Motherhood Employment Penalty and Gender Wage Gap Across Countries: 1990–2010

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Abstract

In this paper, we use twin birth as an instrument to estimate the effects of fertility on female labor force participation using 70 censuses from 36 countries in 1990–2010. We document a strong relationship between the gender wage gap and the size of the motherhood penalty. The penalty is smallest in countries with small gender wage gaps. Both cross- and within-country relationships between motherhood penalty and gender wage gap remain strong and negative even when we condition on per-capita GDP and educational attainment. Our estimates suggest that a reduction of 1-percentage-point in the gender wage gap is associated with a decrease of 0.45–0.65 percentage-points in the estimated motherhood employment penalty.

Keywords: Child penalty, female labor supply, family size, gender wage gap, twin birth
JEF Classification: J13, J16, J18, J22

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1. Introduction

The negative effects of childbirth on a mother's employment and wages are broadly referred to as the "motherhood penalty". The related literature documents substantial cross-country variation in the size of the motherhood penalty (Aaronson et al. 2017; Agüero and Marks 2011; Baranowska-Rataj and Matysiak 2016; Besamusca et al. 2015; Blau and Kahn 2017; Cáceres-Delpiano 2012; Goldin 2014; Kleven and Landais 2017; Kleven et al. 2019; Olivetti and Petrongolo 2008; Olivetti and Petrongolo 2016). However, very few studies aim to systematically examine the underlying determining factors of motherhood penalty across countries and time. Baranowska-Rataj and Matysiak (2016) finds that the motherhood employment penalty in European countries is greater in places with little public support for working parent such as Anglo-Saxon and southern European countries. Aaronson et al. (2017) pool censuses from 103 countries by per-capita GDP and find that the motherhood employment penalty appears to increase with GDP.

In this paper, we document the association between the motherhood penalty and the (unconditional) gender wage gap. We utilize the well-known twin birth instrument to estimate the causal effect of children on a mother's labor force participation using harmonized international censuses from the Integrated Public Use Microdata Series, International (IPUMS-I). Unlike Baranowska-Rataj and Matysiak (2016) and Aaronson et al. (2017), we do not pool data across countries; instead, we separately estimate the motherhood penalty in each country, year-by-year. Therefore, we can investigate both cross- and within-country variation in the gender wage gap and the motherhood penalty on employment. We document that the effects of childbirth on labor force participation are more negative in countries with larger gender wage gaps. The pattern remains when we restrict attention to within-country changes in gender wage gaps and fertility effects, and when we further control for within-country changes in per-capita GDP and education level. Focusing on within-country changes, the estimated motherhood penalty decreases by 0.59–0.65 percentage-points when the gender wage gap shrinks by 1 percentage point. Our findings agree with the argument that reductions in the gender wage gap raise the opportunity cost of labor force inactivity for mothers, thereby reducing the apparent child penalty on employment.

2. Data and Model

We collect data on the gender wage gap from the Organization for Economic Co-operation and Development, International Labour Organization, and United Nations Economic Commission for Europe, International Trade Union Confederation. (See Figure A1.) Gender

wage gap is defined as the difference between average earnings of women and men relative to earnings of women: $GWG = \frac{Male\ eanings - Female\ eanings}{Male\ earnings}\ x\ 100\%$. To estimate the motherhood employment penalty, we use censuses for 36 countries from IPUMS-I and focus on the period from 1990 to 2012, a relatively recent period for which data on gender wage gap are available. Following Angrist and Evans (1998), we create a sample of mothers aged 21–35 with least two children for each of the 70 country-year censuses.[1] We estimate the following linear model by both ordinary least squares (OLS) and two-stage least squares (2SLS):

$$Work_i = \alpha + \beta . Nchild_i + X_i\Gamma + \varepsilon_i \quad (1)$$

where $Work_i$ is an indicator for mother i working; $Nchild_i$ is an indicator denoting that mother i has more than two biological children; X_i is a vector of control variables including: mother's age, mother's age at first childbirth, the sex of the first child, and indicators for four education levels: less than primary, primary, secondary, and university and above. Since the fertility decision is likely endogenous, $Nchild_i$ is instrumented by $Twinbirth_i$, an indicator denoting that mother i's second pregnancy is a twin birth (Aaronson et al. 2017; Jacobsen, Pearce, and Rosenbloom 1999). The standard errors are made robust to heteroskedasticity.

