How Work-Family Policies Shape the Motherhood Earnings Penalty in a Cross-National Perspective

Families, markets, and states are three central, intersecting societal institutions that shape the gendered distribution of paid and unpaid work (O'Connor, Orloff, and Shaver 1999). In analyzing gender inequalities, scholars argue that state interventions between labor markets and families may have alternately ameliorating or exacerbating effects on the degree of gender economic inequality (Orloff 1993; Mandel and Semyonov 2005, 2006; Korpi et al. 2009; Mandel 2009). Many of the state interventions considered important to explaining the gender gap in various countries target the capacity of parents to combine caring for children with maintaining paid employment. While some state interventions are aimed at male workers/fathers specifically (i.e., paternity leave), most of these work-family policies are used by and effect women and mothers to a far greater extent. Because of this, we argue that the impact of state interventions on gender economic inequality may operate partially through the effects of work-family policies on employment and earnings differences among women related to their engagement in motherhood. In this way, we examine how state interventions alter the relationship between family structure and women's market based work and move the literature beyond a broad comparison of gender differences to a sharper focus on state interventions, motherhood, and market work..

To consider how state interventions increase or decrease the negative impact of children on women's earnings, we analyze the motherhood earnings penalty across 22 countries. Our paper brings together two major literatures. One is focused on the "motherhood penalty" or the negative effect of children on women's earnings. The second is focused on gendered welfare state outcomes, and in particular, the complex, and perhaps contradictory effects of welfare state policies on outcomes for women and mothers. We bridge these literatures, in order to more fully

explore the complex intersections of state, family, and markets in contemporary welfare states. Our aim is to develop an integrated, and more nuanced, understanding of these relationships among families, markets, and states.

Earnings Penalties for Motherhood

It is well established that children are linked to reduced earnings for women in most Westernized countries (Waldfogel 1997, 1998a, 1998b; Lundberg and Rose 2000; Budig and England 2001; Anderson, Binder, and Krause 2003; Avellar and Smock 2003; Glauber 2007; Budig and Hodges 2010), the UK (Joshi and Newell 1989;Waldfogel 1997, 1998b; Joshi, Paci, and Waldfogel 1999; Harkness and Waldfogel 2003; Davies and Pierre 2005), Austria, Canada, Germany, Finland and Sweden (Harkness and Waldfogel 2003; Davies and Pierre 2005; Gangl and Ziefle 2009), and Denmark, Spain, and Portugal (Davies and Pierre 2005). Previous cross-national work suggests substantial variations in the size of these penalties (Harkness and Waldfogel 2003; Davies and Pierre 2005; Gangl and Ziefle 2009), although we know less about the impacts of individual welfare state policies on the size of these penalties.

Individual- and country-level factors both shape the motherhood penalty and we detail these multilevel pathways in Figure 1. In this figure, pathways between factors empirically proven to affect the motherhood penalty are shown as solid lines. Dashed lines represent the unknown pathways we investigate in the current study. To estimate the relationship between state interventions with the motherhood penalty, we must first account for individual-level factors that affect this penalty. Thus, we first discuss how individual-level factors, including number of children, (level 1) shape earnings. Through a series of nested regression models, we show how controlling for individual differences among women partially accounts for the motherhood earnings penalty, as measured by number of children in the home. At the level of

country differences (level 2), the dependent variable is the partial coefficient for number of children on annual earnings (net of individual factors and estimated at level 1). Each country has a child penalty coefficient, and level 2 factors discussed below detail how country-level polices shape the penalty.

[FIGURE 1 ABOUT HERE]

Effects of Individual-Level Factors on Earnings Penalties for Motherhood

Our focus is primarily on how state interventions condition the relationship between family and market for women. Yet, in order to understand the effects of policy, we must first ensure that we are controlling for factors that may partially explain the motherhood earnings penalty at the individual level .A large body of research has established the impact of children on women's earnings, and the individual-level factors that shape this relationship (Waldfogel 1998a, 1998b; Lundberg and Rose 2000; Budig and England 2001; Anderson et al. 2002; Avellar and Smock 2003; Sigle-Rushton and Waldfogel 2004; Budig and Hodges 2010). First, the motherhood penalty is shaped by family structure and household resources. Married women incur larger penalties for motherhood in the United States (Budig and England 2001; Glauber 2007; Budig and Hodges 2010). Cross-nationally, however, married and partnered[1] women do not always suffer the largest motherhood penalties. Comparative work shows that gross motherhood penalties are often large for single women in some other countries, while in still others there is no difference between single and married/partnered[1] mothers (Gangl and Ziefle 2009). In addition, other household income, including partners' earnings and transfer income from the state or private sources, may impact women's decisions to engage in paid labor, and therein affect the motherhood penalty.

Human capital and work effort (measured by labor supply) profoundly shape the motherhood penalty. First, the motherhood penalty can be partially explained by differences in

human capital. Women with (more) children typically have less experience and seniority due to the employment breaks taken to accommodate childrearing (Klerman and Liebowitz 1999; Budig and England 2001; Staff and Mortimer 2012), though this explains more of the penalty among highly-paid skilled workers where returns to experience are steeper (Budig and Hodges 2010). The motherhood penalty also varies by educational attainment, wherein smaller or no penalties are found among the highly educated, both in the U.S. (Taniguchi 1999; Anderson et al. 2002; Amuedo-Dorantes and Kimmel 2005) and cross-nationally (Todd 2001). In addition, mothers' lower labor supply, measured as hours worked or part-time status, explains an additional portion of the penalty for children (Waldfogel 1997; Budig and England 2001), but a significant penalty remains even after controls for human capital and labor supply are added.

In addition to human capital and labor supply, the motherhood penalty may be shaped by compensating differentials (Gash 2009). To the extent that mothers trade earnings for jobs that have more family-friendly characteristics, these characteristics may partially explain the motherhood penalty. While Budig and England (2001) found no effect of job characteristics on the penalty in the U.S., other work shows the penalty is larger among women in non-professional/non-managerial occupations (Budig 2006). Some scholars argue that female-dominated occupations are argued to be potentially more family-friendly (Gangl and Ziefle 2009) and it is well-documented that gender occupational segregation increases the gender pay gap (England et al. 1988; Jacobs 1989; Reskin and Roos 1990; Petersen and Morgan 1995; Tomaskovic-Devey and Skaggs 2002). It is reasonable to think gender segregation may be positively correlated with motherhood, and partially account for the effect of children on women's earnings.

Yet even in models that include all of the individual-level factors discussed above, a significant penalty persists in many countries in Europe and North America (Budig and England

2001; Harkness and Waldfogel 2003; Authors 2007a; Gangl and Ziefle 2009; Budig and Hodges 2010). Possible explanations for this unexplained penalty among American mothers include employer discrimination, lowered productivity, inadequate childcare options, and the absence of paid family leave. Correll, Benard, and Paik (2007) provide evidence of employer discrimination with their experimental research in the United States, as do Glass and Fodor (2011) with their research based on interviews of employers and anti-discrimination cases in Hungary. While our design does not measure employer discrimination, it does allow us to consider how state interventions may be associated with the motherhood earnings penalty despite diverse socio-political-economic contexts.

Welfare State Policies and Motherhood Earnings Penalties

A wide range of societal-level factors may potentially account for the negative impact of children on women's earnings. We are most interested in those welfare state interventions that are meant to address how families and markets intersect. For example, work-family policies include maternity and parental leave and subsidized or state-provided childcare. Taxation policies may either reward or penalize dual-earner couples. We explore whether policies of these sorts might be associated with variations in earnings penalties cross-nationally.

Welfare state scholarship has, in recent years, explored whether policies aimed at women's reconciling employment with care of family members – such as leaves and childcare – have perhaps unintentionally disadvantaged women, or groups of women (Albrecht et al. 2003; Charles and Grusky 2004; Mandel and Semyonov 2005, 2006; Hook and Pettit 2009; Mandel 2009, 2010; Glass and Fodor 2011). This literature suggests that, counter to expectations that work-family policies would support women's employment and ameliorate inequality (Gornick and Meyers

2003; Gash 2009), these policies may, themselves, undermine women's – and particularly mothers' – employment.

Much of this literature focuses on broad gender gaps between men and women, rather than looking more particularly at differences among women and mothers. Yet whether these policies are "friend or foe" to women may depend on the outcomes upon which we are focused (Mandel 2009; Bianchi and Milkie 2010). Korpi et al. (2009, p. 3) further note that within countries, there may be "competing values and conflicting goals concerning relationships between women, men, and families," making it important to consider state interventions independently. As such, our study allows us to address more closely the effects of different state interventions on the earnings of women (more) children.

Scholars often assume that family-work reconciliation policies are positively related to outcomes such as wages, but have not analyzed fully how different policies are specifically associated with different outcomes with a multilevel modeling approach. While recent cross-national work examines the effects of motherhood on earnings (Gornick and Meyers 2003; Harkness and Waldfogel 2003; Authors 2007a), little research measures the impact of specific social policies on the motherhood penalty.[2] Cross-national research that estimates policy effects in multilevel models examines gender wage inequalities, but not inequality by motherhood status (Mandel and Semyonov 2005). Other work that does consider specific policy relationships with the motherhood penalty correlates policy measures with motherhood penalties estimated separately for each country, but does not utilize multilevel regression methods (Authors 2009, 2010). Our study extends this literature to estimate the effects of specific country-level policies on individual-level motherhood earnings penalties with a multilevel regression approach that correctly estimates these effects across multiple levels of analysis. Moreover, in addition to considering how individual

policies are related to the motherhood penalty, we also examine the relative strength of policies aimed at supporting women's capacity to care for children and remain employed (job protected leaves and publicly funded childcare) versus tax rate policies that make the second earner's wages more or less valuable to the family economy.

What policies and other contextual factors may influence the motherhood penalty? Following previous research, we identify at least three factors that may influence mothers' abilities to combine work and care: (1) childcare for very young and older children, (2) maternity and parental leave policies, and (3) taxation policies (Gauthier and Bortnik 2001; Evans 2002; Gornick and Meyers 2003; Jaumotte 2003; Morgan and Zippel 2003; Pettit and Hook 2005, 2009). We examine these policies separately because we suspect that different gendered assumptions may underlie different policies; a generalized index may therefore obscure policy effects (Korpi et al. 2009). We do consider policy combinations, however. We investigate whether tax policies regarding the second earner's income have stronger or weaker effects once we account for childcare and parental leave policies.

