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The Effects of Paternity Leave on Women's Labor Market Outcomes

Ann Furbush, Stonehill College

I. Introduction

All developed nations and many developing nations have established some type of parental leave policy aimed at improving women's labor outcomes, parent-child relationships, and children's health and development [Blau and Khan (2013); Olivetti and Petrongolo (2017)]. However, almost all parental leave policies give more leave to mothers than fathers. Focusing parental leave policies only on mothers has negative socioeconomic effects on women through lower wages and increased responsibility in the home that may negate the positive outcomes associated with maternity leave [Blau and Kahn (2013); Rhum (1998)]. The negative effects include an equity issue; two parents have a child, but one (the mother) incurs the majority of the responsibility for childcare. Unequal leave policies also create an efficiency issue in which adverse selection under asymmetric information leads to inefficient negotiated leave contracts. Therefore, I examine if offering egalitarian parental leave, rather than disproportionately maternity leave, distributes the responsibility of a new child more evenly across genders and has a positive effect on women's labor market outcomes.

The unequal distribution of responsibility for a child is reflected in both the gender difference in pay and the gender difference in part-time work rates. Women with children work part-time at higher rates than men or women without children [Daune-Richard (1998); Blau and Khan (2013)].[1] Mothers also experience lower wages than the same comparison groups [Angelov et al. (2016); Waldfogel (1998)]. Encouraging male participation in child rearing through paternity leave entitlements may reduce the gender difference in pay and women's rates of part-time work by dividing the cost of having a child more equally across genders. My study uses the gender wage gap and women's part-time work rates as dependent variables and examines the effects of paternity leave on women's labor outcomes. This work is important because most policy and empirical work focuses on maternity leave's effects on women's labor outcomes and leaves out an important piece of the puzzle: the father.

In the 1980s, there was a significant decline in the gender wage gap due to improved educational opportunities for women and lower levels of gender discrimination [Blau and Kahn (2007); Selmi (2000)]. However, the gender gap in wages still exists and has persisted around the world despite ongoing efforts to converge men and women's salaries [McCarthy (2016); Mandel and Shalev (2009)[2]]. Structural inequalities such as unequal parental leave entitlements or mandates may systematically discriminate against women and allow the gender wage gap to prevail. Identifying these unintentionally discriminatory programs can promote effective policy development that further close the gender gap.

[1] While higher rates of part-time work is generally unfavorable, Hill et al. (2004) find that American mother's working part-time report greater work-life balance than mothers employed full-time and did not report less career opportunity.

[2] Mandel and Shalev (2009) examine glass ceilings for working women by analyzing how welfare affects both class and gender inequality.

While few people outwardly oppose paternity leave, legislators around the world generally focus on maternity leave to help women's labor market outcomes. Today, maternity leave is widely offered around the world. A 2005 International Labour Organization report on 166 countries around the world found that 97% offer paid maternity leave (Ray et al. 2010). However, most countries offer little or no leave for new fathers, likely because of lack of knowledge about the benefits of offering paternity leave, both for parents and children. Supporters of additional maternity leave often cite increased female labor force participation and higher health and development for children as reasons to maintain or add maternity leave policy. Indeed, many studies have indicated benefits of work-family policies for children [Carneiro, Løken, and Salvanes (2011); Rhum (2000); Tanaka (2005)] and mothers [Hyde et al. (1995), Rossin-Slater et al. (2013); Waldfogel (1998)]. While I agree that there are significant benefits of maternity leave, I argue that maternity leave without paternity leave can make women worse off. In many ways, the argument to maintain or lengthen maternity leave policy is backed my empirical work, however, omitting paternity leave from consideration is problematic.

Many men around the world continue to not participate in paternity leave for fear that their time off work would harm their career. A Deloitte survey of more than 1000 people in the U.S found that more than one-third of men feel that taking paternity leave would jeopardize their position at work and more than half feel their leave would be perceived as a lack of commitment (Deloitte 2016). While some of this sentiment may be specific to the U.S., men around the world take less leave than women even when it is offered [Angeleov et al. (2016); Haataja (2009) Selmi (2000).]. While these fears may be validated by the discrimination that exists for women who take maternity leave, I argue that men should take the same responsibility for their child as their female counterpart. It is unfair to expect women to jeopardize their careers to take care of a child and not uphold that same expectation for the other parent. Also, men's participation in parental leave may equalize the discrimination associated with leave across genders. This equalization will lessen the harm of having a child on women's careers. Men may also be less harmed than they expect from the addition of a child if they are basing their expected discrimination on women's observed discrimination because the effects will be more equalized. The potential for parental leave policies to level the playing field between parents only works if men take paternity leave.

Empirical and theoretical works point out the negative socioeconomic effects of one-sided or very generous parental leave policy [Blau and Kahn (2013); Gruber (1994); Olivetti and Petrongolo (2017); Rhum (1998); Thévenon and Solaz (2013)]. While numerous studies have been done about the persistence of the gender wage gap and the negative socioeconomic effects of parental leave policies [Blau and Kahn (2003); Blau and Kahn (2007)], empirical work examining the relationship between paternity leave policy and women's labor outcomes is lacking. Selmi (2000) offers paternity leave as a solution to lessen the gender gap in wages, although his study focuses on the United States and does not consider part-time work. While studies examining the relationship between maternity leave and women's labor outcomes exist [Rossin-Slater et al. (2013); Blau and Kahn (2013)], empirical work analyzing the relationship between paternity leave and women's labor outcomes is lacking. My study controls for factors such as EP ratio and education and uses the gender wage gap and women's part-time work rate as the dependent variables to observe the effects of paternity leave policies on pay and working time gender inequality.

Parental leave policies that focus on fathers may decrease the gender wage gap by eliminating the adverse efficiency and equality effects that arise when leave policy is determined by gender. The gender wage gap indicates the relative difference in earnings for women and men on average. The median wage for women is subtracted from the median men's wage and then divided by men's median wage to calculate the gap. The data used includes only full-time employees and self-employed individuals. I also examine how paternity leave affects women's rates of part-time work, which remain high above men's. Women's part-time work rate is the percentage of women working part-time out of the total population of employed women. Using these ratios as key dependent variables, I observe how parental leave policies affect the gender wage gap and women's part-time work rates on a cross-country basis using a fixed effects model. While the fixed effects model controls for cross-country differences in social expectations and norms, it does not account for changes in sentiment within each country over time. This could bias my results if within country changes in sentiment regarding women are significant in my time period or correlated with leave entitlements in some way. A year control variable is included in some specifications to control for changing in sentiment regarding women or other shocks that might have occurred on a worldwide basis, such as the 2008 financial crisis.

I examine the relationship between the gender wage gap and parental leave entitlements surrounding childbirth for both mothers and fathers. The hypothesis based on theoretical works is: as weeks of paternity leave increase, the gender wage gap decreases when controlling for other factors that affect the gender gap in pay. I also examine the relationship between women's part-time work rates and parental leave entitlements. The hypothesis for these specifications is: as weeks of paternity leave increase, women's part-time work rates will decrease when controlling for the same factors.

I start by discussing the theoretical and empirical work that motivates my hypothesis and discuss various works regarding the gender wage gap, part-time work rates, and paid leave. Literature cited in this portion provides additional background for my hypothesis. I include a discussion of the development of parental leave policies around the world before providing a discussion of data including why I selected the data set. In this portion I also discuss any limitations that are associated with the data I used. I then define the empirical model and various specifications, discuss the results, and conclude.

II. Literature Review

While maternity leave mandates are meant to benefit women, an unintended consequence of offering maternity leave without paternity leave is lower wages and higher rates of part-time work for women relative to their male counterparts. This section evaluates the negative socioeconomic effects of offering maternity leave without paternity leave. The theories and previous empirical work in this section are the basis of my hypothesis that maternity leave contributes to the persistence of the gender pay gap and the high prevalence of women's part-time work and that distributing the time and opportunity costs of having a child more equally between the parents can improve these labor outcome indicators for women.

The two main ways that parents receive job-protected leave following childbirth or adoption: employer-funded and government-funded leave. Employer-funded leave puts the cost of leave on employers but allows employers to consider leave costs in negotiating contracts. Employer-funded leave therefore contributes to pay discrimination based on gender because women are more likely to take leave following childbirth (Selmi 2000). Government-funded leave policies, on the other hand, do not directly impose additional costs on employers. Government-provided polices, also do not allow negotiation between employee and employer regarding leave time and pay. If government policies are generous, like they are in many European countries that offer up to 6 years of job-protected leave in France and Spain, and 47 weeks of full-time equivalent paid leave in Sweden and Germany (Ray et al. 2010), hiring and promotion discrimination against women of childbearing age may exist for high-skilled jobs. Companies may not want to hire and promote women who are likely to have a child and leave the company for months, or even years.

Adverse selection may be a source of market failure with employer-funded leave if some companies offer paid maternity leave and others do not or offer less. The United States' policy offers an example of this situation. In the model, a company that voluntarily offers paid maternity leave will attract a higher proportion of "high-risk" women: women who are likely to have children and use leave. As more high-risk women apply to companies or industries with liberal leave policies, the labor supply that these companies face shifts to the right relative to companies or industries that do not offer leave. The outward shift in labor supply succeeds in the intended goal of increasing the proportion of employed women, but systematically decreases the wages at these companies. The companies with lower wages have more high-risk women, and more women in general, relative to other companies.

When adverse selection based on asymmetric information exists, some type of binding contract or government mandate can enhance efficiency (Aghion and Hermalin 1990). The binding aspect of a contract is crucial for the provision to effectively enhance efficiency. "Binding" in this context means that human behavior changes as a result of the legislation or contract. The Family and Medical Leave Act (FMLA) in the United States, for example, is not binding in many cases and was more of a political statement than effective policy. The United States passed the law in 1993 under the Bill Clinton Administration. It required some employers to offer qualifying women short unpaid leave entitlements. Rhum (1997) found that the contract did little to enhance efficiency as it was not binding and few women gained additional rights to leave. Selmi (2000) even claims that the FMLA's effects have been more negative than positive. According to a 2015 Department of Labor report, only 12% of private sector workers have access to paid family leave through their employer (U.S. Department of Labor 2015).

The FMLA was not binding because many of the employers that were subject to the new legislation were already offering leave entitlements to employees. The fact that so many firms were offering leave without a government mandate to do so suggests that firms may offer parental leave to retain high-skilled workers and employ a profit-maximizing strategy. It is likely, however, that a socially efficient leave time will not be negotiated without some type of external mandate.