3. The Motherhood Employment Penalty and Gender Wage Gap

Figure 1 plots the distributions of OLS and 2SLS estimates of the effects of having more than two children on mothers' labor force participation from 70 censuses. The OLS estimates appear to be downward biased and overstate the size of motherhood penalty. Therefore, we focus on the 2SLS estimates.

In the left panel of Figure 2, we plot the 2SLS estimates (and their 95% confidence intervals) of the motherhood employment penalty ($\hat{\beta}_{2SLS}$) against the gender wage gap (GWG in the figures) in each country.[2] The slope of the fitted regression line is -0.45 and statistically significant at the 1% level, suggesting a strong negative association between the gender wage gap and the motherhood employment penalty. On average, a 1-percentage-point reduction of the gender wage gap is associated with a 0.45-percentage-point decrease in the estimated motherhood employment penalty. Because a smaller gender wage gap implies a higher opportunity cost for domestic work and childcare, the observed cross-country association in the

[1] There are total 201 censuses from IPUMS-I in 1990s to 2010s.
[2] Figure A2 plots the $\hat{\beta}_{OLS}$ against GWG.

left panel of Figure 2 is consistent with a substitution effect on the extensive margin from the standard neoclassical labor supply model: mothers are more likely to enter the labor force when the return to market work becomes relatively high while the return to domestic work becomes relatively low.

The cross-country association between motherhood penalty and gender wage gap could be driven by country heterogeneity. For example, both the motherhood penalty and gender wage gap tend to be large in more religious countries. In the right panel of Figure 2, to control for time-invariant country heterogeneity, we plot within-country changes in the estimates for motherhood penalty ($\Delta\hat{\beta}_{2SLS}$) against within-country changes in gender wage gap (ΔGWG) (Countries with only one census are excluded). We find that a narrowing gender wage gap is associated with a decrease in motherhood employment penalty, and the association becomes stronger when we control for country heterogeneity. The slope of the fitted regression line is -0.65 and statistically significant at the 1% level. On average, a 1-percentage-point reduction in the gender wage gap is associated with a 0.65-percentage-point decrease in the estimated motherhood employment penalty.

Aaronson et al. (2017) document a positive relationship between economic development and motherhood employment penalty. To check whether our findings are also driven by economic development, we partial out the GDP per capita from gender wage gap and motherhood employment penalty and plot the residuals. In Figure 3, the slopes of the fitted regression in the left and right panel are still statistically significant at 1% level and equal to -0.41 and -0.65, respectively. In Figures 4 and 5, we further partial out education attainment, and the relationship between motherhood penalty and gender wage gap remain unchanged. Therefore, both cross- and within-country relationships between motherhood penalty and gender wage gap remain strong and negative even when we condition on GDP per capita and educational attainment.

4. Conclusions

This paper documents the association between the effects of fertility on mothers' labor force participation and the gender wage gap in 1990s–2010s. We find that the effects of childbearing on mothers' labour supply is less negative in countries with smaller gender wage gaps, and declines in a country's gender wage gap are strongly associated with reductions in the motherhood employment penalty.

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Figure 1: Distribution of the Motherhood Employment Penalty Estimates