Childcare policies might impact cross-national differences in mothers' earnings. While childcare programs were adopted both to support parents' employment and to provide education, these programs – particularly those for children under 3 – are explicitly recognized as helping families balance care and employment (Kamerman and Kahn 1991; Gornick and Meyers 2003). Indeed, childcare costs are strongly correlated with women's employment. Han and Waldfogel (2002) argue that in the U.S., reducing childcare costs to parents could substantially raise employment of both married and single mothers. Since government funding and subsidies tend to reduce the cost of childcare to parents while keeping the quality of care high (OECD 2001), we focus on public, rather than market-based, childcare. Cross-nationally, Pettit and Hook (2005,

2009) show that high levels of childcare are positively linked with women's labor market participation. This leads us to predict:

Hypothesis 1: The proportion of children enrolled in government-provided or -subsidized childcare should be negatively related to the earnings penalty by allowing mothers the opportunity to engage in paid employment (McDonald 2000). We use separate measures for policies that apply to infants (< age 3) and those that apply to pre-schoolers (ages 3 to 6).

Leave policies (i.e., maternity and parental leave[4]), are meant to support caregiving, while allowing parents to stay connected to employment. Depending on the length of leave, leave policies may have varying associations with the motherhood penalty. For example, very long parental leaves could decrease mothers' employment continuity and earnings (Morgan and Zippel 2003; Pettit and Hook 2005, 2009) by reducing labor force attachment. Moreover, the prospect of mothers' prolonged absence from work might discourage employers from hiring or promoting mothers (Glass and Fodor 2011). Similarly, the absence of leave policies may also increase the motherhood penalty by forcing women to exit the workforce during the child's first year of life, and therein reducing job experience and making mothers less attractive to employers as long-term workers. In contrast, moderate leaves may help mothers maintain labor force attachment and encourage timely returns to employment, thus minimizing productivity costs to employers and mitigating lost job experience related to maternity. Indeed, studies show curvilinear effects of leave length on women's employment outcomes and poverty (Pettit and Hook 2005, 2009; Evertsson and Duvander 2006; Kenworthy 2008).

Hypothesis 2a: Paid leaves should be negatively associated with motherhood penalties. We measure paid leaves as weeks of a) fully paid maternity leave, b) fully paid parental leave, and

c) a calculated measure of parental leave length * benefit level to generate the number of weeks of fully paid parental care leaves.

Hypothesis 2b: The duration of parental care leaves should matter for lost job experience and employer tenure, and will not be captured in the calculated number of weeks of fully paid parental care leaves above. Thus, we predict that the duration of care leave, regardless of benefit level, should have curvilinear associations with the motherhood penalty. No or very short leaves will be linked to higher motherhood penalties. Moderate leaves should decrease the motherhood penalty. In contrast, very long leaves (e.g., over one and up to three years) should increase the motherhood penalty. We measure women's leaves in terms of the number of weeks of combined leave including a squared term for leave to model curvilinear effects.

Taxation policies. Income taxation policies influence the amount of disposable income available to families and may shape (married) women's decisions about employment (Sainsbury 1999). Notably, in many countries second earners' incomes are taxed more heavily than single earners (Jaumotte 2003 for 2000/2001) which may provide a disincentive to women to take up (full-time) employment. Given the complexity of tax systems, in which the tax burden may depend on multiple factors[1], the body of literature examining the relationship between income tax policies and women's employment participation has not lead to conclusive results (Sainsbury 1999, van der Lippe & van Dijk 2002). However, studies show that tax disadvantages to second earners tend to be related to lower female employment participation. For example, Jaumotte (2003) finds that in a sample of 17 OECD countries higher ratios between the tax rates of a second earner in a coupled household and a single earner (who both earn 67% of the average production worker's earnings) are inversely related to women's employment rates. Sainsbury (1999) concludes that tax

[1] Including level and progressivity of income taxes, tax deductions for dependent spouses and children, joint or individual taxation of married couples, or income thresholds for social security contributions.

policies help explain lower female (full-time) employment participation in conservative European welfare states in the 1990s, where the tax systems imposed considerable penalties on working wives' incomes, but less so in liberal and social-democratic countries. Here, we examine tax disincentives to partnered women's employment, who make up the majority of our samples. By influencing women's labor market attachment, tax policies may shape the earnings penalties connected with motherhood.

Hypothesis 3: Taxation policies that penalize second earner's incomes in coupled households should be related to higher motherhood earnings penalties by discouraging (partnered) women's labor market participation (Jaumotte 2003) resulting in reduced attachment to the labor market.

In addition to considering how individual policies are related to the motherhood penalty, we also examine the relative strength of policies aimed at supporting women's capacity to care for children and remain employed (job protected leaves and publicly funded childcare) versus tax rate policies that make the second earner's wages more or less valuable to the family economy.

We use a multilevel modeling strategy to control for the individual-level factors known to partially explain the motherhood earnings penalty, and simultaneously estimate how country-level factors alter net penalties for children. We thus fill a major gap in the literature by assessing relationships between paid and unpaid parental leaves, childcare provision for young and older children, and taxation policies with the motherhood penalty cross-nationally.

Data and Measures

Many scholars contend that work-family policies increase women's employment and wages, by helping them balance the demands of both family and work (Esping-Andersen 1999; Daly 2000; Korpi 2000; Gornick and Meyers 2003). Much of this scholarship examines the

relationship between work-family policies and outcomes, such as wages, by comparing welfare state contexts or regimes (Esping-Andersen 1990, 1999; Orloff 2002: Gornick and Meyers 2003; Authors 2007a). By contrasting countries with different policy contexts (for example, North European countries, with generous policy regimes versus North American countries, with less generous work-family policies), this research argues that more generous policy contexts lead to more gender-egalitarian outcomes. A limitation of this comparative case approach is that it is difficult to disentangle policy effects with other country-level differences in, for example, culture or broader earnings inequality. To better model individual outcomes and country-level effects, recent research has capitalized on multilevel modeling strategies with larger samples of countries to examine gendered policy outcomes.

Scholarship that uses multilevel modeling strategies argues that work-family policies have paradoxical effects on women's economic outcomes: While these policies increase women's labor force participation and economic independence, they may simultaneously limit their job opportunities and earnings, and therein decrease women's employment and increase the gender earnings gap (Mandel and Semyonov 2005, 2006). By using an index of work-family policies that include public sector employment, leaves, and childcare, Mandel and Semyonov (2005, 2006) argue that positive outcomes are not guaranteed; instead, there are important trade-offs worth considering. But a limitation of this policy index approach is the diversity of the work-family policies included in such indices. Some policies, such as extended parental leaves, may have markedly different effects on maternal employment and earnings than other policies, such as high-quality publicly subsidized childcare. Despite this diversity, scholars typically subsume an array of policies into an overall index to assess their impact on employment and earnings (Gornick, Meyers and Ross 1997; Mandel and Semyonov 2005). We adopt a multilevel

approach, but model these policies separately, because we believe that they may reflect different gendered assumptions about women's and mothers' roles.

Our study uses data from multiple sources. Individual-level data files come from the Luxembourg Income Study (LIS). The LIS is an excellent source of secondary cross-national survey data on households, employment, and earnings. With a few exceptions we use Wave 5 (representing the years 2000/2001)[5] of the LIS data for 22 countries. For all countries, the sample is restricted to employed women, aged 25 to 45 (prime years for childrearing), who are not self-employed and are not in the military.[6]

Our dependent variable is the natural log of annual earnings in 2000 U.S. constant dollars.[7] Differences in the motherhood penalty in earnings across countries could be due to differential selection of mothers into employment across countries. To control for this differential selection, we use a two-stage Heckman selection correction approach (Heckman 1979). Prior to estimating our multilevel models, we first estimate separate probit regressions in each country that predict employment using non-family transfer income, other household labor market income (household earnings from employment minus respondent's earnings), and presence of a pre-schooler as selection criteria. From the results of these models we derive a selection term, the Inverse Mills Ratio, which we then include as an individual-level predictor variable in all multilevel models.

Our primary independent variable is the number of dependent children co-residing with the respondent. We tested an alternate specification of motherhood with the number of child dummy variables and found robust results. The effect of each additional child is monotonic, though not always perfectly linear in all countries. Individual-level independent variables include family composition, human capital and labor supply, and job characteristics. Family characteristics include, in addition to number of children, relationship status (married or cohabiting=1,

otherwise=0). Human capital measures include educational attainment measured with a dummy variable=1 to indicate post-secondary education or higher occupational training leading to licensing or other credentials. We use respondent's age as a proxy for labor market experience.[8] We include a dummy for part-time work, defined as those working 29 or fewer hours weekly.[9] Some models include job characteristics; these measures include a dummy variable =1 if the respondent holds a professional or managerial occupation and a measure of occupational gender segregation. We calculated occupational segregation, i.e. the percent of each occupation that is female, from the LIS data at the finest level of occupational detailed category provided for each country.

Our contribution to this literature is to investigate whether specific social policies and combinations of policies are differentially linked to motherhood earnings penalties. Specifically, we examine the distinct effects of maternity, paternity, and parental leaves, publicly funded childcare for very young (0 to 2 years) and for older (3 to 5 years) pre-school children, and income taxation policies. We use our newly created Work-Family Policy Indicators (WFPI) database,and taxation policy data from Florence Jaumotte's database (2003). and the Luxembourg Income Study (LIS), which provides the best cross-national micro-data for comparing income across OECD countries (OECD 1995).

Our Work-Family Policy Indicators (WFPI) database is modeled after those developed by Gornick and Meyers (2003), Gornick, Meyers, and Ross (1997), and Gauthier and Bortnik (2001). Our database includes 22 countries: Australia, Austria, Belgium, Canada, Czech Republic, Finland, France, East Germany, West Germany,[10] Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Poland, Russia, the Slovak Republic, Spain, Sweden, the United Kingdom, and the United States.[11] We match our policy measures to the LIS survey year for each country, lagging the measurement

of leave policies to two years prior to the survey year.[12] Childcare policy includes the percentage of children age 0-2 and the percentage of children age 3-5 in publicly supported care. For leaves, our measures distinguish between highly-paid maternity and paternity leaves and generally low-paid or unpaid job-protected parental care leaves that begin after maternity leave is exhausted. We include only statutory, job-protected leave provisions that can be taken full time.[13] Our last policy indicator is a measure of tax disincentives to (married) women's employment participation: The measure represents the percentage of the second earner's income that goes into paying the increase in household income taxes in a coupled household with two children where the first earner earns 100 per cent of average production worker's wages and the previously not employed second earner starts to earn 100 cent of the average production worker's wages as well (Jaumotte 2003)[2].

Finally, we use a set of country-level control variables to conduct a robustness analysis of our policy models. Drawing from earlier research (Authors 2010), we first include maternal employment rates as a measure of country-specific differences in employment opportunities for mothers. Second, we include a measure of the proportion of workers in a country who are located in the public sector. Generally, the public sector is more likely to enforce work-family policies that could reduce the motherhood penalty (Nielsen, Simonsen, and Verner 2004). Third, we include the Gini coefficient as a measure of income inequality, drawn from the LIS key figures. It may be that countries with larger motherhood penalties simply have greater overall income disparities, similar to the impact of income inequality on gender gaps in earnings (Blau and Kahn 1992, 1996, 2003;

[2] "The tax rates include employee's social security contributions and are netted from universal cash benefits. But they do not include employer's social security contributions, indirect taxes, nor means-tested benefits (except some child benefits that do vary with income)" (Jaumotte 2003:58).