Mandated maternity leave may cost companies money because the employer temporarily loses expertise within the company and may have to pay women for their time off and hire and train someone to temporarily fill the vacant position. Assuming that men and women are substitutes in

labor, an increase in the cost of hiring women may lead companies to substitute towards male workers (Rhum 1998). These costs may be especially high for high-skilled occupations in which employee turnover is more expensive due to extensive, costly training for employees and loss of company knowledge. Selmi (2000) finds that employers in the United States assume that women's responsibility in the home will negatively affect her performance in the workplace and make employment decisions according to this assumption. Companies may have incentives to discriminate against women to minimize their chances of incurring these costs. The effect is called statistical discrimination, in which group statistics are used as a proxy for information (Selmi 2000). In this case, all women are adversely affected by women's statistically higher propensity to take time off to raise a family, regardless of each woman's plans or likelihood of becoming a parent. As companies seek to hire fewer women of childbearing age, the demand for women's labor shifts to the left. The shift reduces the number of women in the workforce and their wages. If combined with the outward shift of supply discussed earlier, the changes lead to lower wages for women, while the quantity of women in the workforce depends on the severity of each shift [Summers (1989), Rhum (1998)].

While gender pay discrimination seems likely, antidiscrimination laws may prevent it from playing out in reality to some extent. Many developed nations have some form of legislation banning pay discrimination for the same job. In these cases, discrimination may shift to hiring and promotion discrimination rather than pay. Women may have a harder time finding competitive work and have to settle for lower-paying jobs. Studies indicate that promotion discrimination still exists despite antidiscrimination laws. Women fear they will be punished if they use the full amount of parental leave they are offered because women tend to do worse on performance reviews and have a decreased chance of promotion if they use family leave policies [Mun and Brinton (2015); Glass (2004)]. Antidiscrimination laws also cannot account for women's high rates of part-time work that arise from societal pressures and family structure traditions and norms.

Another market failure may arise because children, not companies, incur the costs of having less parental involvement throughout their early life and yet they are not involved in the creation of the employment contract. Therefore, there may be a social externality that is not considered in the contractual agreement between the employee and the employer. Both firms and/or parents may not fully internalize the value of spending time at home and therefore not consider the full benefits of having a parent at home in their negotiations. Negotiated leave lengths may therefore be shorter than the socially efficient value (Rhum 1998).

These shorter negotiated leaves are problematic as direct parental involvement is associated with positive health outcomes for children. Carneiro, Løken, and Salvanes (2011) find that increased maternity leave in Norway led to a 2.7 percentage points decline in high school dropouts and a 5% increase in wages when the children reached age 30. Breastfeeding rates also drop as women return to work and often fall below the recommended duration (Galtry and Callister 2005). Rhum (2000) found a strong negative relationship between parental leave and infant mortalities. Evidence from the study suggests that parental leave policies are cost-effective methods of improving child health outcomes. Some type of government regulation may then be necessary to ensure that all costs and benefits to the involved parties are more fully internalized in contracts.

Government-funded programs likely take these externalities into account more than employer-funded policies. [3]

Empirical and theoretical works support that privately negotiated contracts lead to inefficiencies if full preferences are not revealed. Levine (1991) indicates that just-cause employment regulations will be underprovided in negotiated contracts because people do not reveal preferences that may be unfavorable to employers. Rothschild and Stiglitz (1976) explain that imperfect information in insurance markets leads to inefficiencies where everyone could be made better off if individuals revealed their information yet they consistently do not. Parental leave negotiations likely have similar qualities because a low-risk woman may have an incentive to signal to the employer that she is not high-risk as to not be discriminated against. High-risk women may then have an incentive to copy the low-risk women and signal that they will not take leave they in fact have the intention of taking so as not to be revealed as high-risk. Over time, the signals from women become essentially useless in equilibrium and employers resort to statistical discrimination based on observed outcomes from a majority group.

Aghion and Hermalin (1990) provide a theoretical analysis of situations when binding restrictions can enhance efficiency. They determine that if one party to a contract has better information than the other, binding restrictions can enhance efficiency. Better-informed parties in a contract may have incentives to signal to the other party. According to Aghion and Hermalin's theory, women are better informed about their probability of becoming pregnant and using maternity leave than their employers. This asymmetric information may cause a market failure. Women who have a low likelihood of using the paid leave have an incentive to signal this preferable behavior to their employers by offering to forgo maternity leave benefits. All women who do not signal may be assumed to be high-risk and expensive hires. High-risk women may have incentives to mimic low-risk women's signals so as not to be considered high risk. Binding restrictions in the form of mandated or publically provided leave benefits may enhance efficiency.

While this type of binding restriction exists in many countries, the one-sided leave mandates of most countries do not promote equality. Many empirical studies have observed the negative socioeconomic effects of offering lengthy maternity leave. Blau and Kahn (2013) find that lengthy maternity leave entitlements lead to higher rates of part-time work and lower-level positions for women. Thévenon and Solaz (2013) find that paid leave positively affects the average number of hours women work but widens the gender gap for full-time workers. Similarly, Kumlin (2007) finds that a sizable percentage of the sex wage gap in both Japan and Sweden is because women hold fewer supervisory roles than men, indicating vertical discrimination. Christopher Ruhm (1998) conducted an empirical econometric study of the economic consequences of parental leave mandates in nine European counties. His evaluation is also based on theories of adverse selection under asymmetric information as a source of market failure. He finds that parental leave entitlements increase employment to population ratio but have little effect on hours worked. The length of the paid leave is significant in its effect on

[3] While most studies indicate positive correlations between parent's time spent with new babies and children's outcomes, some exceptions exist. Dustmann and Schönberg (2012) for example, found no evidence of leave expansion improving children's outcomes because the benefits were offset by the lower household income associated with long leave periods.

wages. Brief leaves had little effect on women's earnings while lengthier leaves were associated with 2-3% decreases in women's relative wages. These findings support the theory that women who participate in lengthy leave may establish their role in the home and never catch up to their male counterpart outside the home and suggests that unequal leave mandates have unintended negative socioeconomic effects on women's labor outcomes.

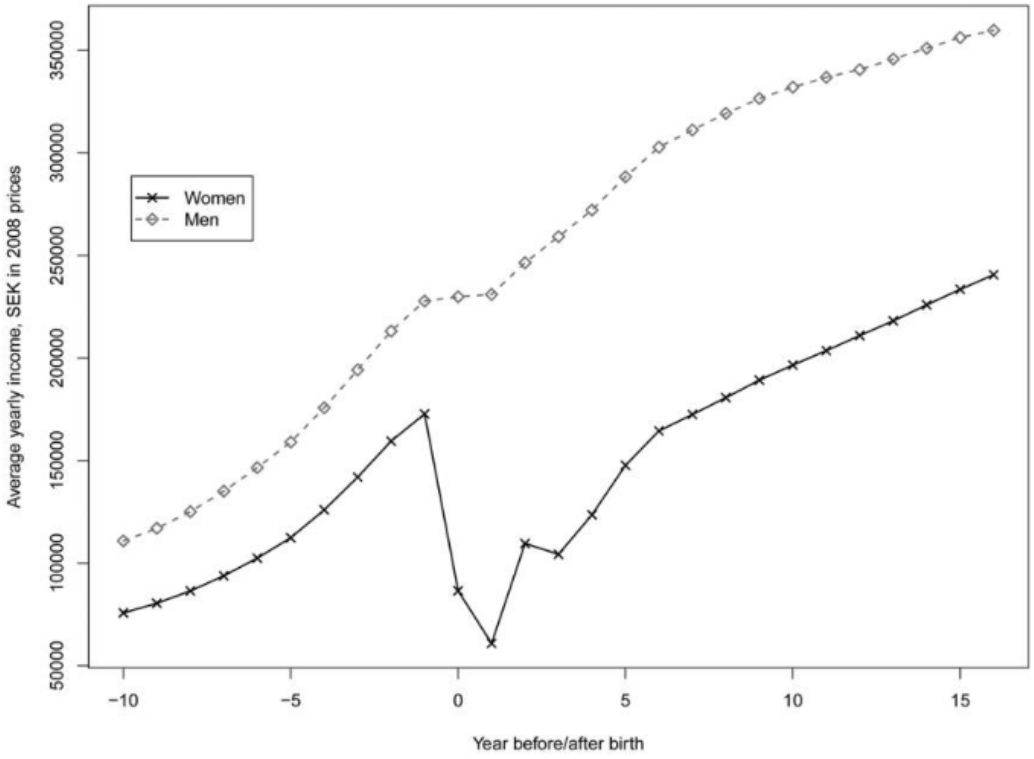
Blau and Kahn's (2013) work along with Rhum's (1998) study indicate that the relationship between maternity leave and the gender wage gap and women's part-time rates may be nonlinear. For example, initial weeks of maternity leave may decrease the gender wage gap as women now have the opportunity to return to work after childbirth. A women's tenure at the same job is therefore not terminated with the addition of a child. However, lengthy leave is associated with lower wages for women as they forgo opportunity for advancement and experience hiring and promotion discrimination during their leave. We do not know the overall effect of maternity leave on the gender wage gap at each leave length because we do not know the magnitude of the positive and negative effects. However, with longer leave times, the negative effects seem to dominate. Similarly, short maternity leave periods may reduce women's part-time work as women have the opportunity to return to their full-time jobs following childbirth. Also, women may be more likely to start working full-time if they can receive maternity leave benefits by doing so. When maternity leave becomes very lengthy, women may have a hard time readjusting to work and balancing work and family responsibilities, increasing the rate of part-time work. A quadratic functional form is included in some specifications of my analysis and allows for an initially decreasing dependent variable as maternity leave weeks increase, but then an increasing trend as the leave becomes lengthier.

There are two ways that paternity leave can affect women within the home. First, offering leave to mothers but not fathers may reinforce traditional gender stereotypes and the male breadwinner model. When women but not men get paid or job-protected time off following childbirth, the women assume more responsibility for taking care of the child than their partner, who continues working.[4] Inequality in caregiving responsibilities reinforces traditional gender roles that exclude fathers from involvement in raising a child (Ray et al. 2010). Women around the world in both developing and developed countries do much more unpaid work than men, such as household chores and childcare [Schwab, Klaus, et al. (2016); Bittman et al. (2003)]. Maternity leave without paternity leave reinforces and perpetuates this asymmetric family dynamic, as women are expected to continue their unpaid responsibilities in addition to their paid work outside the home. Without sufficient help from their partner, mothers may be more likely to work part-time rather than full-time, or forgo opportunities for advancement in their jobs that may be more time demanding. Second, if offering paternity leave decreases the gender wage gap, as women make more money relative to their male counterpart, they gain more bargaining power in the home as their time becomes relatively more valuable (Pollak 2005).

[4] While this is likely true for most occupations, a 2016 study found that in occupations that require intensive skill accumulations early on in a career, gender-neutral family leave policies benefit men more than women. Data from research-intensive universities in the United States led to reduced tenure rates for females and increased tenure rates for males. The study suggests the divergence arises from women using family leave for early childrearing and work in the home while men tend to dedicate the leave time to conduct their research and advance their career (Antecol et al. 2016).