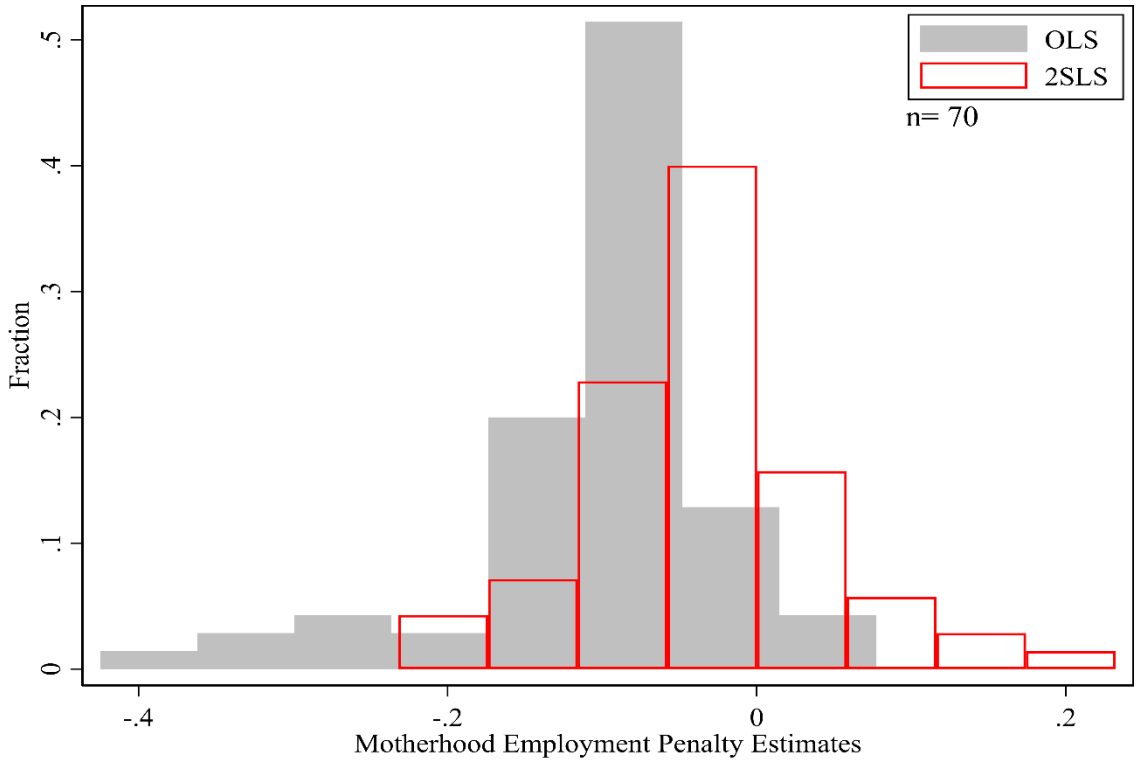
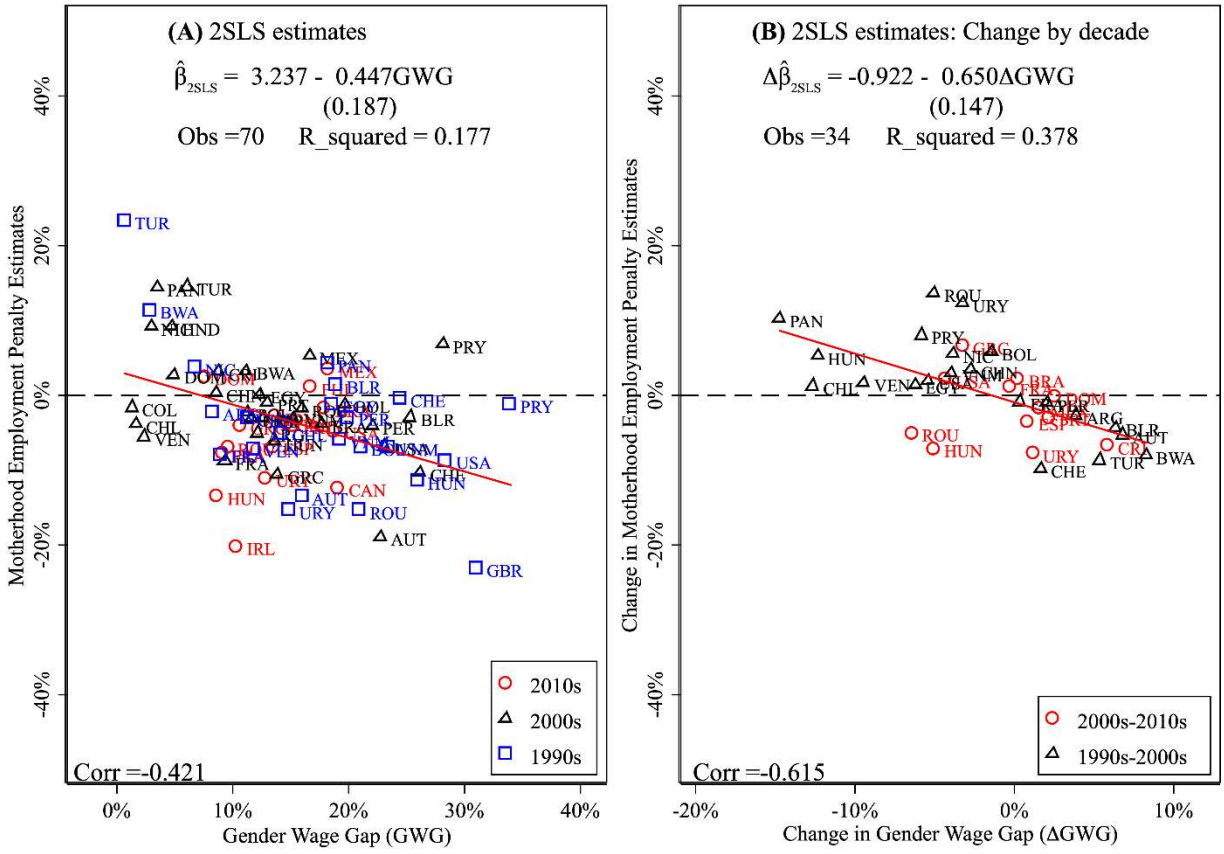