Mandel and Semyonov 2005). And finally, in the robustness analysis we control for GDP per capita to account for the persistent differences in overall wealth especially between the Eastern and Western countries included in our sample.

Methodology

Multilevel modeling enables direct tests of the relationships between societal-level factors and individual-level effects while simultaneously modeling individual and contextual controls (DiPrete and Forristal 1994; Raudenbush and Bryk 2002). Multilevel random-effects models are the best method for our nested data. Recent research demonstrates that multilevel models produce stable coefficients with fewer than 15 macro cases (Quillian 1995; Raudenbush and Liu 2000), and multilevel models have been used with the LIS data to examine the effects of welfare policies on the gender gap in earnings for 14 to 20 countries (Mandel and Semyonov 2005) and the effects of work-family policies on women's employment for 19 countries (Pettit and Hook 2005). We use restricted maximum likelihood (REML) to estimate our models, since REML provides less biased random-effects estimates than full maximum likelihood, especially in models with fewer level-2 cases. The two methods produce exactly the same fixed-effects estimates (Snijders and Bosker 1999; Luke 2004). As opposed to single-level models that attempt to measure contextual effects, multilevel models provide standard errors that correct heteroskedastic errors, caused by clustered individual observations within countries. While multilevel models estimate the impact of country-level and individual-level factors simultaneously (see combined model (3) below), one could conceptualize the multilevel model as a series of separate regression models that estimate the motherhood penalty for each of the 22 countries, and then treat the effect of the number of children from each country as the dependent

variable in a country-level regression equation. The individual-level (1) and country-level equations (2) can be written as follows:

$$Earnings_{ij} = \beta_{0j} + \beta_{1j}NUMKID + \beta_{2j}X_{ij} + r_{ij} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_j + u_{0j} \quad (2)$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_j$$
$$\beta_{2j} = \gamma_{20}$$

where i indexes individual women and j indexes country. $Earnings_{ij}$ represents individual earnings i in country j. β_{0j} is the intercept, denoting mean earnings. Number of children, and its coefficient $\beta_{1j,}$ estimates the average per-child motherhood penalty across all countries. X_{ij} is the vector of other individual measures (marital status, human capital, job characteristics, etc.) and β_{2j} is the vector of their coefficients. r_{ij} is the individual-level error term. In the country-level equations (2), the coefficients from equation (1) become the dependent variables. The γ coefficients represent country-level coefficients, Z_j the vector of country-level measures (policy and cultural) and u_j the country-level residuals. Note that only the equation for the intercept β_{0j} has an error term: i.e. we use random intercept models to estimate the (cross-level interaction) effects of policy measures on the motherhood earnings penalty (i.e. the effect of motherhood on women's earnings). All level-1 covariates are modeled as fixed effects, assuming that the direction of their effect is the same across all countries. Since the aim of this analysis is to examine the impact of policy measures Z_j on the number-of-children slope β_{1j}, level-2 measures are entered into the equation only for the intercept and slope β_{1j}.

If we substitute the level-1 coefficients with the level-2 equations, we arrive at a combined model which reads as follows:

$$Earnings_{ij}=\gamma_{00}+\gamma_{10}*NUMKID+\boxed{\gamma_{11}Z_j*NUMKID}+\gamma_{01}Z_j+\gamma_{20}X_{ij}+u_{0j}+r_{ij} \quad (3).$$

In our analysis we focus on the cross-level interaction $\gamma_{11}Z_j$*NUMKID, indicating the effect of social policies on the number-of-children slope, i.e. the per-child motherhood penalty.

Prior to estimating the full model with controls, we estimate an intercept-only model which allows us to compute the interclass correlation (ICC). The ICC and the variance components enable us to decompose earnings variation into the within-country variance (individual-level) and between-country variance (country-level). By doing this, we can identify how much earnings variation is attributable to between-country differences and thus how much we may be able to explain with our country-level measures.

Potential Limitations

We recognize that our models do not fully address endogeneity issues. Endogeneity may occur, for example, if women who are more likely to have low earnings are more likely to have children, therein reversing the causal order of the logic of the motherhood penalty. Establishing causal order is difficult with cross-sectional data. We do include the Inverse Mills ratio to reduce selectivity into employment on factors that may also predict motherhood. We also include measures of human capital, labor supply, and family composition in our models. However, to the extent the data contain imperfect measures of human capital and other factors, our contribution centers on describing how specific policies are associated with these penalties, rather than on making causal claims. This marks a substantial advance on current research in this area.

Despite the individual-level control variables included in our models, unobserved heterogeneity among women within and between countries may constrain our ability to fully explain variation in the motherhood penalty and the full effects of policies on this penalty (but see Waldfogel 1998b showing that controlling for unobserved heterogeneity does not lower the motherhood penalty in a cross-national study). For example, differences in women's preferences

regarding employment and motherhood are unobserved in our data. Cross-sectional data prevent us from controlling for stable unmeasured heterogeneity through statistical models and this is a limitation of our data. However, it is reasonable to think that family policies, in addition to directly impacting the motherhood penalty, may also alter the socio-political norms regarding employment among mothers, which, in turn, may change women's own preferences and thereby affect the motherhood penalty. Hook (2006) makes a similar argument about the impact of social policies influencing normative gendered behaviors. Similarly, policy contexts may impact employers' preferences for hiring and evaluating the work performance of mothers. To the extent policies change preferences, this kind of unobserved heterogeneity would be difficult to capture even with longitudinal data in the absence of measures of preferences. Despite these limitations, our study advances the state of knowledge of family policy effects and leads us closer to designing future studies to address causality.

Findings

Country-level and Individual-level Characteristics

Our first table presents data from our policy database and our country-level control variables. We find great variation in the percentage of children under 3 who are enrolled in publicly funded childcare, from less than 5 percent in the United Kingdom (UK), Poland, the Czech Republic, and Luxembourg to more than one-third of children aged 0 up to 3 years in Sweden and the former East Germany. There is also variation in the proportion of children aged 3 up to 6 in publicly funded care (or schooling), though with the exception of Poland and Australia, in all countries at least one-half of children in this age bracket are in such care. Paid birth-related maternity leave ranges from no leave at all in the United States (US) and Australia to 25 weeks in the Slovak Republic (in the early 1990s when we measure income for the latter two countries).

The next column, "number of weeks of fully funded parental leave" is calculated by multiplying the number of weeks of job protected leave by the benefit level. This ranges from 0 weeks in Australia, Ireland, Israel, the Netherlands, Poland, Spain, the UK, and US to almost a year or more in Hungary, France, and Sweden. The maximum job-protected leave available to women, we see a very large range, from 12 weeks of leave in the US to more than 2 ½ years in Poland, Russia, the Czech Republic, the Slovak Republic, Hungary, East/West Germany, Finland, Spain, and France. We find little variation in the number of weeks of birth-related paid paternity leave: In most countries fathers are not entitled to any leave or only a few days, but Israel, Finland, and Sweden offer 2 to 6 weeks. While paid paternity leave exists, the length is generally too short (with the exception of 6 weeks in Israel, which is perhaps enough time to bond with a newborn and/or establish intra-family norms around father care[17]) to significantly alter fathers' pre-dispositions toward childcare responsibilities. Thus, paternity leave may be more a signal of cultural valuation regarding the importance of father-care and gender equitable care sharing.

Regarding taxation, we measure the percentage of the average production worker's wage that would be allocated to pay for the additional income tax incurred for a second earner. While we do not have data on this measure for Israel, Russia, or the Slovak Republic, we observe considerable variation among the 19 remaining countries. The taxation rate ranges from a low of around 25 percent in the UK, Spain, and France, to a high of over 50 percent in Belgium and East/West Germany.

[TABLE 1 ABOUT HERE]

Turning to country-level control variables, we find women's labor force participation is the lowest in Italy and Spain. If, due to positive selection into the labor force, the mothers more likely to earn less are not in the labor markets in these countries, we might find lower motherhood

penalties. Conversely, we find high labor force participation of women in Sweden, Russia, East Germany, and Belgium. Table 1 also presents public sector size, the Gini coefficient as an indicator of income inequality, and GDP per capita as a measure of the size of the economy. The distributions on these factors are well documented. We also present descriptive statistics for our individual measures in each country with Table 2, which shows the weighted means and standard deviations for all level-1 variables.

[TABLE 2 ABOUT HERE]

The Earnings Penalty for Motherhood

We begin our series of nested multilevel models with a model that estimates the intercept only. The average earnings across all countries is 8.924 in the natural log of 2000 U.S. dollars. We can divide the variance components from this model into that due to within-country variation (Sigma-squared = .780) and between-country variation (tau=.941), and calculate the inter-class correlation (ICC), which is .941/ (.780+.941) = .55. This indicates that 55 percent of the variation in *women's earnings* is due to variation between countries, while 45 percent is due to within-country variation. However, this is the variation in all women's earnings, and not the variation in the effect of the motherhood penalty on earnings.

In Model 1 of Table 3, we add the number of children in the household to the model. We find that the unadjusted average child effect across countries is statistically significant ($p < .000$) and is about 15 percent per child ($e^{-.16}$-1). Model 2 adds marital status and human capital characteristics, which reduce the average per-child penalty by 57 percent, from 15 to 8 percent ($e^{-.045}$-1), but the penalty and its variation across countries remain significant. Our third model adds job characteristics and, consistent with past findings (Budig and England 2001), we observe that adding these characteristics does not explain the child penalty, nor is the model fit improved,

despite the significant results. Because we believe job characteristics are endogenous to the earnings equation, our next series of models that estimate policy effects use only human capital and family structure controls.

[TABLE 3 ABOUT HERE]

The fourth model in Table 3 presents the cross-level interactive effect between the percentage of children aged 0 up to 3 years who are in publicly funded childcare slots and the per child penalty. We hypothesized that the availability of state-provided childcare should reduce the negative effect of children on women's earnings. Programs for children under 3 have been explicitly designed to help families balancing care and employment, while programs for children 3 to 6 are more likely to be seen as educational programming in addition to supporting working parents (Kamerman and Kahn 1991; Gornick and Meyers 2003).[18] We expected that state-provided or -subsidized childcare should decrease the motherhood penalty by allowing women the opportunity to engage in paid employment (McDonald 2000). Our findings are consistent with our hypotheses for very young children. The main effect for number of children is -.101, indicating that, in a country with no children aged 0 to 2 years in publicly funded childcare, the per-child penalty is 9.6%. The significant interaction between infant childcare and number of children is positive and equals .001. This indicates that for each additional percentage of infants in publicly funded care, the per-child penalty declines by .001 log points. We see in the fifth model, turning to care for older preschoolers, findings are similar as for infant care, though weaker in size.