There are also two different ways in which childbirth affects women's high prevalence of part-time work. The first is that discriminatory parental leave policies, whether intentional or unintentional, encourage women to take on more responsibility within the home (Blau and Kahn 2013). An increased role in the home makes work-life balance difficult to maintain and can lead higher rates of part-time work. The second reason that childbirth is associated with higher prevalence of part-time work for women is based on gender differences in social norms and caregiving expectations. On Stephen Dubner's *Freakonomics* Podcast, labor economist Claudia Goldin argues that women value temporal flexibility and do not like competition or value income growth as much as men (Dubner 2016). Women choose part-time work because they participate in much more unpaid work such as caregiving and child rearing [Schwab, Klaus, et al. (2016); Bittman et al (2003)]. Maternity leave that is greater than paternity leave encourages unequal unpaid work distribution across genders because it reinforces antiquated gender stereotypes and traditional family structures.

Studies indicate that the division of household work is sex unequal, especially following the birth of a child. Angeleov et al. (2016) conducted a study in Sweden that observed the gender gap within parent couples. They found extreme decreases in women's income directly after childbirth due to extended parental leave. Women took a substantial majority of parental leave in Sweden, at about 80% of the total entitlement usage. This study supports that women are encouraged to participate in the work force but less intensely or less frequently than their male counterpart as well as the theory that women take on a bigger role within the home after lengthy maternity leaves. Men's wages in Sweden are only slightly affected by the addition of a child while women's wages drop drastically and never regain their original trajectory. The principle finding of the study is that within a couple, 15 years after the birth of the child, the percentage difference between men and women's income is 32% larger than the pre-child difference. The dramatic divergence is represented by the figure below.



(Angeleov et. al 2016)

Most studies in this field focus on the effects of maternity leave on women. While there is evidence that maternity leave benefits women in some ways, other studies contradict this or show that the leave hurts women in other ways [Blau and Kahn (2013); Gruber (1994); Olivetti and Petrongolo (2017); Rhum (1998); Thévenon and Solaz (2013)]. Yet, legislation around the world still focuses largely on women's leave entitlements as a strategy to benefit women.

II. Development of Leave Policies Around the World

Europe

Early employment legislation regarding gender was put in place in the mid 19th century to better regulate working conditions for women in industrialized countries (Olivetti and Petrongolo 2017). These regulations took the form of maximum weekly hours for women and restrictions on employment for married women. However, later in the 19th century, maternity leave legislation was introduced in many European countries (Olivetti and Petrongolo 2017). Until the late 1960s, regulations limited women's labor force participation and were considered more of mandates than entitlements. The regulations seemed to perpetuate the traditional role of women in the home. The discriminatory nature of the leave was especially evident following World War II when men returned from war to find that women had filled many of the male-dominant jobs

while men fought. However, increased women's labor force participation later in the 20th century generated greater demand for maternity leave entitlement (Olivetti and Petrongolo 2017).

The European Union ratified the EU Directive on Parental Leave in 1996, establishing minimum standards regarding parental leave policy and job-protections (Olivetti and Petrongolo 2017). Each member state must offer a minimum of 14 weeks maternity leave with a paid allowance, including 2 weeks of mandatory leave (Ray 2008). Protections against hazardous working conditions, night work, and employment termination due to pregnancy or maternity leave are also part of the EU requirements. While the UK follows the maternity leave standards, it is the only exception to all of these guidelines because it did not sign the agreement (Ray 2008). Switzerland, which is not in the European Union, has some of the least generous family leave entitlements in Europe with no paternity leave and only 16 weeks of maternity leave.

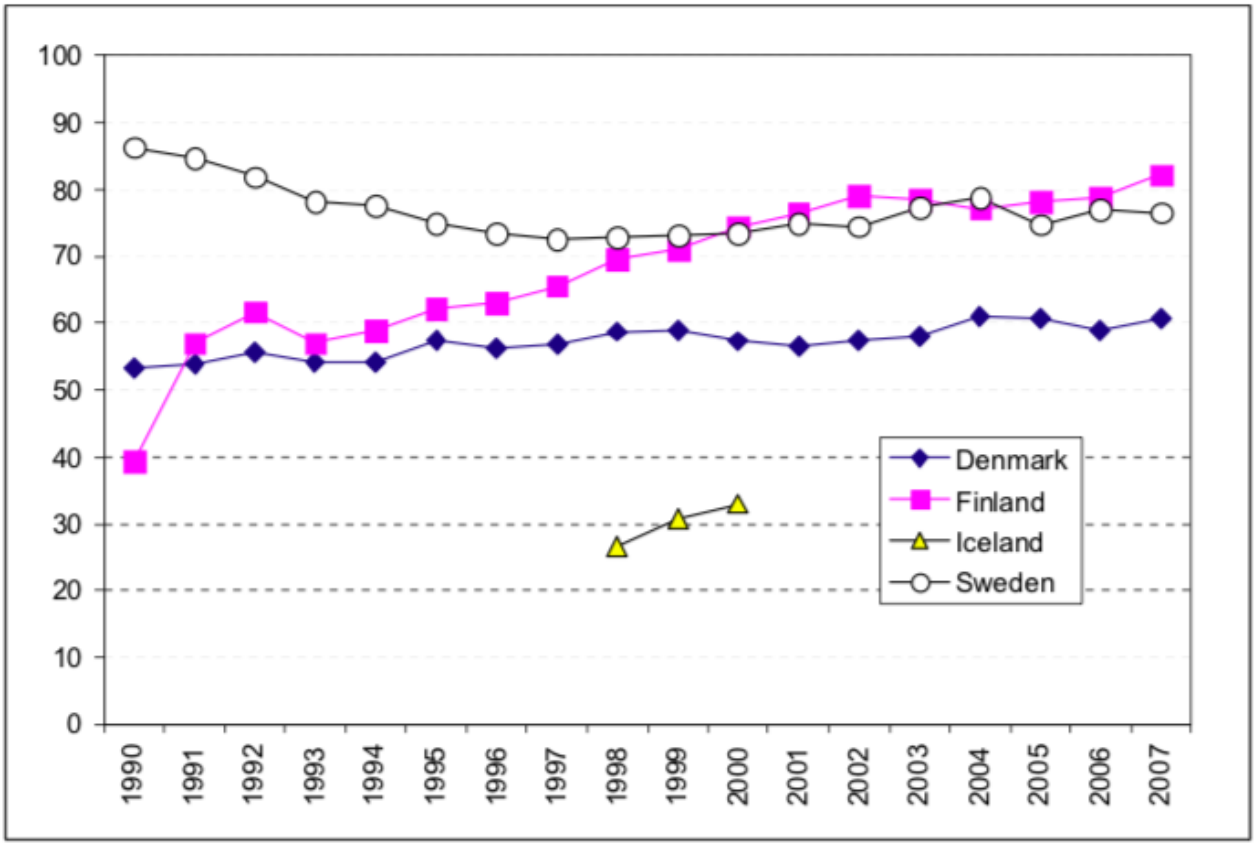
Nordic Countries

Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) lead the world in family-friendly policies and gender equality in many aspects. Three of the four countries that stand out in offering both generous and egalitarian family leave policies are Nordic countries. They are Finland, Norway, and Sweden, with Greece as the fourth (Ray et al. 2010). In many Nordic countries, children are viewed as a public responsibility rather than just a parent's responsibility. Accordingly, policy regarding childcare often spreads the cost of having a child across society as a social investment (Galtry and Callister 2005). For example, job-protected maternity leave was introduced in Sweden as early as the 1930s and paid maternity leave in the 1950s (Galtry and Callister 2005). Sweden was also the first to introduce parental leave and an early pioneer of paternity leave (Gupta et al. 2006).

While Nordic countries have high participation rates for mothers and strict equality laws, some of their generous policies are associated with negative labor outcomes for women such as child penalties on wages and a stagnant gender wage gap [Angeleov et al. (2016); Gupta et al. (2006)]. The programs are also expensive as the Nordic model relies heavily on government funds.

Some research exists examining father's usage rates of paternity and parental leave in Nordic countries. Haataja (2009) find that fathers in Finland use paternity leave the most but share parental leave the least when compared to Denmark, Iceland, and Sweden. The graph from Haataja (2009) below shows the differences in paternity leave use across time and countries. While it looks like fathers in Iceland use very little paternity leave, this is likely because the father's use of shared parental leave is most popular in Iceland (Haataja 2009). Many fathers may therefore be on leave because of the addition of a child but the leave is categorized as parental leave rather than paternity leave. Parental leave is leave that can be shared between parents and is not for the exclusive use of one parent.

Diagram 1. Number of fathers on paternity leave per 100 children born per year in the Nordic countries[a].



(Haataja 2009)

United States

The United States is often criticized for lagging behind other developed countries with regards to family leave entitlements. Indeed, it is one of the only developed countries that offers no paid leave entitlements to new parents. Few federal laws have been enacted to protect or support new parents. In 1978, the US passed the Pregnancy Discrimination Act stating that pregnant women cannot be treated differently than other workers (Gault et al. 2013). Since then, the Family and Medical Leave Act of 1993 provided job-protected leave for mothers and fathers up to twelve weeks. The law, however, does not promise any compensation during the leave and is limited to companies with greater than 50 employees (Gault et al. 2013).

While the FMLA still remains in the US, some states have enacted more generous family leave policy than the federal regulations require. Five states, California, Hawaii, New Jersey, New York, and Rhode Island, as well as Puerto Rico have established Temporary Disability Insurance (TDI) programs that include at least partial wage replacement for new parents while on leave related to pregnancy or childbirth (Gault et al. 2013). Between 2002 and 2013, four states, California, New Jersey, Rhode Island, and Washington state, have also established Family Leave Insurance programs that provide wage replacement specifically for new parents or for care of a

sick family member. Some additional states, such as Maine and Vermont, have passed laws to provide more unpaid, but job protected, leave than the FMLA gives (Gault et al. 2013).

Australia and New Zealand

In Australia, mothers are entitled to 52 weeks of unpaid leave with the option to transfer 1 week to the father, who receives no leave entitlements. The father may be entitled to additional leave if he is the primary caregiver of the child (Ray 2008). Paid maternity leave was not introduced until 2011, making Australia one of the last developed countries to offer paid leave entitlements to new mothers. Fathers are still not entitled to leave unless the mother transfers it to them. Paternity leave is not paid. However, Australia gives a Newborn Upfront Payment, or a baby bonus, to new parents that is not contingent on the use of leave entitlements (Ray 2008).

New Zealand offered 14 weeks of maternity leave in 2000 and in 2016 offered 18 weeks. In 2003, New Zealand started to offer paid maternity leave with a 12-week entitlement and in 2016 all 18 weeks of leave for mothers were paid. In 2003 fathers gained the rights to 2 weeks of paternity leave, which they still have today. No paid paternity leave is provided. Both parents also share 52 weeks of extended leave entitlements, although maternity weeks is included in this 52-week limit (Ray 2008).

Developing Countries

Developing countries are often characterized by traditional gender roles and patriarchal societies. Policy and social norms often reflect these traditional gender norms. However, regardless of development status, most countries around the world offer paid maternity leave. A 2005 International Labour Organization report on 166 countries around the world found that an overwhelming majority (97%) offers paid maternity leave. The only 5 exceptions were Australia, the United States, Lesotho, Papua New Guinea, and Swaziland (Ray et al. 2010). Some of the exceptions have since changed their policies and provide paid maternity leave.

