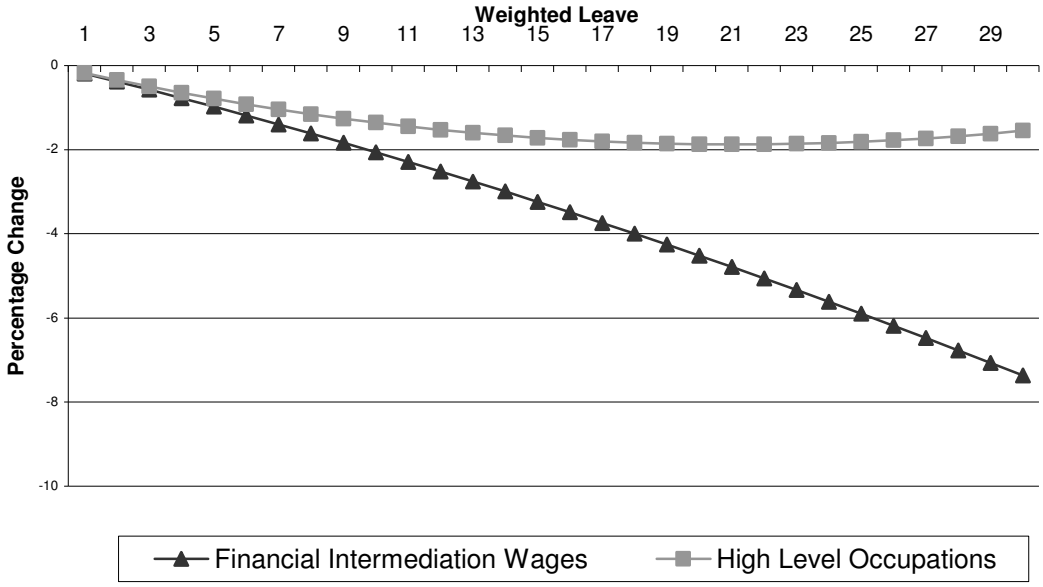


Figure 5: Wages, Occupations and Leave



Tables

Table I: Weighting Leave Durations

Benefit %	**Weight**
0-33%	33%
33-75%	66%
75-100%	100%

Table II: Employment/Participation Ratios of Women and Weighted Leave

Age (Control Group)	25-34 (n=490) (Men 45-54)		15-64 (n=505) (Men 15-64)		25-34 (n=505) (Men 25-34)	
Specification	Robust	WLS	Robust	WLS	Robust	WLS
Leave	0.18 (0.14)	0.19 (0.13)	0.15 (0.09)	0.17 (0.10)	0.09 (0.12)	0.08 (0.11)
Leave^2	-0.33 (0.15)	-0.33 (0.17)	-0.29 (0.11)	-0.31 (0.13)	-0.23 (0.14)	-0.22 (0.14)
ρ-value	0.07*	0.045**	0.06*	0.01***	0.016**	0.0***

"Leave" is weighted leave divided by 100 for ease of interpretation. "Leave^2" is its square.

Change in participation due to a given length of leave is calculated using the formula: $\Delta = \exp(\beta_1 Leave_t + \beta_2 Leave_{t-1} + \beta_2 Leave_{t-2} + \beta_3 Leave_t^2 + \beta_4 Leave_{t-1}^2 + \beta_3 Leave_{t-2}^2) - 1$

Standard errors reported in parentheses are for $Leave_t$ and $Leave_t^2$

ρ-values are from F-tests performed on all leave variables including lagged leave instead of only leave and leave^2

*** p<0.01, ** p<0.05, * p<0.1

Table III: Working Hours of Women and Weighted Leave

Age (Control Group)	25-54 (n=359) (Men 25-54)	
Specification	Robust	WLS
Leave	0.25 (0.05)	0.28 (0.06)
Leave^2	-0.21 (0.06)	-0.22 (0.07)
ρ-value	0.0***	0.0***
30 Weeks Leave	5.95%	6.5%

"Leave" is weighted leave divided by 100 for ease of interpretation. "Leave^2" is its square. Change in working hours for a given length of leave is calculated using the formula: $\Delta = \exp(\beta_1 Leave_t + \beta_2 Leave_{t-1} + \beta_2 Leave_{t-2} + \beta_3 Leave_t^2 + \beta_4 Leave_{t-1}^2 + \beta_3 Leave_{t-2}^2) - 1$

Standard errors reported in parentheses are for $Leave_t$ and $Leave_t^2$

ρ-values are from F-tests performed on all leave variables including lagged leave instead of only leave and leave^2

*** p<0.01, ** p<0.05, * p<0.1

Table IV: Wages and Occupations of Women and Weighted Leave

Dependent	Manufacturing Wages (n=327)		Financial Wages (n=133)		Share of Women (15-39) in High Level Occupations (n=268)	
Control group	(Men)		(Men)		(Men)	
Specification	Robust	WLS	Robust	WLS	Robust	WLS
Leave	0.15 (0.08)	0.15 (0.1)	-0.18 (0.22)	-0.16 (0.37)	-0.18 (0.45)	-0.17 (0.49)
Leave^2	-0.17 (0.09)	-0.17 (0.11)	-0.24 (0.32)	-0.27 (0.5)	0.42 (0.39)	0.39 (0.51)
ρ-value	0.14	0.5	0.0***	0.02**	0.07*	0.58

"Leave" is weighted leave divided by 100 for ease of interpretation. Leave^2 is its square.

Change in an outcome due to a given length of leave is calculated using the formula: $\Delta = \exp(\beta_1 Leave_t + \beta_2 Leave_{t-1} + \beta_2 Leave_{t-2} + \beta_3 Leave_t^2 + \beta_4 Leave_{t-1}^2 + \beta_3 Leave_{t-2}^2) - 1$

Standard errors reported in parentheses are for $Leave_t$ and $Leave_t^2$

ρ-values are from F-tests performed on all leave variables including lagged leave instead of only leave and leave^2

*** p<0.01, ** p<0.05, * p<0.1