[FIGURE 2 ABOUT HERE]

To show the impact of these interacted effects more clearly, Figure 2 presents the per-child effect on earnings across the observed cross-national distribution of the percentage of infants (solid line) and older preschoolers (dashed line) in publicly funded care. We see that increases in childcare for

infants are associated with smaller penalties, reducing the per-child penalty from 9.5 percent in countries with only 1 percent of children in such care to 4.3 percent in countries with 41 percent of infants in publicly subsidized care. We do not extrapolate outside of our observed values: Sweden, the country with the highest percentage of infants in publicly funded care, has 41 percent of infants in public care.[19] Similarly, we see that countries with the lowest percentage of children aged 3 up to 6 in public care (39 percent), the wage penalty is 9.5 percent per child. At the highest levels of enrolment for this age group, 99 percent, the per child penalty declines to 6.8 percent. That the strength of the effect of older preschooler care is weaker than that of infant care is not surprising. In many countries, childcare for this older age group is part of the early education system, and is more focused on its educational aspects than its efforts to help families balance work and family demands. For example, in many countries pre-school education is part time and does not correspond with normal working hours. In summary, our first hypothesis is firmly supported: Greater levels of childcare for infants and preschool children are linked to smaller motherhood penalties. Turning to the impact of family leave, we first consider paid leaves: paid maternity leave, paid paternity leave, and our calculated measure of weeks of fully funded job-protected parental care leaves. In Model number 6 in Table 4 we find a significant and positive interaction between number of children and weeks of fully paid maternity leave. Figure 3 shows how the per-child effect changes by length of paid maternity leave such that, in countries with 0 weeks of paid maternity leave, the predicted per child penalty is 11 percent, and shrinks to 6 percent per child as paid maternity leave length increases to 25 weeks. In summary, we find support for our hypothesis 2a stating that paid maternity and parental care leaves should be negatively associated with the size of the motherhood penalty.

[FIGURE 3 ABOUT HERE]

Paid paternity leave also shows a significant and positive interaction with number of children, indicating that where paid paternity leave lengths are greater, the motherhood penalty is smaller. Model 7 of Table 4 shows the cross-level interactive effect between number of children and length of paternity leave. Here we find that the average per-child effect in countries offering no paid leave to fathers is about 9.2 percent per child. The significant interaction is positive, however, and shows that for each additional week of paternity leave, the per-child penalty declines by about 1.7 percentage points. While this implies that six weeks of paid paternity leave might eradicate motherhood penalties, we urge strong caution against interpreting this effect in such a manner. The distribution of countries on this variable is highly skewed, as we saw in Table 1. The vast majority of countries offer no paid paternity leave to men, and several of those that do offer only a few days. As we suggested above, with such little time offered to fathers, it is unlikely that this paternity leave alters any traditional gender distribution of carework in heterosexual couples. Israel, with its six weeks of leave for new fathers, may be the exception in this regard, but we think it more likely that the presence of paid paternity leave may signal cultural differences in the valuation of father involvement with children and an emphasis on more gender equitable sharing of care. Indeed, Israel, Sweden and Finland are known for their multiple policies aimed at gender egalitarianism, and paternity leave may be a signal of a broader regime of equalizing the sexes. In summary, we find some evidence to support our hypothesis 2a in regard to paternity leave, though for the reasons discussed above, we are not wholly convinced by the evidence.

Next we consider the effect of our calculated measure for number of fully funded weeks of leave (weeks of job protected parental leave * benefit level). As the cross-level interaction between fully funded leave length and number of children in model 8 in table 4 and Figure 3 show, weeks of fully funded parental leave also significantly impact the size of the motherhood wage penalty.

The per child penalty in countries with zero weeks of funded leave is 9.3 percent, and this declines to a minimum of 4.4 percent in countries with 53 fully funded weeks of parental care leave.[3] Overall, hypothesis 2a is strongly supported by our findings for paid maternity and paid parental care leaves, with some support for paid paternity leaves as well.

In addition to paid leaves, we also examined the cross-level effects of job-protected parental care leave for women (often unpaid) and the motherhood penalty.

The ninth model in Table 4 presents the impact of the maximum number of weeks of women's job-protected parental leave (and its squared term) on the penalty for motherhood. (Findings for the combination of maternity plus parental care leaves are equivalent to the results presented for parental care leaves alone.) Parental care leave may or may not be associated with monetary transfers to families, depending upon the country. Here, the main effect of number of children is significant and indicates that in countries with zero weeks of job-protected leave, the per-child penalty is roughly 13.2 percent. The cross-level statistical interactions between the child penalty and weeks of leave is significant ($p \leq .001$, two-tailed test) and positive, while the cross-level interaction between the child penalty and the squared leave term is significant and negative. This indicates a curvilinear relationship, which is best viewed graphically in Figure 4. Again, this figure shows how the effect of children on earnings varies by the number of weeks of leave offered to women as a solid line. The curvilinear pattern is dramatic and shows that countries with zero to 49 weeks of job-protected care leave have very large motherhood penalties (exceeding 6 percent per child), as do countries with extremely long leaves, from 157 to 173 weeks (3 or more years). But even the longest leaves are associated with smaller penalties relative to no leave at all. The per-

[3] In results not shown, we included both paid maternity leave and fully funded parental care leave in the same model, results for both were robust.

child penalty is smallest (1.24 percent per child) in countries with 101 to 105 weeks of job-protected leave (around 2 years of job-protected leave).

[FIGURE 4 ABOUT HERE]

In summary, for women we find our hypothesis 2b supported for extended care leaves, Countries that allow for very long leaves of absence (3 or more years) are also associated with high motherhood penalties, perhaps due to lost human capital or employer discrimination against long-absent workers. Still, countries with no leave provisions show the largest motherhood penalties. However, countries that allow for 2 years of job-protected leave are associated with the smallest per-child penalties – that are roughly 73 percent smaller relative to no leave, perhaps because this leave length strikes the best balance between mothers' desires to care for newborns and their desires to return to employment.

We next consider whether motherhood penalties are larger when the marginal tax rate of the second earner's income is higher. Model 11 of Table 5 and Figure 5 offer evidence in support of our third hypothesis: the percentage of the second earner's income that must go to pay the additional income tax burden generated by that income is significantly related to the size of the motherhood penalty. Countries with the lowest reported marginal tax rates, of 23 percent, show the smallest per child penalties of 7.9 percent. Per child penalties become larger as the marginal tax rate increases, such that the highest marginal tax rate of 53 percent is associated with a 12.2 percent child penalty.

[FIGURE 5 ABOUT HERE]

The level of taxation of the second earner's income may have tradeoffs with usage of work-family policies, particularly childcare for very young children and lowly benefitted or unpaid job protected leave. To consider whether the relationship of childcare and leave policy indicators are

contingent on second earner tax rates, in models 12 and 13 of table 5 we re-estimate our earlier models for childcare of 0 to 3 year olds and for duration of parental leave by including taxation rates of second earners. In model 12, the size and significance of the cross-level interactions between number of children with childcare for 0-3s is unchanged with the inclusion of the taxation policy, as is the cross-level interaction of taxation with number of children unaffected by the inclusion of the childcare rates of 0-3s. However, in model 13 we find that the significance of the cross-level interaction between taxes and number of children becomes stronger, and the significance of leave duration and children becomes weaker, when we include both measures and their interactions in the model. This implies that the effects of leave duration may be partially accounted for by the degree of the tax penalty for 2nd earners. While the two measures are uncorrelated in a bivariate analysis, they may be correlated after adjusting for the effects of other factors in the model and in terms of their joint prediction of the dependent variable (earnings). To examine this, we re-estimated the leave duration model including the taxation measure as an additive control. Results of this model are shown in Figure 4 above. Once we control for the tax penalty on the second earner's income, that leave duration still shows a curvilinear relationship where the absence of leave and very long leaves are associated with larger motherhood penalties, and the penalties are generally larger and less curvilinear, with the exception of leave durations of 0 to 14 weeks being associated with smaller motherhood penalties when the tax penalty is controlled. Thus, while the leave duration is less effective at moderating the impact of children on wages when the tax wedge is included, motherhood penalties are greater at almost every level of leave in this model.

Robustness of Cross-Level Interactions

We examine whether other salient country-level characteristics might explain away the significant policy and cultural impacts on the motherhood penalty established in our multi-level models. We thus conduct a robustness analysis of our significant interactions to examine whether the associations between policies and the child penalties might be due to country-level differences in women's labor force participation [21], the size of the public sector, the level of within-country income inequality, and the size of the country's GDP. Table 6 presents the results from this series of analyses.

[Table 6 about here]

The four policy measures are presented in separate panels. The first column of Table 6 replicates results from Tables 3, 4, and 5 where human capital individual controls and the particular policy measure, plus an interaction between the policy measure and number of children, are included. Column two includes a measure of women's labor force participation for each country. The third column controls for the size of the public sector in each country, which is associated both with maternal employment and the likelihood of enforcement of family policies. The fourth column controls for the Gini coefficient to examine whether country-level income inequality can explain variation in the motherhood penalty and the effects of policies on this penalty. Finally, the fifth column controls for each country's GDP to examine whether the size of the country's economic is related to the size of the motherhood penalty and the effect of work-family policies on this penalty. In each model, the country-level control is included as a main effect, and we tested for statistical interactions with number of children. None of the country-level control variables significantly interacted with number of children, and non-significant interactions were excluded from the models.

Remarkably, in every single model, results for the motherhood penalty and for the cross-level interaction between the policy indicator and the motherhood penalty are impervious to the inclusion of these level 2 controls. Looking first at the effect of childcare for 0- to 3-year-olds on the motherhood penalty we find that none of the level-2 control variables altered a) the effect of children on earnings or b) the interactive effect between childcare and number of children. While the main effects of the policy indicator (percentage of 0 to 3 year olds in public care) does change across models, the main effect for the motherhood penalty and its cross-level interaction with percentage of children in public care is unchanged. Notably, the Gini coefficient, while having a negative and significant impact as a main effect, failed to alter the relationship between children and earnings. This is very interesting, particularly given the important impact of income inequality on gender gaps in earnings (Blau and Kahn 1992, 1996, 2003; Mandel and Semyonov 2005), and suggests that motherhood penalties (as opposed to gender gaps) cannot be explained or easily attributed to larger economic pressures leading to earnings inequalities.