Despite differences in country development status, offering paternity leave seems to help women. A 2016 World Bank study used firm-level data for 53 developing countries and found a strong and consistent positive relationship between paternity leave and women's employment. A conservative estimate from this study indicates that mandating paternity leave increases the proportion of female workers by 6.8% (Amin et al. 2016). Studies like this indicate that the positive effects of paternity leave on women's labor outcomes are persistent across countries of various levels of development.

III. Discussion of Data

My study uses panel data of 30 OECD countries over 17 years. The data spans from 2000 to 2016. The gender wage gap serves as one of my key dependent variables. The gender wage gap is calculated and provided by the OECD. The OECD uses median earnings of men and women relative to the median earning of men to calculate the gender wage gap. The median earnings of women is subtracted from the median earnings of men. This is then divided by the median earnings of men to calculate a gender wage gap in percentage form. The OECD calculation is for

full-time or self-employed workers and does not consider part-time work. Median wage is a reasonable proxy for gender pay discrepancies because it provides an average that is not dramatically affected by outliers.

The wage gap data only includes full-time and self-employed workers. Women, and especially mothers, constitute a large portion of the part-time labor force (Tijdens 2002). There may be a significant difference in wage discrepancies for part-time and full-time work. While having wage data for both could be useful, full time wage differences likely offer a better understanding of pay inequality for skilled workers. In countries where maternity leave is only offered to full-time workers, part-time parents will not receive any compensated or job-protected leave time. It could be more common for mothers with part-time jobs to not return to work after childbirth if there is no compensation or job protection. On the contrary, without job protection or compensation, mothers with part-time jobs may be more likely to return to work sooner as to not lose their position. Women who anticipate being mothers may also not pursue their careers as vigorously if they expect to take on significant responsibilities within the home, leading to more women working part-time even before they become mothers.

The second dependent variable is women's part-time work rates. The OECD defines part-time employment rate as employed people over the age of 15 that work less than 30 hours per week at their main job. This variable, separated by gender, is a proportion of women working part-time out of all employed women and is therefore given in percentage form.

Part-time work data is included as a dependent variable in some specifications to examine the effects of leave entitlement on women's part-time work rates. A limitation of part-time work data is that it does not consider people who work multiple jobs. The indicator counts people as working part-time if they work less than 30 hours at their main job. People who work multiple jobs are considered part-time workers even if their total hours worked in a week exceed 40. This is not an issue for my study if women are still working part-time following childbirth because of their increased role within the home.

Many countries could not be included due to lack of data. The missing data left a data set consisting disproportionately of developed nations. While not ideal, the data included spans countries across the world and across earning levels. A data set consisting of mostly developed nations is still telling of socioeconomic effects of leave entitlements for new parents. Most countries that offer paternal leave are developed nations and adopted their leave policies recently, so observing differences among the countries provides significant variance. The policy variation within countries across time allows for analysis of before and after policy implementation.

The OECD provides parental leave data. For this study, I use both paid and job-protected regardless of pay (both paid and unpaid) weeks of maternity and paternity leave. Some variables include homecare and parental leave as well. Data and explanations of each variable come from the OECD [PF2.5; OECD (2017)]. For clarity and abbreviation, I labeled the variables differently than the OECD. The original label is provided but it is important to note that my variable abbreviations do not always follow the OECD's definitions. For example, the OECD assumes that women take the full amount of shareable leave, but continues to call this variable "parental leave". I use the label Total Maternity Leave (TML) for a variable the OECD

classifies as parental leave, because they assume women use the full shareable leave. I define parental leave as leave for both parents rather than just the mother throughout the paper and will continue to do so. Therefore, maternity leave refers to any leave available to mothers and includes what the OECD defines as parental leave.

Different measures of paternity and maternity leave entitlements are used to examine the relationship between the leave characteristics and the gender wage gap and Women's Part-Time Work Rates. Maternity Leave (ML) is the total weeks of employment-protected maternity leave available to employed women regardless of income support (both paid and unpaid). The OECD labels this variable "Maternity_Weeks". Some specifications use other measures of leave for mothers. Total Paid Maternity Leave (TPML) is the total employment-protected weeks for which a mother can receive payments. It includes what the OECD calls parental leave, which is a flexible leave time that parents can allocate amongst themselves as well as maternity weeks. Any leave that is a "total" includes leave for exclusive use of one parent, parental leave (as defined by the OECD), and homecare leave entitlements. The OECD labels this variable "Total_Paid".

Paternity Leave (PL) is the total weeks of employment-protected paternity leave available to employed men regardless of income support. The OECD labels this variable "Patleave". Paid Paternity Leave (PPL) is the weeks of paid paternity leave available to employed men. The OECD labels this variable as "Patleave_paid". It may be the case that offering any number of paternity leave weeks greater than zero reflects social expectations or incentives for equality. A dummy variable for paternity leave is used to permit the possibility of a step-effect in which the gender wage gap or women's part-time work rates depend on whether the existence of paternity leave has an effect on the dependent variables. For this dummy variable, a 1 signifies that the country offers more than 0 weeks of paternity leave. A zero indicates that the country offers 0 weeks of paternity leave.

Control variables were used to hold constant gender differences in labor force participation and education by gender. Employment to population (EP) ratio served as a proxy for involvement in the labor force by gender. I control for gender discrepancies in education using percentage of the population ages 25-64 that completed tertiary education. The OECD provided data for EP ratio and education. Tertiary education seems like the best proxy for education level because mean years of schooling do not consider the threshold effects of earning a degree. Also, different countries require different years of schooling to earn a degree or start schooling at different ages. Percentage of the population with a tertiary degree by gender therefore seems like a more reasonable comparison mechanism across countries.[5]

A major weakness of the OECD data used in my study is that it reports government policies rather than human behavior. The gender wage gap could be affected by parent's usage of the available leave rather than the policy. For example, if mothers are offered 2 years of maternity leave but most mothers only take half of that, employers may discriminate based on 1 year, the average observed use of leave entitlements, because this is more correlated with the costs they

[5] Within some countries, there may be a correlation between parental leave weeks and higher education. For example, in the U.S., women with a college education are more likely to be offered maternity leave than women without a degree because high-skilled workers often work at companies that are more likely to offer leave (Waldfogel 1998).

will incur. Usage rates likely differ in different countries based on societal norms and expectations. Haataja (2009) finds significant difference in usage rates even across culturally alike Nordic countries. It is assumed in this study that all parents take the full extent of the job-protected or paid leave they are given, or at least the same proportion of what they are offered, although this is not the case for every individual and is not consistent across countries. Some parental leave variables are more likely to overstate actual usage rates and bias results than others. Paid leave, for example, may be more highly used than unpaid leave, so total available leave regardless of pay may overstate the actual leave taken. Women and men may also have different usage rates within the same country based on the social expectations in that country.

My data also limit me to country averages while there may be regional discrepancies among countries. In Canada, for example, parental leave is established on a provincial rather than national level and in the United States, some states offer leave in addition to the federally established protections [Ray (2008); Gault et al (2013)]. Because every country has very different leave policies, not all policy outcomes are captured in the data. My data include only federal leave policies. Complex leave policies that allow parents to divide leave between them dynamically or offer different leave lengths depending on the number of children are also not reported perfectly in the data. It may be relevant to note, for example, that France offers different length paid leave for mothers and fathers for some years included in the sample depending on the number of children. For this study, I used data for first child to not overstate paid leave length for parents with only one child. Using this shorter leave period understates the amount of leave that parents with two or more children take. Many countries, such as Austria, Belgium, Denmark, Finland, Germany, the Netherlands, Norway, Portugal, Spain, and Sweden, allow parents to combine leave-taking and part-time employment (Ray 2008). The combination keeps parents involved with their work while still working reduced hours. Policies such as these are not perfectly accounted for in the OECD data.

Summary statistics are reported in the appendix. The highest gender wage gap in my study is Korea in 2000 with a gap of 41.65%. The minimum is in Hungary in 2006 with a gap of 0.3844%. A.2 and A.4 show that gender wage gap average was 20.15% in 2000 and 18.95% in 2016, decreasing slightly. However, the OECD only had data for 7 countries' gender wage gaps in 2016. Summary statistics for 2015 in A.3 has 18 observations and reports a mean gender wage gap of 15.78%, indicating that the gender wage gap has reduced slightly. The average gender wage gap for all 17 years is 16.35%, as shown in A.1.

A.6 shows the mean gender wage gap for each year included in my data set. While there is some fluctuation, there is no distinguishable trend. The gender wage gap seems to remain relatively stagnant around the mean for all years, about 16.35%. During years of low gender wage gaps, there may have been a financial or social shock that spurred global change for women in the work place. To account for any shocks to the world economy, such as the 2008 financial crisis, or changes in sentiment that occurred on a worldwide scale, I use year controls in some specifications.

Cross-country studies in this field generally have some limitations. Country-specific antidiscrimination legislation, social trends, or other exogenous factors may impact wages or women's rates of part-time work. Microeconomic or country specific models may be more precise in observing the effects of parental leave on women's relative wages as they can control

more specifically for different country factors (Olivetti and Petrongolo, 2017). For my study, a significant limitation may come from the lack of control for changes in sentiment over time within each country, despite the fixed effects and year controls. The fixed effects model controls for differences in country sentiment regarding gender or cultural differences across countries. The year controls help keep constant any global changes that may have affected the dependent variables in a certain year. However, there is no control in place to consider changes within each country over time.

A.7 shows the mean gender wage gaps by country. There is significant variation in gender wage gaps across countries. For example, the two Asian countries in the data, Japan and Korean, report much higher gender wage gaps than the other countries included. Most Nordic countries, on the other hand, report relatively low gaps. These drastic changes are likely due to cultural differences in gender norms and social expectations. The fixed effects model helps control for the inherent differences in culture or traditions regarding gender across countries.

A.1 reports that the mean women's part-time work percentage is 25.73% while men's is significantly lower at 7.84%. Women's part-time work increased slightly between 2000 and 2016 from 24.51% to 25.74%. Men's part-time work also increased during that time from 6.26% to 9.31%. A.8 demonstrates the consistency over time of the dramatic difference between men and women's rates of working part-time.

The highest Total Maternity Leave was 208 weeks in Poland in 2013; it has since dropped to about 204 weeks. The highest Total Paid Maternity Leave was in the Czech Republic with 214 weeks, although this number has since dropped to 110 weeks. The Czech Republic also offers the highest Total Paternity Leave of 156 weeks. Country Tables A.9 and A.10 in the Appendix provide raw data for the countries included in both 2000 and 2015 to observe how policies and the gender wage gap changed. In general, offering paternity leave is more prevalent in 2015 than in 2000. A.11 shows the mean leave policies for mothers and fathers over time. While both increase over time, mean paternity leave only exceeds 1 week in 2016. Many countries still do not offer any paternity leave, keeping the mean leave for fathers very low. Maternity leave averages vary between 15 and 20 weeks, but steadily increase over time.