Figure 2: Relation of child penalty and gender wage gap



Notes: In the left panel, the lower and upper caps represent the 95% confidence intervals of each estimate

Figure 3: Child penalty after partialling out GDP per capita

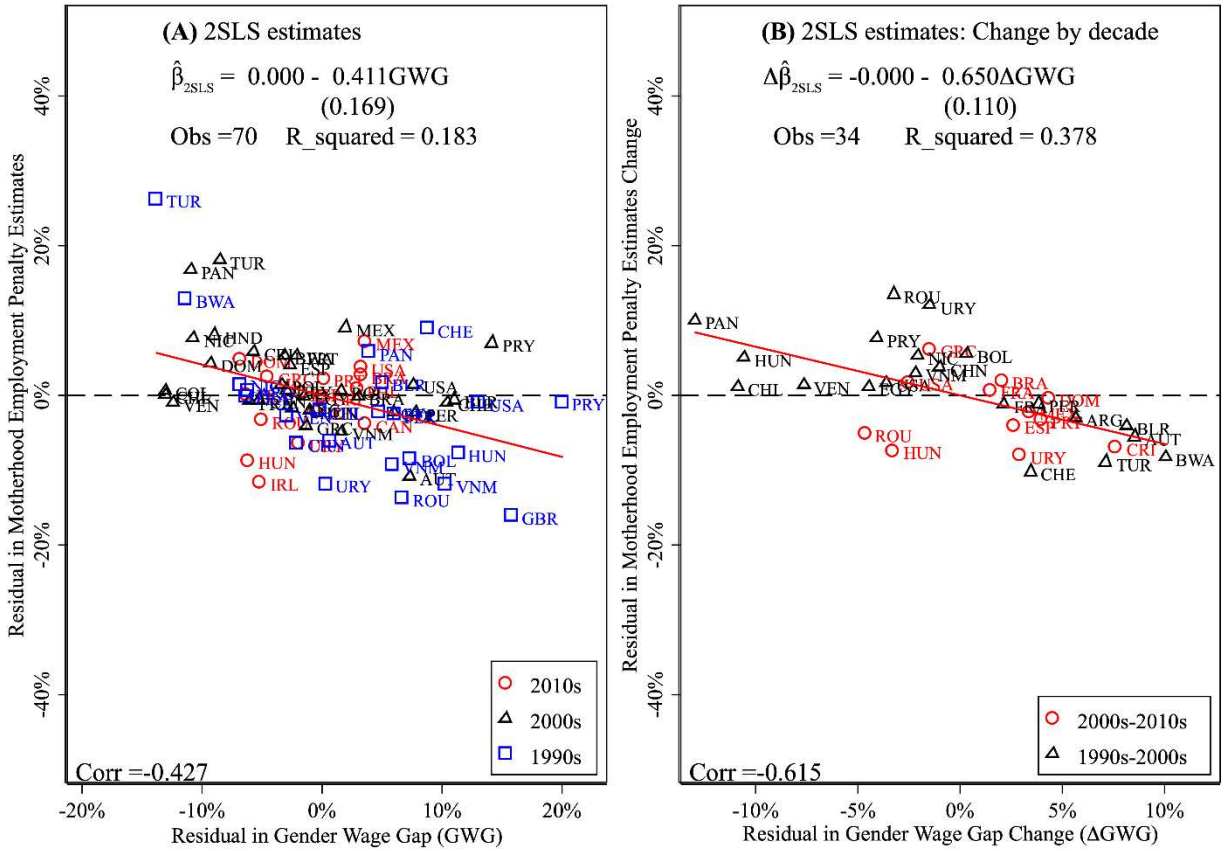


Figure 4: Child penalty after partialling out educational attainment

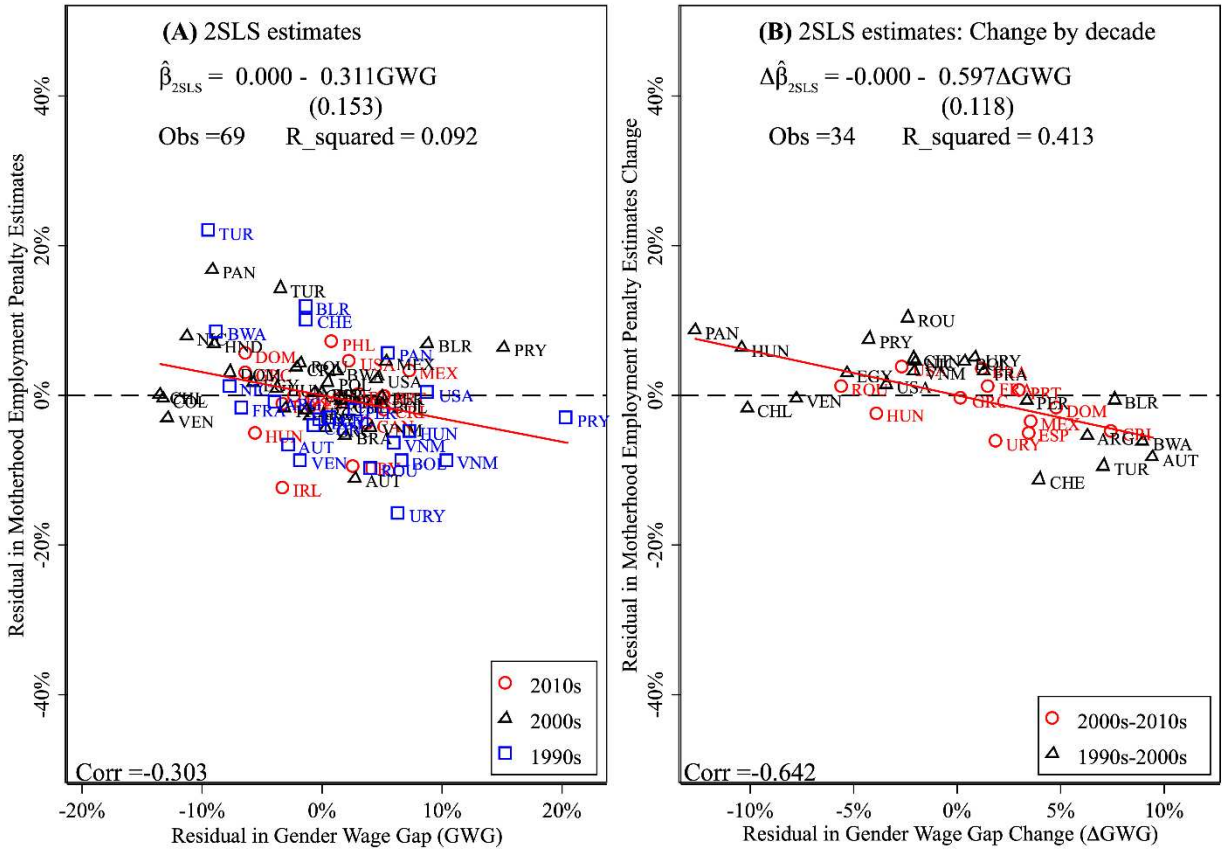


Figure 5: Child penalty after partialling out educational attainment and GDP per capita