The robustness checks for the other policy measures (paid leaves, parental care leave duration, tax policies and combinations of indicator models) show equally resilient results. None of the control variables (employment probabilities, public sector, and the Gini coefficient) significantly interacted with number of children. Moreover, the impact of number of children on earnings, and the interactions between number of children and the policy measures, were unaffected by the inclusion of the country-level control variables. We thus conclude that our policy findings are robust to the inclusion of these country-level controls.

Discussion and Conclusions

Our analysis endeavored to accomplish several goals. First, in contrast to past research that used welfare state typologies and/or work-family policy indices to theorize and investigate

the impacts of family policies on women's economic outcomes, we examined the relationship between particular policies and the earnings penalties for motherhood cross-nationally, as well as how taxation of the second earner's income combines with policies to effect earnings. We argued that past findings of inconsistent effects of policies on women's, and mothers', economic outcomes might result from the conflation of contradictory policy effects. Two widely studied policies, leave and childcare, clearly have countervailing effects. The increased prevalence of publicly funded childcare for children under the age of 3 and children aged 0 to 3 is significantly associated with smaller per-child penalties. We find this effect despite the varying socio-economic policy contexts of the 22 nations in our analysis. Similarly, the effects of leave provide evidence in support of our hypotheses that paid leaves (maternity, paternity, and equivalent fully paid weeks of parental care) all are inversely associated with the motherhood penalty: where these paid leaves are longer, motherhood penalties are smaller. In regard to the duration of extended parental leaves, we find a curvilinear relationship: both the absence of care leaves and very long leaves for women serve to increase the negative effects of motherhood on earnings, while moderate job-protected leaves are associated with smaller motherhood penalties. However, we caution that our findings regarding paternity leaves, given the relative absence of these leaves cross-nationally and their short duration, are better interpreted from a cultural standpoint. We argue that the presence of these leaves is best viewed as a cultural indicator of the value of father-care in the nations that have them (Sweden, Finland, and Israel).

As we predicted, tax policies also matter. Where the marginal income tax rate for the second earner captures a greater share of her earnings, motherhood penalties are larger. Moreover, marginal second earner tax rates influence the relationship between leave duration

and the motherhood penalty, such that leave has weaker relationship with the motherhood penalty in models where we adjust for the second earner tax rate.

Our third goal was to correctly model the multilevel effects of individual-level factors and country-level indicators. We wanted to break with the tradition of using welfare-state typologies and associating ideal types with women's economic outcomes. While this approach has advanced understandings of welfare states and gender inequities significantly, it cannot disentangle contexts particular to specific countries from their policy effects. Our approach reveals that despite significant differences in socio-economic and political settings, some family-policy effects are robust across these differences. For policymakers contemplating which policies might be most effective at reducing pay inequities, the answer is clear: Policies that serve to keep women attached to the labor market, through moderate-length leaves, publicly funded childcare, lower marginal tax rates on second earner income, as well as support for father involvement after a birth, appear most effective at reducing the motherhood penalty.

Overall, we have integrated important insights made by scholars regarding how welfare state interventions via work-family policies and affect women's economic outcomes, as well as the factors that shape earnings penalties to mothers. By integrating these different literatures, we have been able to explain previously conflicting findings, while identifying the ways in which policies should be constructed in order to promote the best outcomes for mothers' earnings. At their core, we believe that work-family policies are neither good nor bad – but have complex and contextualized effects that relate to the gendered assumptions underlying the policies. High-quality childcare for children under 3 and short-term care leaves support mothers' employment; long-term care leaves, on the other hand, help weaken women's labor force attachment, and may indeed increase employers' reluctance to hire mothers (Correll et al. 2007).

In addition, we believe that our findings have important implications for understanding *gender inequality* as well as motherhood penalties. Over time, earnings for childless men and women have been converging; yet earnings for mothers and fathers remain significantly different in many countries. This means that unpacking the sources of inequality between mothers and childless women (as well as between fathers and childless men as in Glauber 2007; Authors 2008; Hodges and Budig 2010) is an important step toward fully unpacking the sources of gender inequality. Future research should explicitly consider the degree to which parenthood generates observed gender earnings gaps.

Endnotes

1. In many countries, cohabitation is akin to marriage. We include cohabitors as married couples.

2. Waldfogel (1998b) found women covered by or using maternity leave in the UK and U.S. received a wage premium.

3. While Mandel and Semyonov (2005) do estimate supplementary models with separated, as well as combined, measures for childcare and maternity leave, their paper primarily focuses on the effect of a combined policy index on the gender pay gap. We extend the separate policy models approach begun in their work.

4. "Maternity leave" and "paternity leave" refer to birth-related leave typically accompanied by earnings-related benefits, while "parental leave" stands for longer leaves, typically with low levels of benefits or unpaid but providing job protection, that enable parents to care for young children in the home.

5. Because Wave 5 data are not available or are of poorer quality, we use Wave 4 data for the Czech Republic and the Slovak Republic and Wave 6 data for Poland.

6. Due to data limitations, only mothers with children living in their household can be identified. This likely leads to underestimation of the penalty because mothers whose children have left the home could still suffer from reduced earnings, but would be coded as childless women in our sample.

7. We use average annual exchange rates and Consumer Price Index (CPI) Conversion Factors (Sahr 2001) to convert national currencies into U.S. dollars in year 2000. We also estimated models using earnings in national currencies. The fixed-effects coefficients are not affected by the conversion. Since the conversion into U.S. dollars reduces the spread of the earnings distributions, the standard errors tend to be smaller in the models using logged 2000 U.S. dollars. Finally,

following Mandel and Semyonov (2005, 2006), we also estimated models using within-country earnings percentile rankings; this corrects for different levels of earnings dispersions across countries.

8. While not an ideal measure of experience, this is commonly used when actual work experience is lacking (see Filer 1993; Stewart 2000).

9. In Finland direct weekly hour measures are unavailable, though numbers of weeks worked full time and part time are available. We constructed a measure of part-time employment by comparing the numbers of weeks worked full and part time. If a respondent spent a majority of the weeks in part-time employment he or she was coded as part-time employed. In the Slovak Republic and Poland, the part-time measure represents self-reported part-time status.

10. We examine former East and West Germany separately, due to the persistent differences in employment patterns and different policy legacies (Rosenfeld, Trappe, and Gornick 2004).

11. While we have Swiss policy data, we found the LIS data for Switzerland to be too problematic for use in our analyses.

12. Of course, it is likely that the lagged effect is longer, especially given our measurement of motherhood. Without longitudinal individual-level data, however, we believe that this is the best approach to take.

13. In federally organized states, we measure leave policies at the federal level, or the smallest common denominator at the subnational-level. The details of the construction of the policy measures is can be found in the documentation of Work-Family Policy Indicators database available at: http://www.lisdatacenter.org/wp-content/uploads/resources-other-work-family-policy-indicators.pdf.

14. These data are available through the Leibniz Institute for the Social Sciences: http://www.gesis.org/en/services/data/survey-data/issp/modules-study-overview/family-changing-gender-roles/2002/.

18. In addition, programs for 3-6-year-olds vary remarkably in the number of hours children are in care, as well as the number of days each year that care is provided. With a more detailed measure, for example, including the number of hours of care per week for 3-6-year-olds, we might expect to find stronger effects. While Jane Lewis (2009) offers the percentage of children in care (public or private) for 30 or more hours a week, unfortunately not all of the countries used in our analysis are included in her tabulations.

19. Because Sweden is an outlier on this policy measure, in results not shown we top-coded Sweden to the next lower observed value and re-estimated the models to ensure Sweden was not driving our findings. Results remained significant and in the same direction.

20. Sweden is the well-documented exception here where the so-called "daddy month" has increased fathers' take-up of parental leave, even though women still take the overwhelming majority of leave days (Haas and Hwang 1995).

21. In results not shown, we tried alternate specifications of labor force participation: women's employment rates, mothers' employment rates, women's full-time employment rates, mothers' full-time employment rates, and women's and mothers' employment probabilities (generated by a logistic model using presence of a preschooler, education, age, and other household income and its square as predictors). Results were robust across all specifications, so we opted for the simplest specification (women's employment rates).

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Figure 1. Factors Impacting the Earnings Penalty for Motherhood, Two-Level Model

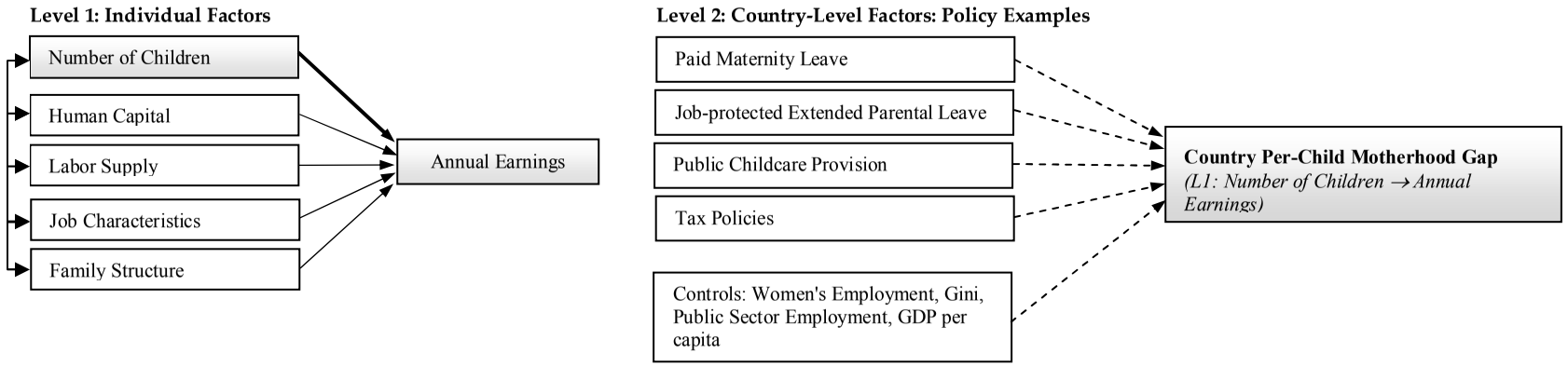

Table 1. Country-level Measures

	% of 0-3 year olds in publicly supported childcare[1]	% of 3-6 year olds in publicly supported childcare[1]	No. of weeks of fully paid maternity leave[1]	No. of weeks of fully paid parental leave[1]	Max. no. of weeks of job protected leave[1]	No. of weeks of paternity leave[1]	Taxation of 2nd earner's income (100% of APW)[2]	% women employed[3]	% workers employed in public sector[4]	Gini coefficient[5]	GDP per capita in current US dollars[6]
Australia	13	41	0	0	52	0	32	65	16	.317	19053
Austria	8	77	16	24	85	0	29	75	27	.257	24194
Belgium	20	99	12	4	28	0.6	53	78	31	.279	22623
Canada	5	53	8	6	25	0	36	76	19	.315	23559
Czech Rep.	1	76	19	32	162	0	30	76	22	.259	6011
Finland	24	66	12	37	161	3	34	70	27	.246	23543
France	22	99	13	53	159	0.6	26	72	30	.278	22547
Germany E	34	87	14	13	161	0	53	78	23	.231	23114
Germany W	5	75	14	13	161	0	53	67	22	.280	23114
Hungary	10	88	24	73	159	0	30	71	37	.292	4692
Ireland	4	56	10	0	14	0	31	62	18	.313	25313
Israel	19	79	10	0	64	6	NA	61	17	.346	18423
Italy	6	85	18	8	48	0	39	52	16	.333	19269
Luxembourg	4	68	16	23	42	0.4	28	67	11	.260	46277
Netherlands	6	68	16	0	16	0	40	76	25	.231	26033
Poland	2	39	18	0	173	0	37	66	29	.507	6620
Russia	21	64	20	12	165	0	NA	80	38	.434	1775
Slovak Rep.	9	78	25	36	161	0	NA	75	44	.189	2215
Spain	5	77	16	0	161	0.4	23	52	26	.336	14421
Sweden	41	86	7	50	64	2	34	86	34	.252	27286
UK	1	71	8	0	18	0	24	69	19	.347	24993
US	6	53	0	0	12	0	30	73	16	.368	34600