IV. Empirical Models

Previous literature and theoretical models suggest that paternity leave can reduce the gender wage gap. To test this hypothesis, I examine the Gender Wage Gap (GWG) for country i in year t using the following equation:

$$GWG_{it} = \beta_i + \beta_1 ML_{it} + \beta_2 PL_{it} + \beta_3 (ML_{it} * PL_{it}) + \beta_4 MLsq_{it} + \beta_5 DifED_{it} + \beta_6 DifEP_{it} + \varepsilon$$

Because the gender wage gap is a ratio expressed as a percentage, the independent variables coefficients represent the percentage point change in the gender wage gap based on a one-unit change in that variable. For example, if the coefficient for maternity leave is negative 1, that means that each additional week of maternity leave reduces the gender wage gap by 1 percentage point, so for a country with the mean gender wage gap of 16.35%, the additional week of maternity leave would reduce the gap to 15.35%, a 6.11% decrease from the mean.

The gender wage gap variable only captures full-time or self-employed individuals. As it is likely that leave entitlements also affect part-time work rates, I also examine the relationship between paternity leave entitlements and women's part-time work rates. To test this hypothesis I examine Women's Part-Time Work Rates (WPT) for country i in year t using the following estimation strategy:

$$WPT_{it} = \beta_i + \beta_1 ML_{it} + \beta_2 PL_{it} + \beta_3 (ML_{it} * PL_{it}) + \beta_4 MLsq_{it} + \beta_5 DifED_{it} + \beta_6 DifEP_{it} + \varepsilon$$

Similarly, women's part-time work is in percentage form. The interpretation of the coefficients is therefore similar to that of the gender wage gap specifications. A coefficient of negative 1 for the maternity leave variable would mean that each additional week of maternity leave reduces women's part-time work rate by 1 percentage point. With a mean women's part-time work rate of 25.73%, a coefficient of negative 1 for maternity leave would translate into a 3.89% reduction in the dependent variable.

I interact maternity leave and paternity leave weeks to discern the effects of nondiscriminatory entitlement leaves and see how the two factors together affect the gender pay gap. The interaction term (ML*PL) is used to test if the gender wage gap is affected by maternity and paternity leave together. Almost all countries offer maternity leave, so the interaction shows the effect of paternity leave in the presence of maternity leave. Maternity leave is included to eliminate bias on the paternity leave coefficient. The interaction tests if paternity leave's effect on the dependent variable depends on maternity leave. The term is useful to examine if adding paternity leave negates the negative effects of maternity leave on women. Different maternity and paternity leave variables are interacted in different specifications.

Control variables in my study include employment to population (EP) ratio and education (ED) level. The EP ratio is separated by gender so that women's EP ratio is the percentage of women employed relative to the country's total population of women and men's EP ratio is the percentage of men employed relative to the country's total population of men. To observe how a divergence of these factors by gender affects the dependent variables, I use the difference between men and women's EP ratio as the control variable. I use this difference because the wage gap is likely more affected by how different men's and women's EP ratios are than just the EP levels by gender. As the difference in EP ratios by gender increases, meaning that men are participating in the labor force more than women, I expect the dependent variables to also increase.

Similarly, I use the difference between men and women's education levels as the other control variable. As a proxy for education levels, I use percentage of women and men with a tertiary degree. Therefore the difference in education is the percentage of men with a tertiary degree relative to the total population of men minus the percentage of women with a tertiary degree relative to the total population of women. I use this difference to examine how the gender wage gap changes as the difference between men and women's education changes. I expect a larger difference in education levels by gender, meaning that men are more educated than women, to lead to a both a higher gender wage gap and higher rates of part-time work for women.

V. Results

Tables in the appendix display regression results. Stars are used to indicate significance levels of coefficients. One star indicates a p-value ≤ 0.10 while two stars indicate a p-value ≤ 0.05 and three stars indicate a p-value ≤ 0.01. Standard errors are reported in parenthesis underneath coefficients. Dependent variables are reported at the top of the tables and R-squared values and number of observations are included at the bottom.

Table 1 displays econometric results from a benchmark specification examining the relationship between the gender wage gap and leave entitlements without controls. The effect of maternity leave varies depending on the definition of the maternity leave. Figure 1 shows the relationship between the gender wage gap and maternity leave, indicating a mostly negative relationship, although it appears to be nonlinear. Paid maternity leave offers mixed relationship depending on whether year controls are included. Figure 3 shows the relationship between the gender wage gap and total paid maternity leave, which appears to be weaker than paid paternity leave's relationship with the gender wage gap shown in Figure 4. As expected, all paternity leave variables have negative coefficients, although levels of significance vary. Regressions with year controls display weaker and less significant coefficients. Cross-national time trends captured by the year control may affect the gender wage gap. R-squared values increase significantly with the addition of year controls, suggesting they improve the regression analysis. Nevertheless, these initial results indicate that additional weeks of paternity leave reduce the gender wage gap. Figures 2 and 4 also indicate a negative relationship between paternity leave and the gender wage gap, suggesting that paternity leave entitlements reduce the gender gap in wages.

Control variables make regression results presented in Table 2 stronger than those is Table 1. Table 2 displays regression results examining the relationship between the gender wage gap and leave entitlements when controlling for differences in education and EP ratios between genders. With these controls, all maternity leave factors have negative coefficients in every specification. However, total paid maternity leave is not statistically significant. The results indicate that the positive effects of maternity leave (resulting in a negative relationship with the dependent variable) dominate the negative effects in regards to reducing the gender wage gap, leaving an overall positive effect. Results once again indicate that paternity leave factors significantly reduce the gender wage gap. The magnitude of the coefficients for paternity leave is significantly higher than those of maternity leave variables, indicating that each additional week of paternity leave has a greater effect in reducing the gender wage gap than additional weeks of maternity leave. Year controls continue to lessen the magnitude of the effects of parental leave policies on the gender wage gap as well as significance levels. However, the direction of the relationship remains consistent and with the addition of control variables, the effects of adding year controls on the R-squared term is much less significant than in Table 1.

Key results from Table 2 indicate that an additional week of paternity leave reduces the gender wage gap by 1.08 percentage points, or a 6.61% reduction from the mean, when controlling for differences in education and employment to population ratio. The dummy for paternity leave indicates that offering any length of paternity leave entitlements greater than 0 reduces the gender wage gap by 1.65 percentage points (10.10% reduction from the mean) and is statistically significant.

Table 3 displays results using an interaction term to examine if the effects of paternity leave on the gender wage gap depend on the presence of maternity leave. The interaction is used to test if the effect of paternity leave on the gender wage gap is different for different levels of maternity leave. The first column's regression results show that the effect of paternity leave on the gender wage gap is -0.3408 + -0.0003*maternity leave. The very small coefficient on the interaction term suggests that paternity leave's effect on the gender wage gap is largely independent of maternity leave. Results throughout this table are inconsistent and statistically insignificant. In the absence of paternity leave, the effect of maternity leave on the gender wage gap changes directions and is not significant. Similarly, in the absence of maternity leave, the effect of paternity leave on the gender wage gap is inconsistent. However, there is no country included in my study that offers no maternity leave but some paternity leave, so this result may not have practical value.

Table 4 shows regression results that include the nonlinear functional form for maternity leave. Figure 1 suggests that the relationship between the gender wage gap and maternity leave may be quadratic and decreasing at a decreasing rate. However, the squared term for maternity leave is neither statistically nor economically significant in any variation. A possible explanation for this insignificance is the potential for overestimating leave usage, which is amplified by squaring the variable and dilutes its significance. For example, if women are consistently not using the full amount of leave they are offered, employers may not discriminate based on the full length of weeks. Paternity leave continues to have a negative relationship to the gender wage gap in every specification and regardless of year controls. However, year controls eliminate the significance of the paternity leave variables. Interestingly, when including maternity leave squared term, the coefficient for maternity leave becomes positive in every instance. However, none of the maternity leave coefficients are significant in affecting the gender wage gap in this model.

Table 5 displays econometric results of the effect of parental leave entitlements on women's part-time work rates. Without the control for EP ratio, Table 5 regressions pick up on women who joined the work force. In all statistically significant instances, maternity leave increase women's part-time rate, suggesting that the negative effects of maternity leave dominate the positives in regards to women's part-time work rate. Figure 5 shows the mixed effects of maternity leave on women's part-time work rates. Total paid maternity leave has negative coefficients, although it is not consistently statistically significant. Figure 7, however, suggests a strong negative relationship between total paid paternity leave and women's part-time work rates. Paid leave may be more effective in encouraging women to join the full-time work force than just job-protected leave.

Paternity leave has mixed results in this specification, as the coefficient signs are inconsistent and not statistically significant. However, Figure 6 reveals a negative relationship between paternity leave and women's part-time work rates. Figure 8 also illustrates a negative relationship when examining paid paternity leave and women's part-time work rates.

Table 6 seems to offer a better econometric model and controls for differences in education and EP ratio by gender. R-squared values are significantly higher and the controls are significant in most cases and maintain consistent coefficient signs. In this model, maternity leave maintains positive coefficients, signifying that an additional week of maternity leave increases women's part-time work rates. This relationship is likely because women who take long leaves have

difficulty readjusting to work and be more likely to reduce their hours to maintain work-family balance. The coefficients, however, are very low indicating little effect on women's rates of part-time work, despite moderate statistical significance. Total paid maternity leave continues to show a negative relationship with women's part-time work, suggesting that paid leave entitlements encourage women to work full-time. These results are consistent with other empirical work. Rossin-Slater et al. (2013) find that additional paid maternity leave entitlements given by the state of California in 2004 increased hours worked for mothers of 1-3 year-old children by as much as 10-17%.

Paternity leave factors have negative coefficients in every variation when controlling for differences in education and EP ratio by gender, signifying that additional weeks of paternity leave reduce women's part-time work rates. This relationship likely arises from the more equitable distribution of unpaid work as men spend more time at home and parents develop more equitable household responsibility divisions. One additional week of paternity leave reduces women's part-time work rate by 1.39 percentage points, or 5.40% of the mean rates of part-time work for women when including year controls. A corresponding additional week of paid paternity leave reduces women's part-time work rates by 1.47 percentage points, or 5.71% of the mean. Year controls seem to be significant in regressions with part-time work as the dependent variable. This is likely because rates of part-time work vary more quickly across years than the gender wage gap, which moves more slowly and may be less affected by a shock in a certain year.

Table 7 displays an econometric analysis of parental leave entitlement's effect on women's part-time work rates including the maternity leave squared term. Figure 5 suggests that this functional form describes the relationship between the two variables, as a quadratic line fits the trend. However, the squared maternity leave variable is completely insignificant in describing women's part-time work rates in the regression results. Interestingly, the coefficients on maternity leave show no almost significance with the addition of the squared term. Other variables follow the same patterns as previous specifications. Maternity leave weeks increase women's part-time work rates while total paid maternity leave reduce them. Paternity leave consistently reduces the gender wage gap in all circumstances. Interestingly, the coefficients on paternity leave in this table are larger than they were without the squared term.