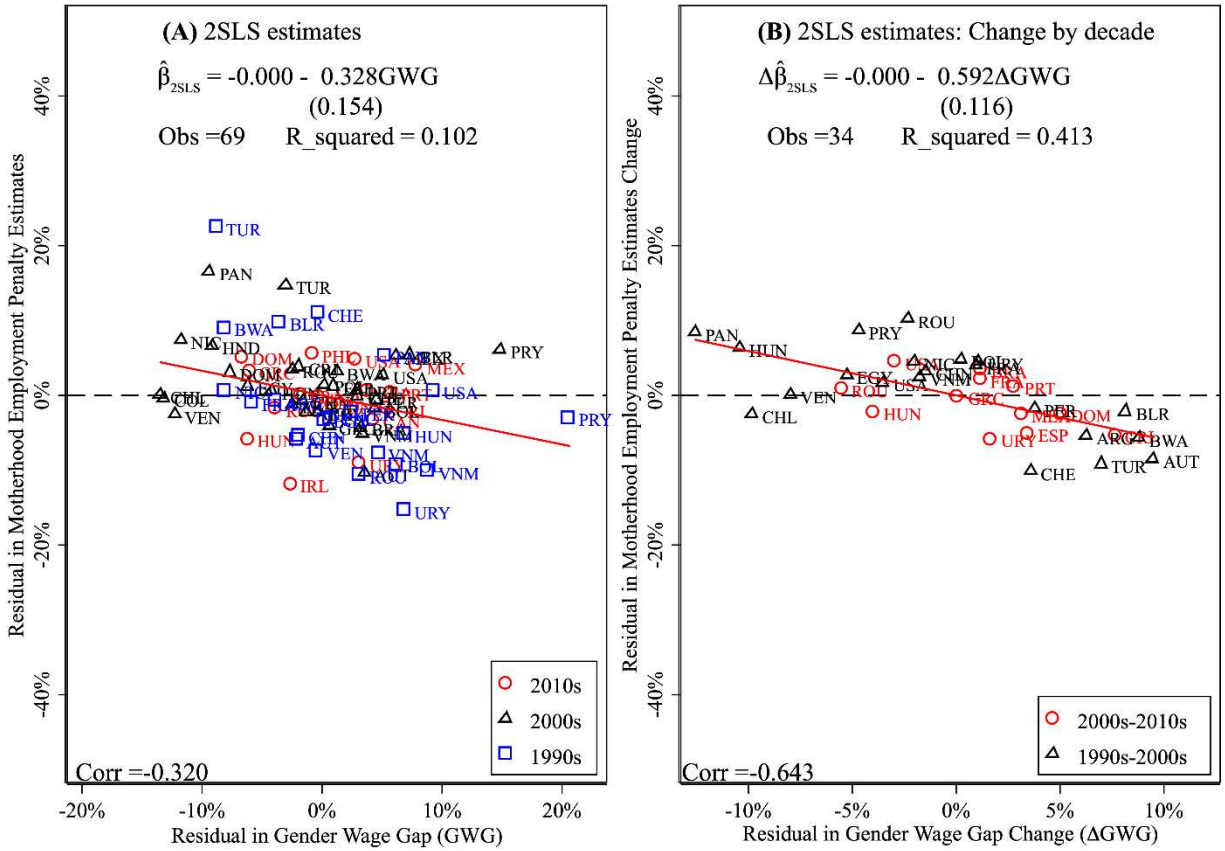
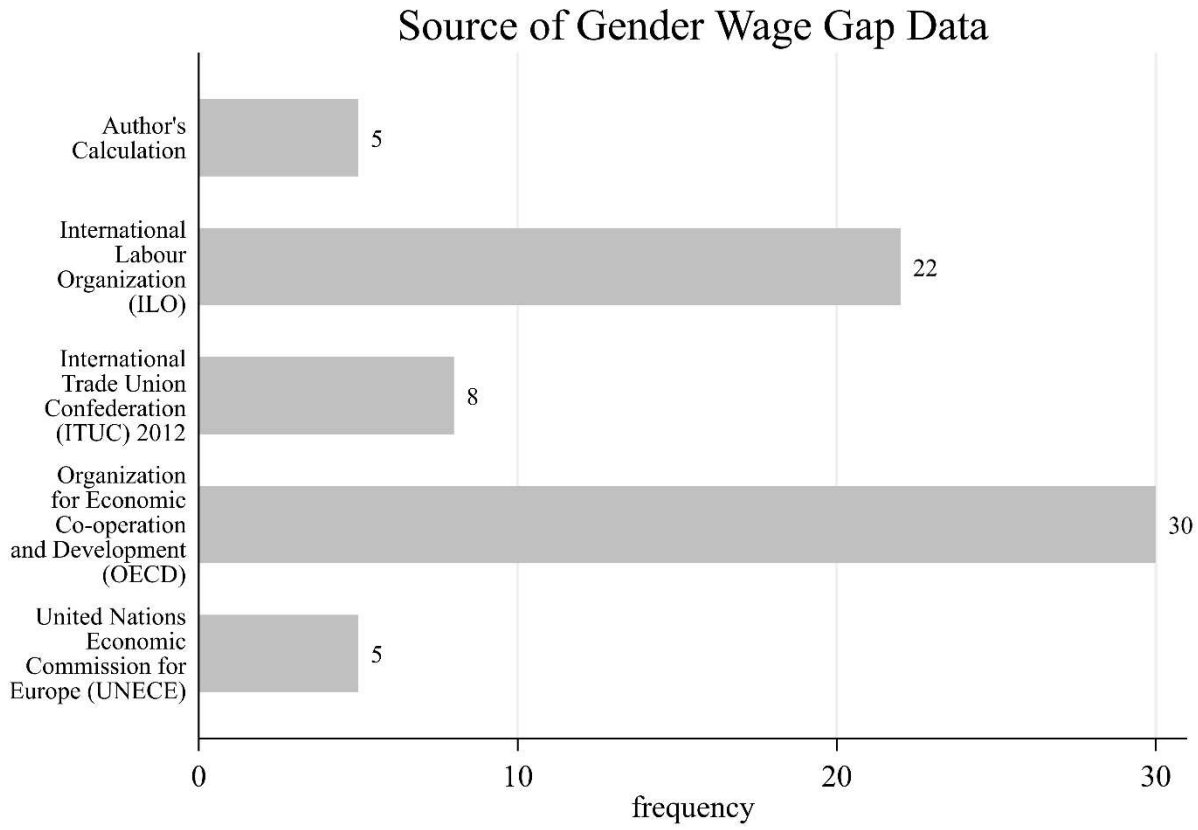