Sources:
[1] Work-Family Policy Indicators (http://www.lisdatacenter.org/resources/other-databases/)
[2] Jaumotte (2003)
[3] Authors' calculations based on LIS data
[4] International Labor Organization and authors' calculations based on LIS data
[5] Luxembourg Income Study, Key Figures
[6] OECD (2012)

Table 2. Weighted Means and Standard Deviations in Parentheses for Individual-level Variables

	N (aged 25-45)	Natural log of annual earn.	No. of children	Married/ Cohab.	Age	Part-time worker	Higher educ.	Inverse Mills Ratio	Prof./ Manag. worker	Prop. wom. in occ.
Australia	1,441	9.547	1.237	.775	35.010	.348	.245	.412	.279	.577
		(.690)	(1.147)	(.418)	(5.657)	(.477)	(.430)	(.067)	(.449)	(.189)
Austria	545	9.127	1.128	.760	35.330	.307	.180	.367	.103	.571
		(.744)	(.961)	(.428)	(5.988)	(.462)	(.384)	(.047)	(.304)	(.157)
Belgium	812	9.485	1.454	.803	35.738	.275	.474	.381	.226	.589
		(.712)	(1.118)	(.398)	(5.765)	(.447)	(.500)	(.037)	(.419)	(.163)
Canada	8,141	9.438	1.311	.760	35.849	.208	.218	.392	.199	.626
		(1.105)	(1.128)	(.427)	(5.898)	(.406)	(.413)	(.043)	(.400)	(.217)
Czech R.	6,907	8.109	1.614	.843	36.734	.043	.104	.357	.087	.623
		(.579)	(.867)	(.364)	(5.735)	(.203)	(.305)	(.091)	(.282)	(.195)
Finland	2,752	9.410	1.267	.774	35.509	.085	.221	.402	.236	.675
		(1.005)	(1.177)	(.418)	(6.022)	(.280)	(.415)	(.101)	(.424)	(.203)
France	2,723	9.146	1.347	.775	35.415	.218	.211	.391	.218	.679
		(.846)	(1.058)	(.418)	(5.969)	(.413)	(.408)	(.068)	(.413)	(.224)
Germ. E	762	9.322	1.214	.735	35.900	.182	.380	.348	.117	.670
		(.970)	(.886)	(.442)	(5.807)	(.386)	(.486)	(.066)	(.322)	(.229)
Germ. W	2,466	9.272	1.115	.743	35.994	.382	.243	.391	.111	.659
		(1.093)	(1.061)	(.437)	(5.691)	(.486)	(.429)	(.081)	(.315)	(.223)
Hungary	406	7.343	1.526	.855	36.291	.079	.215	.399	.199	.774
		(.940)	(.947)	(.353)	(5.694)	(.271)	(.412)	(.056)	(.400)	(.222)
Ireland	640	9.398	1.526	.793	34.792	.318	.307	.441	.209	.615
		(.881)	(1.332)	(.406)	(5.706)	(.466)	(.462)	(.064)	(.407)	(.161)
Israel	1,408	9.450	2.035	.837	35.106	.237	.457	.440	.193	.573
		(.762)	(1.462)	(.369)	(5.943)	(.426)	(.498)	(.058)	(.395)	(.166)
Italy	1,170	9.145	1.202	.833	36.907	.251	.171	.500	.145	.435
		(.560)	(.933)	(.374)	(5.301)	(.434)	(.377)	(.019)	(.353)	(.135)
Luxemb.	666	9.553	1.022	.756	34.765	.289	.330	.392	.175	.592
		(.900)	(1.027)	(.430)	(5.810)	(.454)	(.471)	(.069)	(.380)	(.211)
Netherl.	1,606	9.514	1.175	.823	34.821	.481	.324	.373	.378	.634
		(.917)	(1.120)	(.381)	(5.755)	(.500)	(.468)	(.053)	(.485)	(.206)
Poland	6,419	8.027	1.482	.798	36.109	.077	.307	.422	.243	.628
		(.569)	(1.061)	(.402)	(6.016)	(.267)	(.461)	(.037)	(.429)	(.182)
Russia	820	6.012	1.371	.781	36.962	.069	.264	.368	.266	.795
		(1.023)	(.833)	(.414)	(5.832)	(.253)	(.441)	(.020)	(.442)	(.234)
Slovak R.	5,187	7.275	1.868	.863	36.322	.034	.123	.370	.132	.642
		(.514)	(.994)	(.344)	(5.528)	(.182)	(.328)	(.079)	(.339)	(.194)
Spain	923	8.871	1.043	.871	34.379	.160	.305	.494	.206	.560
		(.975)	(1.034)	(.336)	(5.710)	(.367)	(.461)	(.039)	(.405)	(.148)
Sweden	3,606	9.408	1.380	.688	35.078	.280	.197	.340	.103	.548
		(1.108)	(1.161)	(.463)	(5.912)	(.449)	(.398)	(.052)	(.304)	(.145)
UK	5,582	9.675	1.232	.797	35.515	.359	.217	.374	.219	.574
		(.896)	(1.130)	(.402)	(5.824)	(.480)	(.412)	(.073)	(.413)	(.175)
US	13,544	9.871	1.368	.716	35.764	.117	.309	.392	.348	.645
		(1.011)	(1.221)	(.451)	(5.913)	(.322)	(.462)	(.049)	(.476)	(.238)

Table 3. Multilevel Models Estimating the Effect of Publicly Supported Childcare Indicators on the Earnings Penalty for Motherhood, Net of Individual-level Controls

	1 Gross Penalty		2 Human Capital		3 Job Characteristics		4 Human Capital + Enrolment of 0-3 Year Olds		5 Human Capital + Enrolment of 3-6 Year Olds	
	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta
No. of Children	**-0.160**	**-0.145**	**-0.088**	**-0.080**	**-0.084**	**-0.077**	**-0.101**	**-0.091**	**-0.119**	**-0.108**
	0.003		0.003		0.003		0.004		0.011	
Married/Cohabiting			0.014	0.005	0.010	0.003	0.013	0.004	0.014	0.005
			0.008		0.007		0.008		0.008	
Age			**0.017**	**0.081**	**0.016**	**0.077**	**0.017**	**0.081**	**0.017**	**0.081**
			0.001		0.001		0.001		0.001	
Part-time Worker			**-0.743**	**-0.230**	**-0.730**	**-0.226**	**-0.741**	**-0.230**	**-0.743**	**-0.231**
			0.008		0.008		0.008		0.008	
Higher Education			**0.508**	**0.174**	**0.300**	**0.103**	**0.507**	**0.174**	**0.508**	**0.174**
			0.007		0.008		0.007		0.007	
Inverse Mills Ratio			**-1.924**	**-0.109**	**-1.893**	**-0.107**	**-1.921**	**-0.109**	**-1.929**	**-0.109**
			0.048		0.047		0.048		0.048	
Prof./Manag. Worker					**0.421**	**0.140**				
					0.009					
% Women in Occ.					0.015	0.002				
					0.015					
% 0-3 Yr. Olds in Childcare							-0.003	-0.022		
							0.021			
% of 0-3 Yr. Olds in CC * # of Child.							**0.001**	**0.025**		
							0.000			
% 3-6 Yr. Olds in Childcare									-0.002	-0.021
									0.014	
% of 3-6 Yr. Olds in CC * # of Child.									**0.000**	**0.031**
									0.000	
Intercept	**9.154**		**9.228**		**9.208**		**9.256**		**9.341**	
	0.205		0.222		0.223		0.341		1.041	
BIC	173632		157830		155421		157844		157866	
AIC	173595		157738		155312		157735		157756	

4. Multilevel Models Estimating the Effect of Maternity, Paternity, and Parental Leave on the Earnings Penalty for Motherhood, Net of Individual-level Controls

	6 Weeks of Paid Maternity Leave		7 Weeks of Paid Paternity Leave		8 Parental Leave Generosity		9 Maximum Weeks of Leave	
	B	Beta	B	Beta	B	Beta	B	Beta
No. of Children	**-0.111**	**-0.101**	**-0.096**	**-0.087**	**-0.098**	**-0.089**	**-0.141**	**-0.128**
	0.004		0.003		0.004		0.007	
Married/Cohabiting	0.013	0.004	0.014	0.005	0.013	0.004	0.012	0.004
	0.008		0.008		0.008		0.008	
Age	**0.017**	**0.081**	**0.017**	**0.081**	**0.017**	**0.081**	**0.017**	**0.080**
	0.001		0.001		0.001		0.001	
Part-time Worker	**-0.742**	**-0.230**	**-0.741**	**-0.230**	**-0.741**	**-0.230**	**-0.741**	**-0.230**
	0.008		0.008		0.008		0.008	
Higher Education	**0.508**	**0.174**	**0.507**	**0.174**	**0.507**	**0.174**	**0.506**	**0.174**
	0.007		0.007		0.007		0.007	
Inverse Mills Ratio	**-1.927**	**-0.109**	**-1.922**	**-0.109**	**-1.928**	**-0.109**	**-1.923**	**-0.109**
	0.048		0.048		0.048		0.048	
Wks of Fully Paid Maternity Lv.	**-0.115**	**-0.717**						
	0.026							
Wks of Fully Paid Maternity Lv. * # of Children	**0.002**	**0.037**						
	0.000							
Wks of Paid Paternity Leave			0.122	0.107				
			0.159					
Wks of Paid Paternity Leave * # of Children			**0.017**	**0.034**				
			0.002					
Wks of Fully Paid Parental Lv.					-0.018	-0.270		
					0.010			
Wks of Fully Paid Parental Lv. * # of Children					**0.001**	**0.024**		
					0.000			
Max. Length of Leave for Women							0.001	0.051
							0.018	
Max. Length of Leave for Women * # of Children							**0.002**	**0.271**
							0.000	
Max. Length of Leave for Women Squared							0.000	-0.617
							0.000	
Max. Length of Lv. for Women Sq. * # of Children							**0.000**	**-0.224**
							0.000	
Intercept	**10.764**		**9.153**		**9.533**		**9.911**	
	0.383		0.241		0.289		0.570	
BIC	157811		157797		157862		157851	
AIC	157702		157688		157752		157723	