VI. Conclusion

My analysis supports the hypothesis that paternity leave has positive effects on women's labor market outcomes. Each additional week of paternity leave reduces the gender wage gap by 1.08 percentage points (6.61%) when controlling for educational and EP ratio differences by gender. When maternity leave weeks are at the average, the dummy variable revealed that offering paternity leave reduces the gender gap by 1.65 percentage points (10.10% from the mean). Offering paternity leave distributes the cost of having a child more evenly across genders and converges men and women's earnings.

This study implies that increasing paternity leave could reduce the gender wage gaps. The magnitude of the coefficients is higher for paternity leave than maternity leave in all

specifications with the gender wage gap as the dependent variable. Paternity factors were also consistently more statistically significant. This comparison suggests that offering an additional week of paternity leave entitlements reduces the gender wage gap by more than offering an additional week of maternity leave. Many people continue argue that offering maternity leave benefits women and parental leave legislation reflects that belief. I argue that the effects of maternity leave on women are mixed and that additional paternity leave is more effective in benefitting women than additional maternity leave.

Policy that focuses on paternity leave rather than maternity leave may be more effective in reducing the gender wage gap. Men may also benefit from the option to spend more time with their children as male sentiment towards family responsibility and involvement seems to be shifting (Parker and Wang 2013). In many societies, modern ideologies and family dynamics reject antiquated gender roles and stereotypes but regulations have not adjusted and have led to systematic gender discrimination.

Paternity leave also reduces women's rates of part-time work. Each additional week of paternity leave reduces women's part-time work rate by 1.39 percentage points, or 5.40% from the mean. Similarly, each additional week of paid paternity leave reduces women's part-time work rates by 1.47 percentage points, or 5.71% from the mean. Maternity leave, on the other hand, was found to increase women's part-time work. Lengthy maternity leave likely makes returning to work more difficult for mothers and establishes unequal parenting and unpaid work habits among couples. Paid maternity leave, however, consistently reduced the incidence of women's part-time work, suggesting that paid leave entitlements entice women to work full-time. Paid maternity leave may therefore be an effective strategy for reducing women's part-time work rates in addition to paternity leave.

In summary, offering paternity leave can help counter the negative socioeconomic effects of maternity leave such as lower wages relative to men and high rates of part-time work among women. Paternity leave encourages a more equitable distribution of the cost of having a child across genders. While this study has limitations, the implications are profound and I hope my work opens the door for future research into the benefits of paternity leave and the potential for nondiscriminatory parental leave policies to converge men and women's wages and reduce women's part-time work rates.

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VIII. Appendix

A.1
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender Wage Gap	372	16.35196	7.747934	0.384387	41.65435
Women's Part-Time Work	492	25.73484	12.53727	2.317741	61.14087
Men's Part-Time Work	492	7.842986	3.747201	0.9892323	19.50062
Maternity Weeks	510	17.85882	9.965491	0	52
Total Maternity Leave	510	82.77565	55.33667	8	208
Total Paid Maternity Leave	510	53.67517	51.15303	0	214
Paternity Leave	510	0.8162465	1.089693	0	5
Paid Paternity Leave	510	0.6860504	1.063333	0	5
Total Paternity Leave	510	25.46367	36.98909	0	156
Total Paid Paternity Leave	510	6.265741	11.24703	0	52.6
Men's Education	477	28.1381	10.07592	7.304782	50.33536
Women's Education	477	29.39666	11.73509	6.741281	62.38523
Difference in Education	477	-1.258567	6.333508	-15.39836	19.49305
Men's EP Ratio	510	74.01012	6.332544	56.66901	89.48445
Women's EP Ratio	510	59.59124	11.28467	22.31909	83.42941
Difference in EP Ratio	510	14.41887	8.985547	0.9596687	45.50648

A.2

Summary Statistics in 2000

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender Wage Gap	17	20.15425	8.824774	7.166556	41.65435
Women's Part-Time Work	28	24.50963	12.74466	2.870459	57.32316
Men's Part-Time Work	28	6.260278	3.107216	1.001951	13.10055
Maternity Weeks	30	15.76192	7.854398	0	40
Total Maternity Leave	30	79.10914	58.10362	8	176
Total Paid Maternity Leave	30	51.47858	59.5423	0	214
Paternity Leave	30	0.5409524	1.035606	0	4
Paid Paternity Leave	30	0.4742857	1.00228	0	4
Total Paternity Leave	30	17.95555	32.37572	0	156
Total Paid Paternity Leave	30	3.41873	7.369106	0	26.4
Men's Education	26	22.68767	9.047675	7.579196	37.65869
Women's Education	26	20.67093	9.662583	6.741281	42.53361
Difference in Education	26	2.016745	5.685634	-6.470846	19.49305
Men's EP Ratio	30	75.08439	6.681101	61.23348	88.18673
Women's EP Ratio	30	56.96672	12.03986	26.16301	80.99274
Difference in EP Ratio	30	18.11767	9.898807	4.106882	45.50648

A.3

Summary Statistics in 2015

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender Wage Gap	18	15.78607	7.465285	5.836048	37.17628
Women's Part-Time Work	29	26.01081	12.47606	5.954801	60.73372
Men's Part-Time Work	29	9.348121	3.866483	2.542506	19.50062
Maternity Weeks	30	19.08762	11.13522	0	52
Total Maternity Leave	30	85.62332	56.461	12	203.6667
Total Paid Maternity Leave	30	52.56888	43.9882	0	164
Paternity Leave	30	0.9642857	1.099771	0	4
Paid Paternity Leave	30	0.817619	1.087163	0	4
Total Paternity Leave	30	31.63608	39.91558	0	156
Total Paid Paternity Leave	30	9.067299	14.30433	0	52.6
Men's Education	30	32.47114	9.917736	15.26284	49.55892
Women's Education	30	36.70991	11.2212	15.25528	61.06368
Difference in Education	30	-4.238769	6.261986	-14.87932	8.933701
Men's EP Ratio	30	73.60898	6.304878	59.28031	86.58771
Women's EP Ratio	30	61.83964	10.78201	30.51401	81.83026
Difference in EP Ratio	30	11.76934	8.109595	1.964272	39.28322

A.4

Summary Statistics in 2016

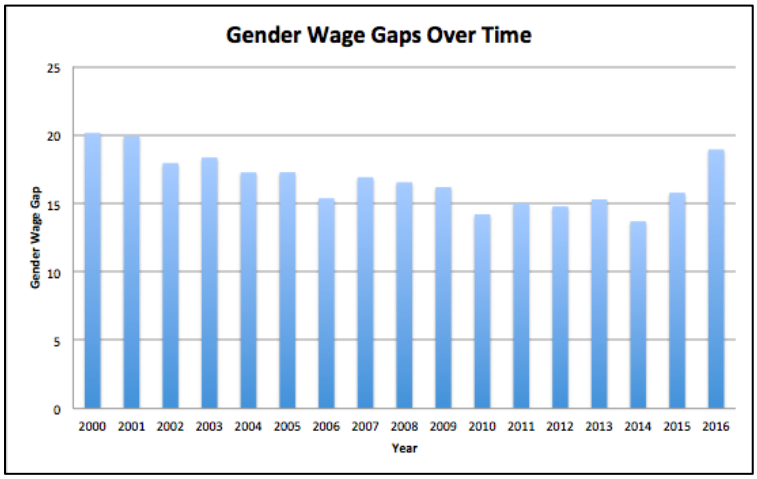
Variable	Obs	Mean	Std. Dev.	Min	Max
Gender Wage Gap	7	18.94885	7.950126	13.89918	36.66667
Women's Part-Time Work	29	25.74539	12.37676	5.491632	59.78325
Men's Part-Time Work	29	9.310477	4.069405	2.572278	18.69839
Maternity Weeks	30	19.09714	11.03088	0	52
Total Maternity Leave	30	85.62332	56.461	12	203.6667
Total Paid Maternity Leave	30	52.49269	43.91453	0	164
Paternity Leave	30	1.037619	1.185999	0	5
Paid Paternity Leave	30	0.8909524	1.183754	0	5
Total Paternity Leave	30	31.70941	39.87842	0	156
Total Paid Paternity Leave	30	9.28349	14.34015	0	52.6
Men's Education	29	33.17853	10.31549	15.28647	50.33536
Women's Education	29	37.46071	11.42727	15.83804	62.38523
Difference in Education	29	-4.282179	6.370071	-15.39836	9.481575
Men's EP Ratio	30	74.44941	6.154447	60.96036	89.00405
Women's EP Ratio	30	62.79343	10.78701	31.15736	83.42941
Difference in EP Ratio	30	11.65598	8.024727	2.713967	38.85447

A.5

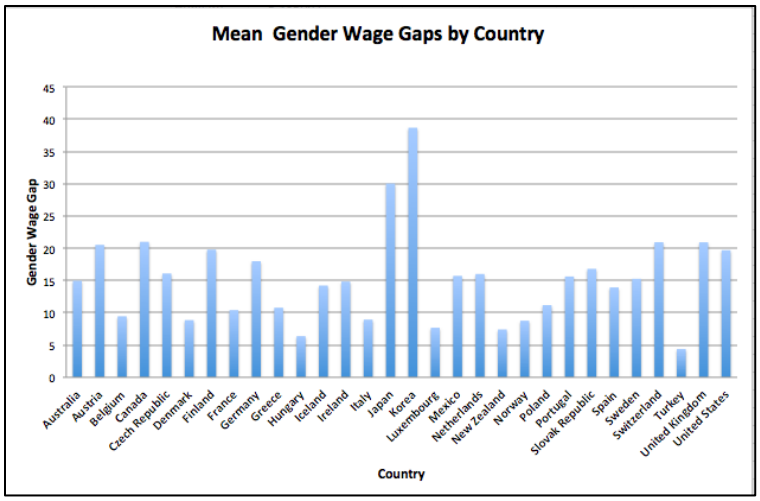
Correlations

	Maternity Leave	Total Maternity Leave	Total Paid Maternity Leave	Paternity Leave	Paid Paternity Leave	Total Paternity Leave	Total Paid Paternity Leave	Gender Wage Gap	Men's Education	Women's Education	Men's EP Ratio	Women's EP Ratio	Women's Part-Time	Men's Part-Time
Maternity Leave	1													
Total Maternity Leave	0.136	1												
Total Paid Maternity Leave	0.1728	0.6578	1											
Paternity Leave	-0.0172	0.19	0.0689	1										
Paid Paternity Leave	0.0458	0.1987	0.0066	0.9398	1									
Total Paternity Leave	-0.0316	0.1501	0.0491	0.1255	0.0522	1								
Total Paid Paternity Leave	-0.2655	-0.1094	-0.0168	0.1569	0.101	0.232	1							
Gender Wage Gap	-0.099	-0.1143	-0.053	-0.2153	-0.1774	-0.0865	0.3019	1						
Men's Education	-0.096	-0.4304	-0.2594	-0.0726	-0.1272	0.0199	0.377	0.4555	1					
Women's Education	-0.0617	-0.296	-0.1538	0.177	0.1082	0.1034	0.2607	0.1232	0.8323	1				
Men's EP Ratio	-0.268	-0.4943	-0.3182	-0.1705	-0.2212	0.1295	0.1063	0.3443	0.4441	0.2802	1			
Women's EP Ratio	-0.165	-0.0782	-0.0201	0.2164	0.1406	0.2046	0.0999	0.0509	0.4813	0.603	0.6089	1		
Women's Part-Time	-0.1024	-0.5787	-0.5985	-0.1503	-0.1744	-0.1359	0.0573	0.0569	0.5153	0.3442	0.498	0.3576	1	
Men's Part-Time	-0.2006	-0.567	-0.511	0.1204	0.0669	-0.0672	0.0727	0.0459	0.5514	0.6291	0.4812	0.4845	0.6894	1