Table A1: List of countries

Country	Year	Country	Year	Country	Year	Country	Year
Argentina	1991	Costa Rica	2000	Mexico	2010	Switzerland	1990
Argentina	2001	Costa Rica	2011	Nicaragua	1995	Switzerland	2000
Austria	1991	Dominican	2002	Nicaragua	2005	U.S.	1990
Austria	2001	Dominican	2010	Panama	1990	U.S.	2000
Belarus	1999	Egypt	1996	Panama	2000	U.S.	2010
Belarus	2009	Egypt	2006	Paraguay	1992	Turkey	1990
Bolivia	1992	France	1999	Paraguay	2002	Turkey	2000
Bolivia	2001	France	2006	Peru	1993	U.K.	1991
Botswana	1991	France	2011	Peru	2007	Uruguay	1996
Botswana	2001	Greece	2001	Philippines	2010	Uruguay	2006
Brazil	2000	Greece	2011	Poland	2002	Uruguay	2011
Brazil	2010	Honduras	2001	Portugal	2001	Venezuela	1990
Canada	2011	Hungary	1990	Portugal	2011	Venezuela	2001
Chile	1992	Hungary	2001	Romania	1992	Vietnam	1989
Chile	2002	Hungary	2012	Romania	2002	Vietnam	1999
China	1990	Indonesia	2010	Romania	2011	Vietnam	2009
China	2000	Ireland	2011	Spain	2001		
Colombia	2005	Mexico	2000	Spain	2011		

Notes. We exclude 7 censuses in which persons are not organized into households, as we cannot match mothers with their children; and censuses in which age is grouped into categories, as we cannot identify birth orders and twin births (Eg. Canada 1991 and 2001, U.K. 2001).

Figure A1. Frequency of gender wage gap database



Notes. We limit that the gender wage gap data must come from the same source for each country over the period. The author calculate data of Vietnam and China by the Vietnam Household Living Standard Survey (VHLSS), the China Health and Nutrition Survey (CHNS).

Figure A2. Relation of child penalty and gender wage gap by OLS