Table 5. Multilevel Models Estimating the Effect of Tax Disincentives for Second Earners, and Combinations of Policy Indicators on the Earnings Penalty for Motherhood, Net of Individual-level Controls

	10 Taxation of 2nd Earner's Wage (100% of APW)		**12 Taxation & Childcare**		**13 Taxation & Leave**	
	B	Beta	B	Beta	B	Beta
No. of Children	**-0.047**	**-0.043**	**-0.050**	**-0.045**	**-0.055**	**-0.050**
	0.015		0.015		0.015	
Married/Cohabiting	**0.018**	**0.006**	**0.017**	0.005	0.016	0.005
	0.008		0.008		0.008	
Age	**0.019**	**0.088**	**0.019**	**0.087**	**0.018**	**0.087**
	0.001		0.001		0.001	
Part-time Worker	**-0.742**	**-0.230**	**-0.740**	**-0.230**	**-0.740**	**-0.230**
	0.009		0.009		0.009	
Higher Education	**0.514**	**0.176**	**0.513**	**0.176**	**0.513**	**0.176**
	0.008		0.008		0.008	
Inverse Mills Ratio	**-2.025**	**-0.115**	**-2.023**	**-0.115**	**-2.028**	**-0.115**
	0.053		0.053		0.053	
Taxation at 100% of APW	0.009	0.049	0.007	0.036	0.014	0.077
	0.018		0.019		-0.014	
Taxation at 100% of APW * # of Children	**-0.002**	**-0.047**	**-0.002**	**-0.055**	**-0.002**	**-0.076**
	0.000		0.000		0.000	
% 0-3 Yr. Olds in Childcare			0.006	0.046		
			0.015			
% of 0-3 Yr. Olds in Childcare * # of Child.			**0.001**	**0.020**		
			0.000			
Max. Length of Leave av. to Women					-0.002	-0.116
					0.013	
Max. Length of Leave av. to Wom. * # of Children					**0.001**	**0.180**
					0.000	
Max. Length of Leave av. to Women Sq.					0.000	-0.280
					0.000	
Max. Length of Leave av. to Wom. Sq. * # of Children					**0.000**	**-0.141**
					0.000	
Intercept	**9.150**		**9.170**		**9.483**	
	0.635		-0.651		0.620	
BIC	143849		143875		143914	
AIC	143741		143749		143769	

Table 6. Robustness Analysis

	Human Capital Controls Only	**+ Women's Emp. Rates**	**+ % of Workers in Pub. Sector**	**+ Gini Coefficient**	**+ GDP per Capita**
EARLY CHILDHOOD EDUCATION AND CARE					
Effect of 0-3 Childcare on # of Children Slope					
Number of Children	**-0.101**	**-0.101**	**-0.101**	**-0.101**	**-0.101**
	0.004	0.004	0.004	0.004	0.004
% 0-3 in Public Care	-0.003	0.013	0.025	-0.009	-0.006
	0.021	0.024	0.015	0.022	0.013
% 0-3 in Care * # of Child.	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
	0.000	0.000	0.000	0.000	0.000
Effect of 3-6 Childcare on # of Children Slope					
Number of Children	**-0.119**	**-0.119**	**-0.119**	**-0.119**	**-0.119**
	0.011	0.011	0.011	0.011	0.011
% 3-6 in Public Care	-0.002	0.001	0.016	-0.013	0.000
	0.014	0.014	0.010	0.016	0.008
% 3-6 in Care * # of Child.	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	0.000	0.000	0.000	0.000	0.000

Table 6. Robustness Analysis Continued

	Human Capital Controls Only	**+ Women's Emp. Rates**	**+ % of Workers in Pub. Sector**	**+ Gini Coefficient**	**+ GDP per Capita**
			LEAVE POLICIES		
Number of Weeks of Fully Paid Maternity Leave on # of Children Slope					
Number of Children	**-0.111**	**-0.111**	**-0.111**	**-0.111**	**-0.111**
	0.004	0.004	0.004	0.004	0.004
Wks of Maternity Leave	**-0.115**	**-0.115**	**-0.072**	**-0.122**	**-0.057**
	0.026	0.025	0.027	0.023	0.023
Wks of Mat. Lv. * # of Child.	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**
	0.000	0.000	0.000	0.000	0.000
Number of Weeks of Fully Paid Parental Leave on # of Children Slope					
Number of Children	**-0.098**	**-0.098**	**-0.098**	**-0.098**	**-0.098**
	0.004	0.004	0.004	0.004	0.004
Wks of Parental Lv.	-0.018	-0.015	0.002	**-0.029**	-0.010
	0.010	0.011	0.009	0.010	0.006
Wks of Partl. Lv. * # of Child.	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
	0.000	0.000	0.000	0.000	0.000
Maximum Number of Weeks of Leave Available to Women					
Number of Children	**-0.141**	**-0.141**	**-0.141**	**-0.141**	**-0.141**
	0.007	0.007	0.007	0.007	0.007
Max. Length of Leave	0.001	0.000	0.004	-0.005	0.002
	0.018	0.018	0.016	0.019	0.014
Max. Length of Lv. * # of Child.	**0.002**	**0.002**	**0.002**	**0.002**	**0.002**
	0.000	0.000	0.000	0.000	0.000
Max. Length of Lv. Squared	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000
Max. Length of Lv. Sq * # of Child.	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	0.000	0.000	0.000	0.000	0.000
Number of Weeks of Paternity Leave on # of Children Slope					
Number of Children	**-0.096**	**-0.096**	**-0.096**	**-0.096**	**-0.096**
	0.003	0.003	0.003	0.003	0.003
Wks of Paternity Lv.	0.122	0.104	0.080	0.118	0.072
	0.159	0.159	0.115	0.158	0.094
Wks of Paternity Lv. * # of Child.	**0.017**	**0.017**	**0.017**	**0.017**	**0.017**
	0.002	0.002	0.002	0.002	0.002

Table 6. Robustness Analysis Continued

	Human Capital Controls	+ Women's Emp. Rates	+ % of Workers in Pub. Sector	+ Gini Coefficient	+ GDP per Capita
TAXATION					
Increase in Taxes Paid by Household in which 1st earner earns 100% of APW and 2nd earner starts to earn 100% of APW in % of 2nd earner's wages					
Number of Children	**-0.047**	**-0.047**	**-0.047**	**-0.047**	**-0.047**
	0.015	0.015	0.015	0.015	0.015
Taxation of 2nd earner's income (100% of APW)	0.009	0.010	0.014	0.006	0.009
	0.018	0.019	0.015	0.018	0.011
Taxation of 2nd earner's inc. (100% of APW) * # of Children	**-0.002**	**-0.002**	**-0.002**	**-0.002**	**-0.002**
	0.000	0.000	0.000	0.000	0.000
COMBINATIONS					
Childcare and Taxation					
Number of Children	**-0.050**	**-0.050**	**-0.050**	**-0.050**	**-0.050**
	0.015	0.015	0.015	0.015	0.015
% 0-3 Yr. Olds in Childcare	0.006	0.010	**0.028**	0.000	-0.001
	0.015	0.018	0.013	0.017	0.010
% of 0-3 Yr. Olds in CC * # of Child.	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
	0.000	0.000	0.000	0.000	0.000
Taxation at 100% of APW	0.007	0.008	0.005	0.006	0.009
	0.019	0.020	0.014	0.019	0.012
Taxation at 100% of APW * # of Children	**-0.002**	**-0.002**	**-0.002**	**-0.002**	**-0.002**
	0.000	0.000	0.000	0.000	0.000
Leave and Taxation					
Number of Children	**-0.055**	**-0.055**	**-0.055**	**-0.055**	**-0.055**
	0.015	0.015	0.015	0.015	0.015
Max. Length of Leave av. to Women	-0.002	-0.001	0.001	-0.007	-0.003
	0.013	0.013	0.013	0.014	0.010
Max. Length of Leave av. to Wom. * # of Children	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
	0.000	0.000	0.000	0.000	0.000
Max. Length of Lv. av. to Wom. Sq.	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000

	Human Capital Controls	+ Women's Emp. Rates	+ % of Workers in Pub. Sector	+ Gini Coefficient	+ GDP per Capita
Max. Length of Lv. av. to Wom. Sq. * # of Children	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	0.000	0.000	0.000	0.000	0.000
Taxation at 100% of APW	0.014	0.017	0.016	0.011	0.012
	0.014	0.015	0.013	0.014	0.011
Taxation at 100% of APW * # of Children	**-0.002**	**-0.002**	**-0.002**	**-0.002**	**-0.002**
	0.000	0.000	0.000	0.000	0.000

Figure 2. Net Per Child Effect on Ln Annual Earnings, by the Percentage of Children Aged 0 up to 3, and for 3 up to 6, Who Are Enrolled in Publicly Funded Childcare

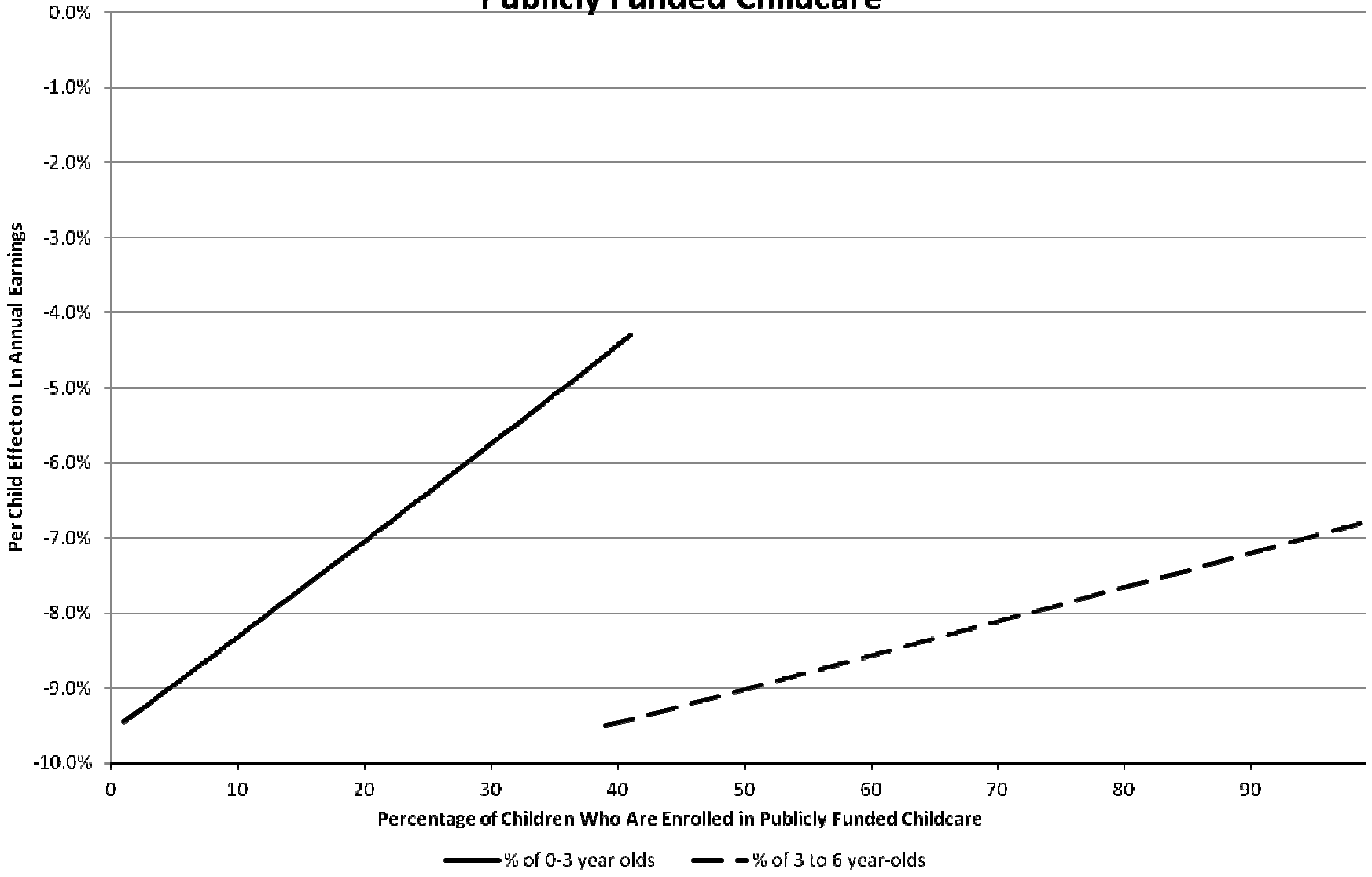

Figure 3. Net Per Child Effect on Ln Annual Earnings by Number of Weeks of Paid Maternity Leave and Fully Funded Parental Leave

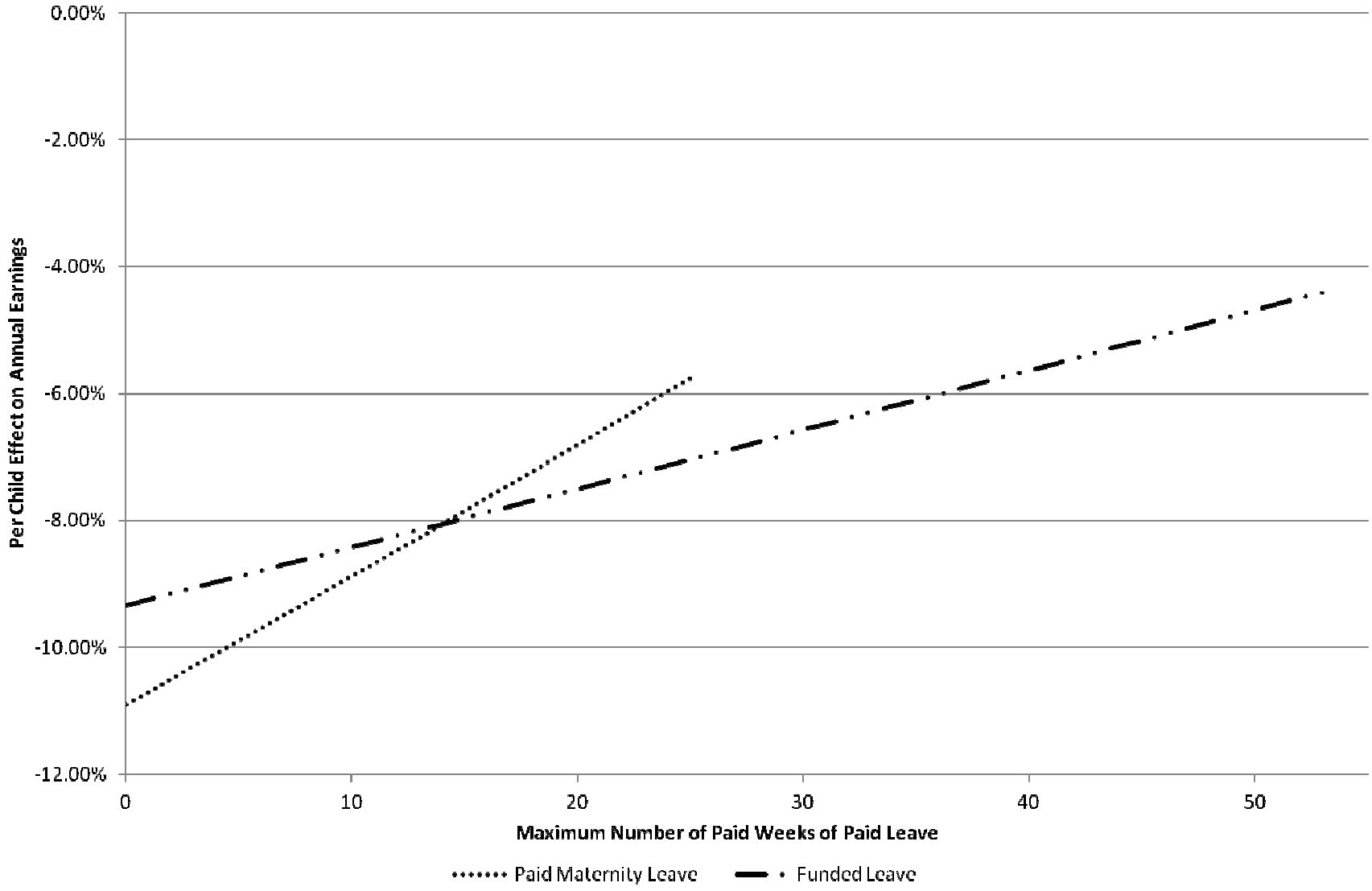

Figure 4. Net Per Child Effect on Ln Annual Earnings by the Maximum Number of Weeks of Parental Care Leave Available to Mothers

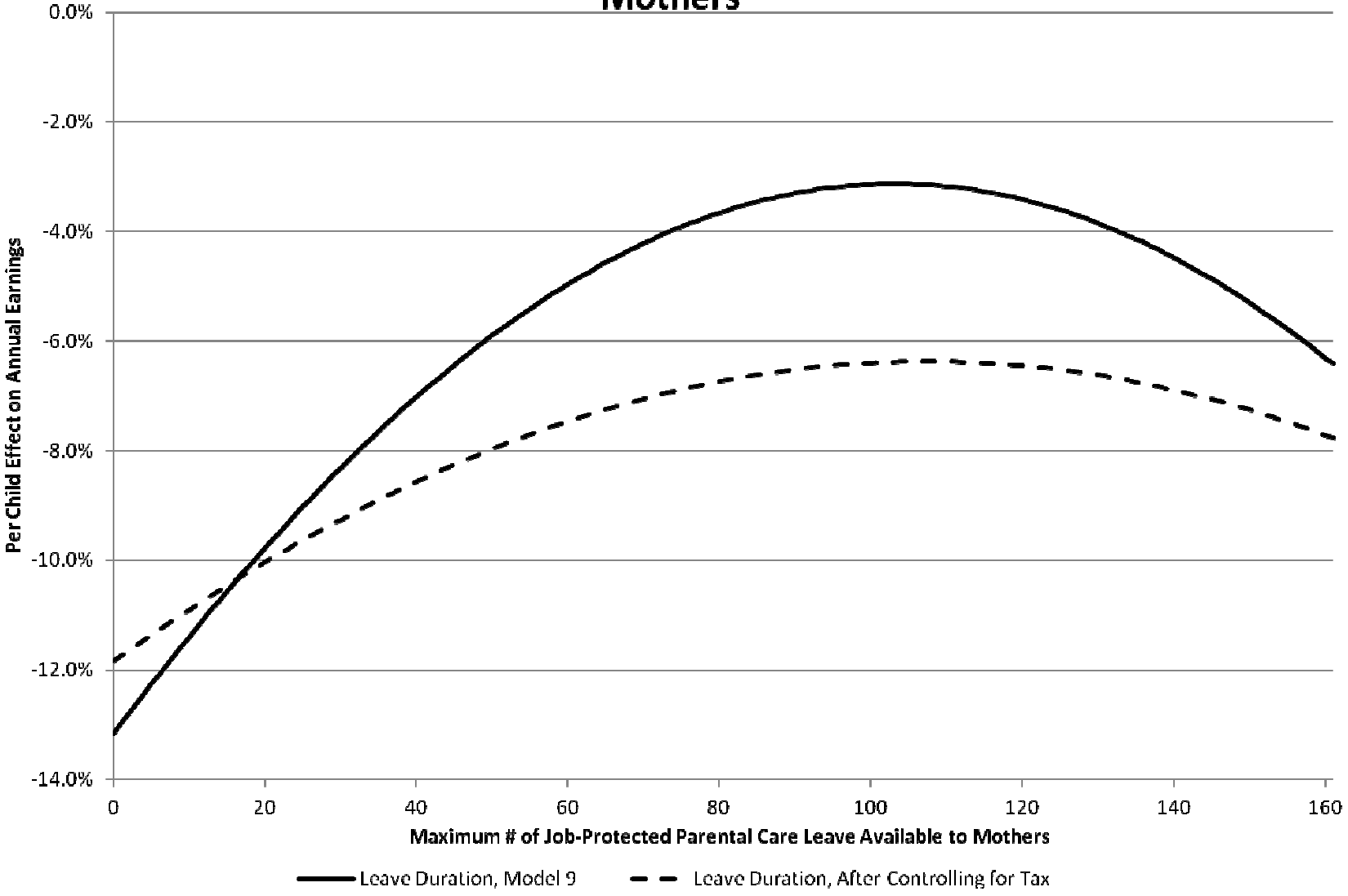

Figure 5. Net Per Child Effect on Annual Earnings by Average % of 2nd Earner's Earnings Used to Pay 2nd Earner's Income Taxes