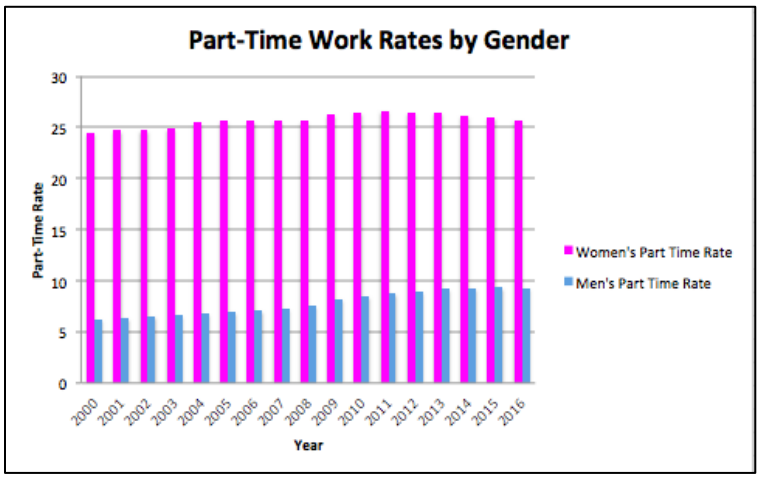
A.6


Gender Wage Gaps Over Time
Gender Wage Gap
25
20
15
10
5
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year

A.7


Mean Gender Wage Gaps by Country
Gender Wage Gap
45
40
35
30
25
20
15
10
5
0
Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States
Country

A.8


Part-Time Work Rates by Gender
Part-Time Rate
30
25
20
15
10
5
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Year
Women's Part Time Rate
Men's Part Time Rate

A.9

Country Table 2000

Country	Gender Wage Gap	Maternity Leave	Paternity Leave	Total Paid Maternity Leave	Paid Paternity Leave
Australia	17.2	0	0	0	0
Austria	23.14	16	0	86	0
Belgium	13.60	15	.6	28	.6
Canada	23.88	17	0	27	0
Czech Republic	.	28	0	214	0
Denmark	.	18	2	54	2
Finland	20.43	17.5	3	161.03	3
France	.	16	0	16	0
Germany	20.51	14	0	109.33	0
Greece	.	17	.4	17	.4
Hungary	14.10	24	0	160	0
Iceland	.	8.67	2	25.97	2
Ireland	19.73	18	0	14	0
Italy	8.52	21.67	0	47.67	0
Japan	36.61	14	0	58	0
Korea	41.65	8.55	0	8.55	0
Luxembourg	.	16	.4	42	.4
Mexico	.	12	0	12	0
Netherlands	.	16	0	16	0
New Zealand	7.17	14	0	0	0
Norway	10.19	9	2	142	0
Poland	.	20	0	20	0
Portugal	.	17.14	4	17.14	4
Slovak Republic	.	28	0	164	0
Spain	.	16	.4	16	.4
Sweden	15.50	11.33	1.43	58.67	1.43
Switzerland	23.79	8	0	0	0
Turkey	.	12	0	12	0
United Kingdom	26.28	40	0	18	0
United States	23.09	0	0	0	0

. indicates missing value

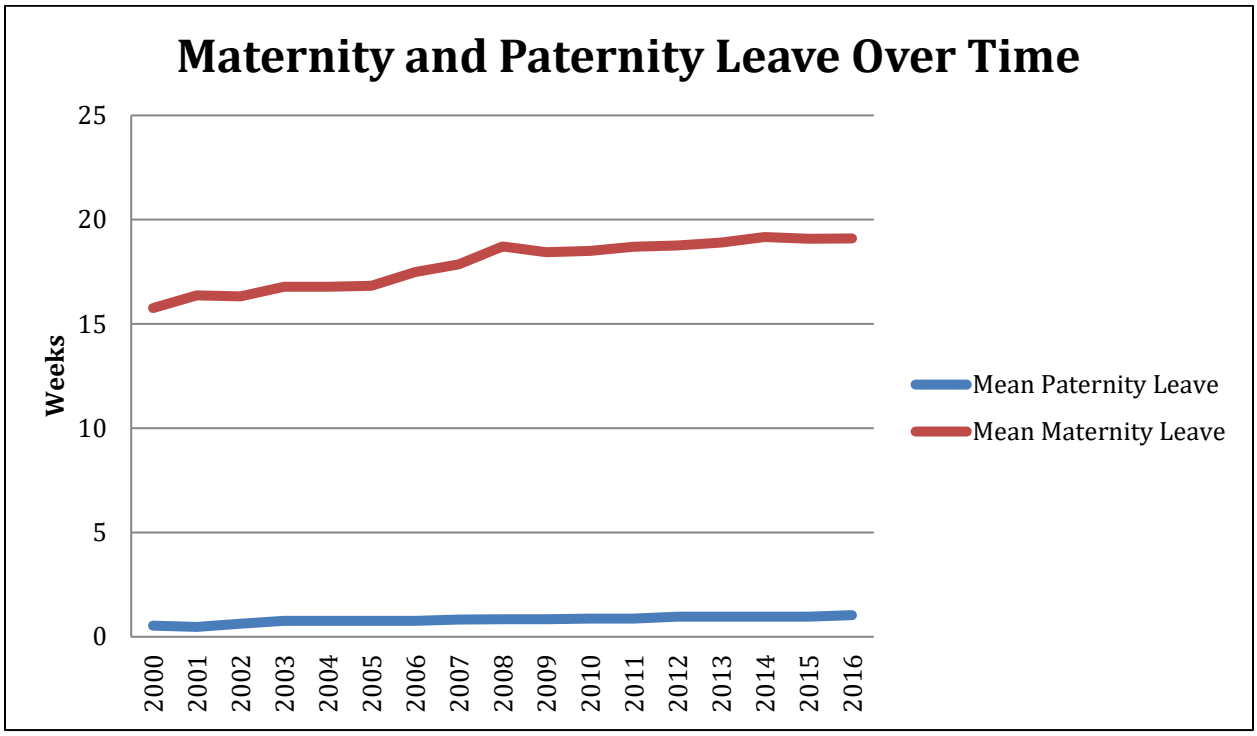
A.10

Country Table 2015

Country	Gender Wage Gap	Maternity Leave	Paternity Leave	Total Paid Maternity Leave	Paid Paternity Leave
Australia	13	6	0	18	0
Austria	17.04	16	0	60	0
Belgium	.	15	2	32.33	2
Canada	18.63	17	0	52	0
Czech Republic	16.46	28	0	110	0
Denmark	5.84	18	2	50	2
Finland	18.06	17.5	3	161.03	3
France	.	16	2	42	2
Germany	.	14	0	58	0
Greece	6.25	43	.4	43	.4
Hungary	9.52	24	1	160	1
Iceland	9.93	13	0	26	0
Ireland	14.45	42	0	26	0
Italy	.	21.7	.2	47.7	.2
Japan	25.73	14	0	58	0
Korea	37.18	12.86	1	64.86	.6
Luxembourg	.	16	.4	42	.4
Mexico	16.67	12	1	12	1
Netherlands	.	16	.4	16	.4
New Zealand	.	16	2	16	0
Norway	7.12	13	2	91	0
Poland	.	26	2	52	2
Portugal	18.92	6	4	30.14	4
Slovak Republic	13.38	34	0	164	0
Spain	.	16	2.10	16	2.10
Sweden	.	15.57	1.43	60	1.43
Switzerland	.	16	0	14	0
Turkey	.	16	0	16	0
United Kingdom	17.10	52	2	39	2
United States	18.88	0	0	0	0

. indicates missing value

A.11



IX. TABLES

Table 1:

Dependent Variable: Gender Wage Gap						
Maternity Leave	-0.1907***	-0.1046***			-0.1952***	-0.1042***
	(0.036)	(0.032)			(0.035)	(0.032)
Total Paid Maternity Leave			0.0060	-0.0032		
			(0.008)	(0.007)		
Paternity Leave	-1.4639***	-0.0442				
	(0.362)	(0.342)				
Paid Paternity Leave			-2.4680***	-0.7669*		
			(0.437)	(0.400)		
Paternity Leave Dummy					-2.2695***	-0.2159
					(0.556)	(0.515)
Constant	21.0360***	16.8287***	17.6248***	15.5944***	20.9629***	16.9140***
	(0.668)	(1.008)	(0.550)	(0.894)	(0.663)	(1.007)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.063	0.3132	0.0024	0.2988	0.0638	0.3135
Observations	372	372	372	372	372	372

Table 2:

Dependent Variable: Gender Wage Gap						
Maternity Leave	-0.0709**	-0.0819**			-0.0723**	-0.0812**
	(0.033)	(0.034)			(0.033)	(0.033)
Total Paid Maternity Leave			-0.003	-0.0027		
			(0.007)	(0.007)		
Paternity Leave	-1.0843***	-0.5408				
	(0.373)	(0.402)				
Paid Paternity Leave			-1.1791***	-0.7116*		
			(0.387)	(0.412)		
Paternity Leave Dummy					-1.6451***	-0.9151
					(0.534)	(0.579)
Difference in EP Ratio	0.1928***	0.1161*	0.2181***	0.1520**	0.2134***	0.1338*
	(0.060)	(0.069)	(0.060)	(0.068)	(0.060)	(0.070)
Difference in Education	0.3921***	0.0373	0.4149***	0.0775	0.3784***	0.0508
	(0.066)	(0.133)	(0.067)	(0.133)	(0.067)	(0.134)
Constant	16.9605***	16.1376***	15.5022***	14.5170***	16.5763***	16.0066***
	(1.192)	(1.479)	(1.060)	(1.381)	(1.166)	(1.448)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.2914	0.3026	0.2803	0.2893	0.2937	0.3042
Observations	346	346	346	346	346	346

Table 3:

Dependent Variable: Gender Wage Gap						
Maternity Leave	-0.0333	-0.0519			0.0327	0.0038
	(0.037)	(0.038)			(0.046)	(0.047)
Total Paid Maternity Leave			0.0004	-0.0014		
			(0.008)	(0.008)		
Paternity Leave	-0.3408	0.0175				
	(0.501)	(0.516)				
Paid Paternity Leave			-1.1724***	-0.7248*		
			(0.387)	(0.414)		
Paternity Leave Dummy					0.9252	1.0165
					(0.946)	(0.958)
Maternity Leave*Paternity Leave	-0.0003**	-0.0003*				
	(0.000)	(0.000)				
Total Paid Maternity Leave*Paid Paternity Leave			-0.0003	-0.0001		
			(0.000)	(0.000)		
Maternity Leave*Paternity Leave Dummy					-0.1223***	-0.0969**
					(0.037)	(0.039)
Difference in EP Ratio	0.2302***	0.1476**	0.2172***	0.1562**	0.2372***	0.1651**
	(0.062)	(0.071)	(0.059)	(0.069)	(0.059)	(0.071)
Difference in Education	0.4007***	0.0549	0.3991***	0.0884	0.3995***	0.1035
	(0.066)	(0.133)	(0.068)	(0.135)	(0.066)	(0.135)
Constant	15.4795***	14.9911***	15.3865***	14.5134***	14.3232***	14.1732***
	(1.362)	(1.618)	(1.061)	(1.383)	(1.340)	(1.610)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.2914	0.3026	0.2803	0.2893	0.2937	0.3042
Observations	346	346	346	346	346	346

Table 4:

Dependent Variable: Gender Wage Gap						
Maternity Leave	0.006	0.033			0.020	0.036
	(0.097)	(0.097)			(0.095)	(0.095)
Total Paid Maternity Leave			0.021	0.0400**		
			(0.020)	(0.020)		
Paternity Leave	-1.0012***	-0.395				
	(0.386)	(0.418)				
Paid Paternity Leave			-1.2396***	-0.7478*		
			(0.389)	(0.410)		
Paternity Leave Dummy					-1.5458***	-0.7689
					(0.542)	(0.589)
Maternity Leave Squared	-0.001	-0.002			-0.002	-0.002
	(0.002)	(0.002)			(0.002)	(0.002)
Total Paid Maternity Leave Squared			0.000	-0.0002**		
			(0.000)	(0.000)		
Difference in EP Ratio	0.1820***	0.098	0.2228***	0.1444**	0.1988***	0.113
	(0.061)	(0.070)	(0.060)	(0.068)	(0.061)	(0.072)
Difference in Education	0.4034***	0.047	0.4347***	0.049	0.3920***	0.063
	(0.068)	(0.133)	(0.069)	(0.132)	(0.068)	(0.134)
Constant	16.3000***	15.1147***	14.7147***	12.8638***	15.8397***	15.0457***
	(1.423)	(1.686)	(1.217)	(1.549)	(1.368)	(1.623)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.2908	0.304	0.282	0.2994	0.2939	0.3059
Observations	346	346	346	346	346	346

Table 5:

Dependent Variable: Women's Part-Time Work Rate						
Maternity Leave	0.1025***	0.0586**			0.0968***	0.0575**
	(0.027)	(0.027)			(0.027)	(0.028)
Total Paid Maternity Leave			-0.0111*	-0.0092		
			(0.007)	(0.007)		
Paternity Leave	-0.0954	-0.6087**				
	(0.245)	(0.258)				
Paid Paternity Leave			0.1207	-0.4677		
			(0.273)	(0.284)		
Paternity Leave Dummy					0.4494	-0.2237
					(0.394)	(0.417)
Constant	23.9188***	25.2150***	26.2681***	26.6542***	23.7110***	24.7296***
	(0.519)	(0.707)	(0.400)	(0.544)	(0.518)	(0.709)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	-0.0324	0.0249	-0.0586	0.0159	-0.0298	0.0134
Observations	492	492	492	492	492	492

Table 6:

Dependent Variable: Women's Part-Time Work Rate						
Maternity Leave	0.0597**	0.0560**			0.0561**	0.0540**
	(0.024)	(0.023)			(0.024)	(0.024)
Total Paid Maternity Leave			-0.0105*	-0.0109**		
			(0.006)	(0.006)		
Paternity Leave	-1.0885***	-1.3925***				
	(0.243)	(0.242)				
Paid Paternity Leave			-1.1949***	-1.4722***		
			(0.249)	(0.247)		
Paternity Leave Dummy					-0.1484	-0.7195*
					(0.370)	(0.388)
Difference in EP Ratio	-0.3498***	-0.2546***	-0.3748***	-0.2834***	-0.3153***	-0.2218***
	(0.035)	(0.039)	(0.035)	(0.039)	(0.035)	(0.040)
Difference in Education	0.0886*	0.4006***	0.074	0.3716***	0.1127**	0.3904***
	(0.048)	(0.080)	(0.047)	(0.079)	(0.049)	(0.084)
Constant	30.3416***	30.5536***	32.3955***	32.4448***	29.1166***	29.1577***
	(0.799)	(0.847)	(0.698)	(0.762)	(0.782)	(0.842)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.1931	0.2524	0.2015	0.2634	0.1553	0.1989
Observations	459	459	459	459	459	459

Table 7:

Dependent Variable: Women's Part-Time Work						
Maternity Leave	0.052	0.045			0.086	0.082
	(0.073)	(0.071)			(0.074)	(0.073)
Total Paid Maternity Leave			-0.0048	-0.0287**		
			(0.014)	(0.014)		
Paternity Leave	-1.0918***	-1.3978***				
	(0.245)	(0.245)				
Paid Paternity Leave			-1.2133***	-1.4293***		
			(0.252)	(0.249)		
Paternity Leave Dummy					-0.1349	-0.7045*
					(0.372)	(0.390)
Maternity Leave Squared	0.000	0.000			-0.001	-0.001
	(0.001)	(0.001)			(0.001)	(0.001)
Total Paid Maternity Leave Squared			0.000	0.000		
			(0.000)	(0.000)		
Difference in EP Ratio	-0.3490***	-0.2534***	-0.3746***	-0.2772***	-0.3188***	-0.2254***
	(0.036)	(0.040)	(0.035)	(0.039)	(0.036)	(0.041)
Difference in Education	0.0877*	0.3996***	0.079	0.3746***	0.1162**	0.3929***
	(0.048)	(0.080)	(0.048)	(0.078)	(0.050)	(0.084)
Constant	30.4102***	30.6563***	32.2336***	32.9462***	28.8498***	28.8967***
	(1.027)	(1.060)	(0.793)	(0.847)	(1.007)	(1.053)
Year Control	No	Yes	No	Yes	No	Yes
R-squared	0.1912	0.2506	0.2	0.2649	0.1537	0.1973
Observations	459	459	459	459	459	459

X. FIGURES

Figure 1:

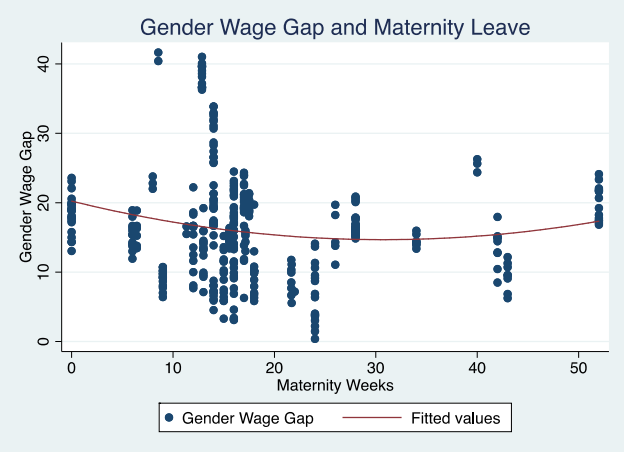


Figure 2:

Figure 3:

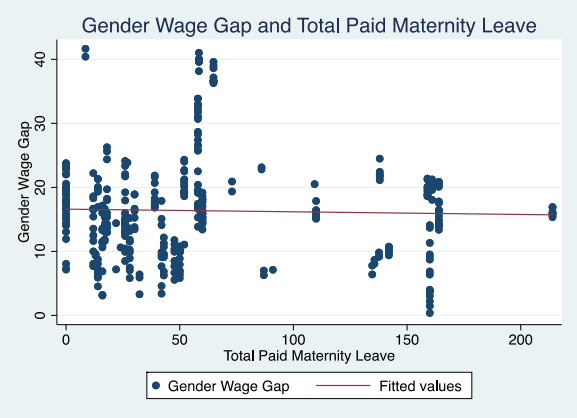


Figure 4:

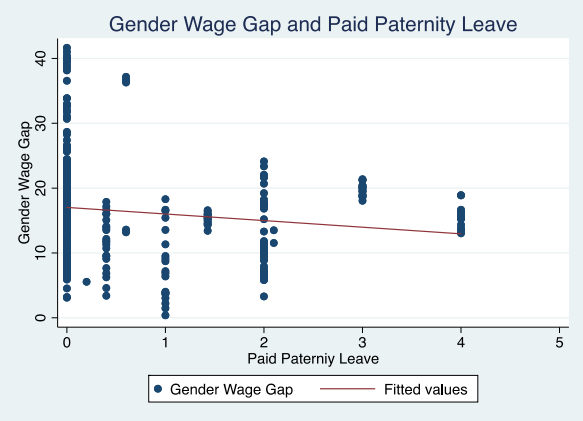


Figure 5:

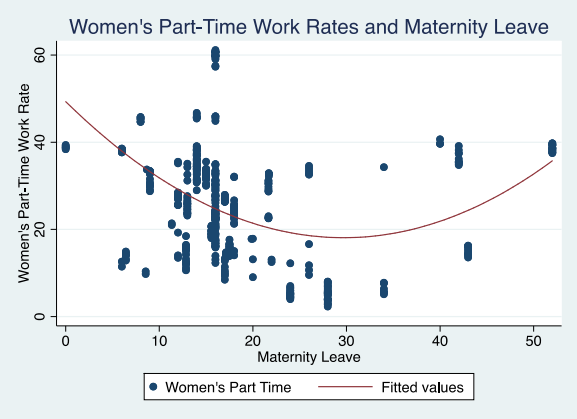


Figure 6:

Figure 7:

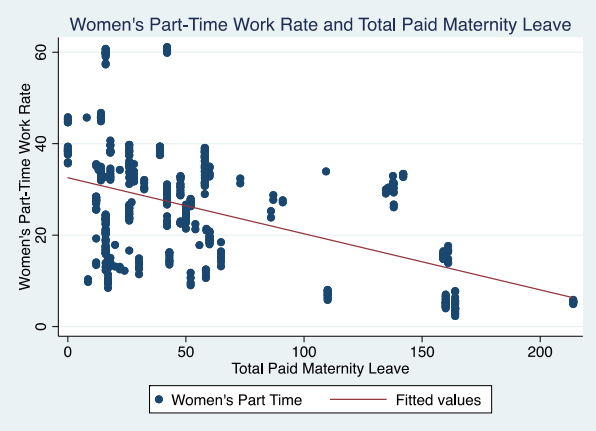


Figure 8: