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## Article

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# Countercyclical fiscal policy and gender employment: evidence from the G-7 countries

## Abstract

Would countercyclical fiscal policy during recessions improve or worsen the gender employment gap? We answer this question by exploring the state-dependent impact of fiscal spending shocks on employment by gender in the G-7 countries. Using the local projection method, we find that, during recessions, a positive fiscal spending shock increases female employment more than male employment, contributing to gender employment equality. Our findings are driven by disproportionate employment changes in female-friendly industries, occupations, and part-time jobs in response to fiscal spending shocks. The analysis suggests that fiscal stimulus, particularly during recessions, could achieve the twin objectives of supporting aggregate demand and improving gender gaps.

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## 1 Introduction

Significant gender employment gap remains in the G-7 countries, leading to sizable loss of output. On average, women's labor market participation rate is about 17 percentage points lower than that of men's, and the wage gap between women and men amounts to about 14% (IMF, 2017a). These labor market divides have important economic implications. For instance, if the female labor participation rate were raised to the country-specific male rate, the output could increase by 5% in the United States (Aguirre et al., 2012). As the G-7 economies are aging, higher female employment could also boost potential growth and total factor productivity (Elborgh-Woytek et al., 2013; Steinberg and Nakane, 2012; Barsh and Yee, 2012).

To increase female labor force participation, the G-7 countries have implemented a range of structural fiscal policies. Taxation is often used to eliminate disincentives for the secondary earners (mostly female) to work. For instance, most G-7 countries now implement individual taxation rather than family income-based taxation.<sup>1</sup> All G-7 countries have spending policies to support childcare facilities and gender-responsive public employment (IMF, 2017a). For example, the Canada Child Benefit provides for a tax-free, income-tested benefit to alleviate the cost of childcare for female workers (IMF, 2017a). Other spending measures include quotas in managerial positions (France, Germany), public sector equal pay (e.g., Canada, France), and so on.

The cyclical component of gender unemployment also deserves attention because of "hysteresis." A process of "hysteresis" could link the short-term cycle to the long-term trend so that a temporary change in unemployment may become permanent (DeLong and Summers, 2012). As such, in a depressed economy, low rates of investment imply a deterioration of physical capital, human capital declines as workers without employment lose their skills, and the long-term unemployed people face a declining likelihood of being rehired. All these factors influence the potential output. Thus, if hysteresis effects are stronger during slumps, then fiscal policy is likely to have more persistent effects on gender employment.

Fiscal spending shocks could influence gender employment equality through several channels. First, the spending shocks may create larger labor demand for female-friendly occupations. Bredemeier et al. (2017) shows that "pink-collar job" booms are the drivers of the female-biased employment effects of fiscal policy. Second, the shocks may stimulate larger demand for part-time employment (which female workers generally occupy), often hired to meet temporary labor demand. Third, the shocks may stimulate female labor supply more in response to the loss in household income, particularly during recessions (household income effect). The positive impacts of fiscal spending shocks on gender equality during recessions would be basically consistent with the long-standing theory of wages (Douglas, 1934). Finally, fiscal spending shocks, if associated with the implementation of properly designed gender-oriented measures, could directly influence gender equality.

This paper examines whether countercyclical fiscal policy during recessions improves or worsens the gender employment gap. We give an answer to this question by exploring the state-dependent impact of fiscal spending shocks on gender employment in the G-7 countries.

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<sup>1</sup> Some countries such as Japan continue to have disincentives for dual earner households, including secondary earner tax deduction and waiving of social security premiums, disincentivizing women from working over a certain income threshold (IMF, 2017b).

Using the local projection method (Jordà, 2005), we find that an expansionary fiscal spending shock would generally improve the gender employment gap during recessions (increasing female employment more than that of males). The impacts during booms, however, are largely statistically insignificant and generally smaller. Our findings are driven by disproportionate employment changes in female-friendly industries, occupations, and part-time jobs in response to fiscal spending shocks. The analysis suggests that fiscal stimulus, particularly during recessions, could achieve the twin objectives of supporting aggregate demand and improving gender gaps.

To the best of our knowledge, this is the first paper to examine how fiscal policy shocks affect the gender employment gap over the business cycle. Recent empirical studies show that the impact of fiscal policy shocks on growth or employment differs between booms and recessions (Auerbach and Gorodnichenko, 2012, 2013; Baum et al., 2012; Blanchard and Leigh, 2013; Dell’Erba et al., 2014). The literature, however, has yet to explore the state-dependent impact of fiscal policy shocks on gender employment.

Our paper is also related to the recent literature that examines the effect of fiscal policy shocks on the gender employment gap. Bredemeier et al., (2017) find that fiscal expansion stimulates predominantly female employment in the U.S. We contribute to the literature by covering all G-7 countries and estimating the state-dependent impact of fiscal policy shocks on the gender employment gap.

The rest of the paper is organized as follows: Section 2 presents key stylized facts on the gender employment gap, the business cycles, and fiscal spending shocks. Section 3 describes the data and discusses the empirical strategy. Section 4 presents the main findings. Section 5 discusses possible channels for fiscal policy to influence gender employment gap, and Section 5 concludes and draws policy implications.

## 2 Stylized Facts

This section looks at the recent developments associated with the gender gap in labor markets of the G7 countries and its correlation with the business cycle and government spending. As a measure of gender employment equality, we use the female share of total employment.

We highlight four stylized facts:

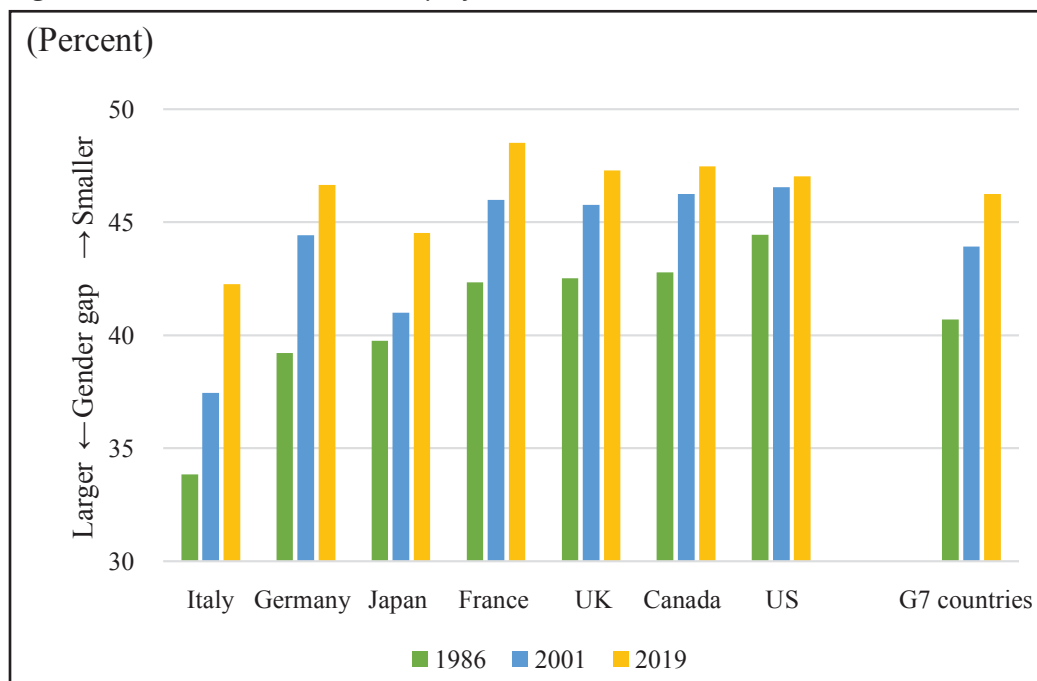
- **Stylized fact 1.** *The share of females in total employment has been on an increasing trend in the G-7 countries, but the gender gap remains* (Figure 1).<sup>2</sup>

For the last few decades, the gaps have generally declined (i.e., female employment grew faster than male employment), leading to a steady increase in the female share of total employment. On average, for the G-7 countries as a whole, the number of female workers is about 18% lower than that of male workers.

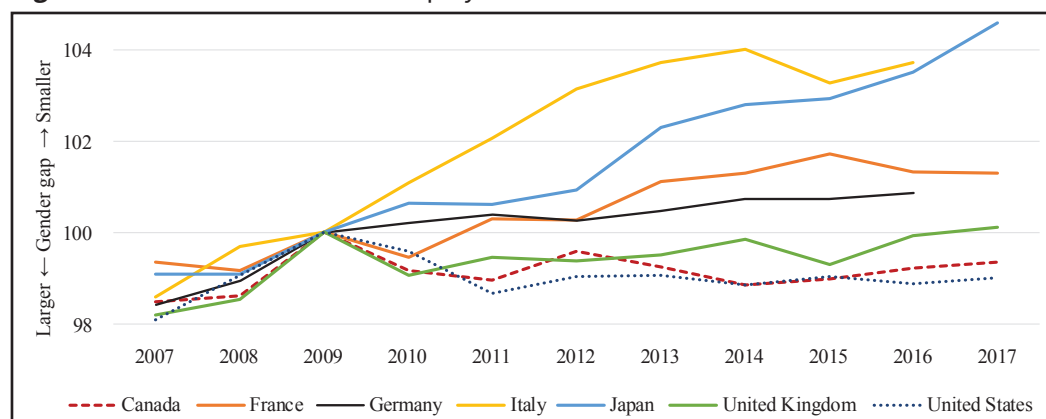
- **Stylized fact 2.** *After the global financial crisis, the increasing trend of the female share in total employment has been reversed in some countries (e.g., Canada and the US).* (Figure 2).

This reversal could possibly be explained by the process of “hysteresis,” including in the

<sup>2</sup> IMF (2017a) summarizes recent trends in gender equality in the G-7 countries, noting that while equality has improved overall, exceptions and gaps remain. Specifically, it notes that there remain significant gaps in pay, and the main burden of unpaid work is on women.

**Figure 1** Female share of total employment: 1986–2019.

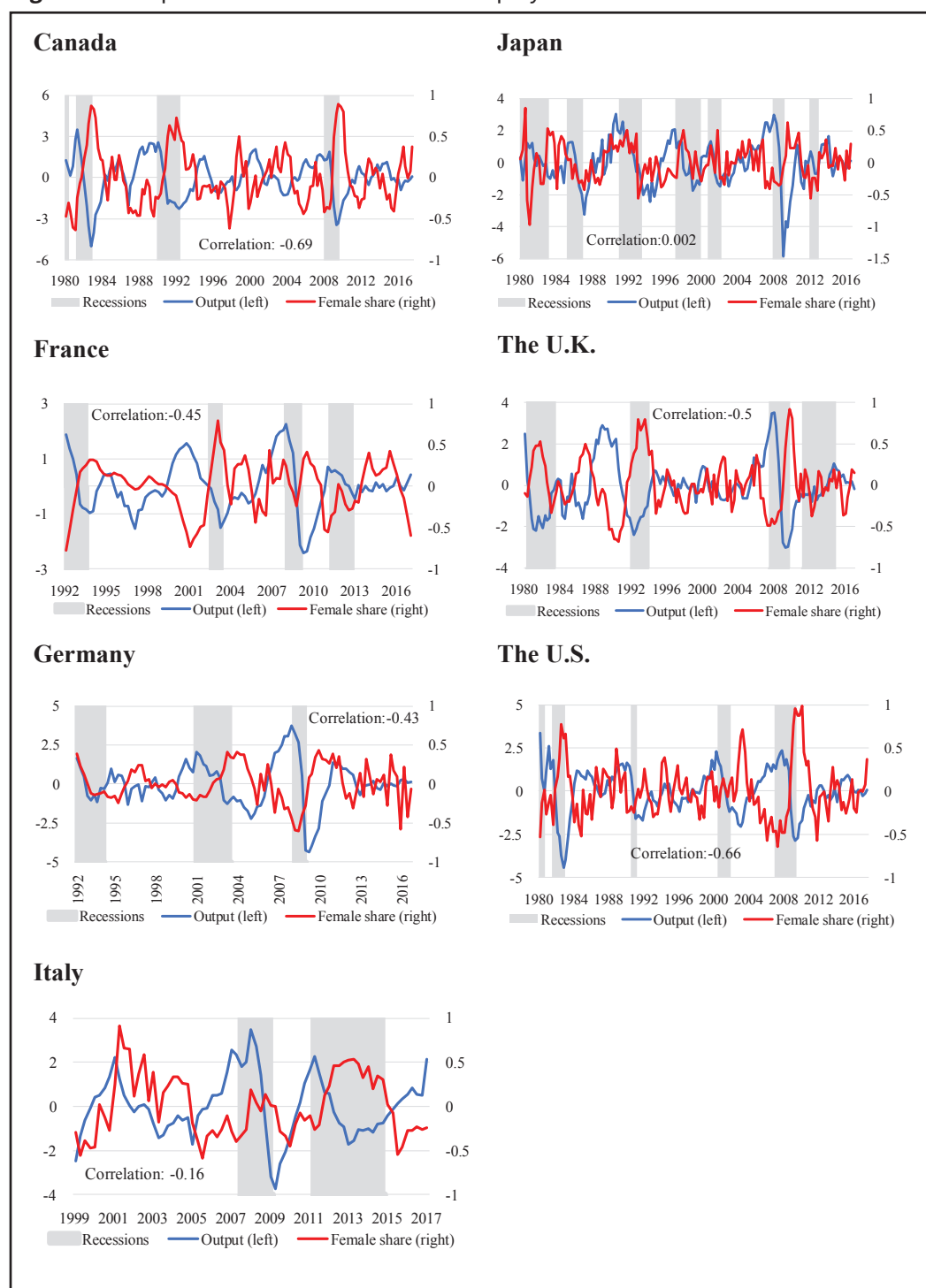
Source: OECD (2016).

**Figure 2** Female share of total employment: 2007–2017.

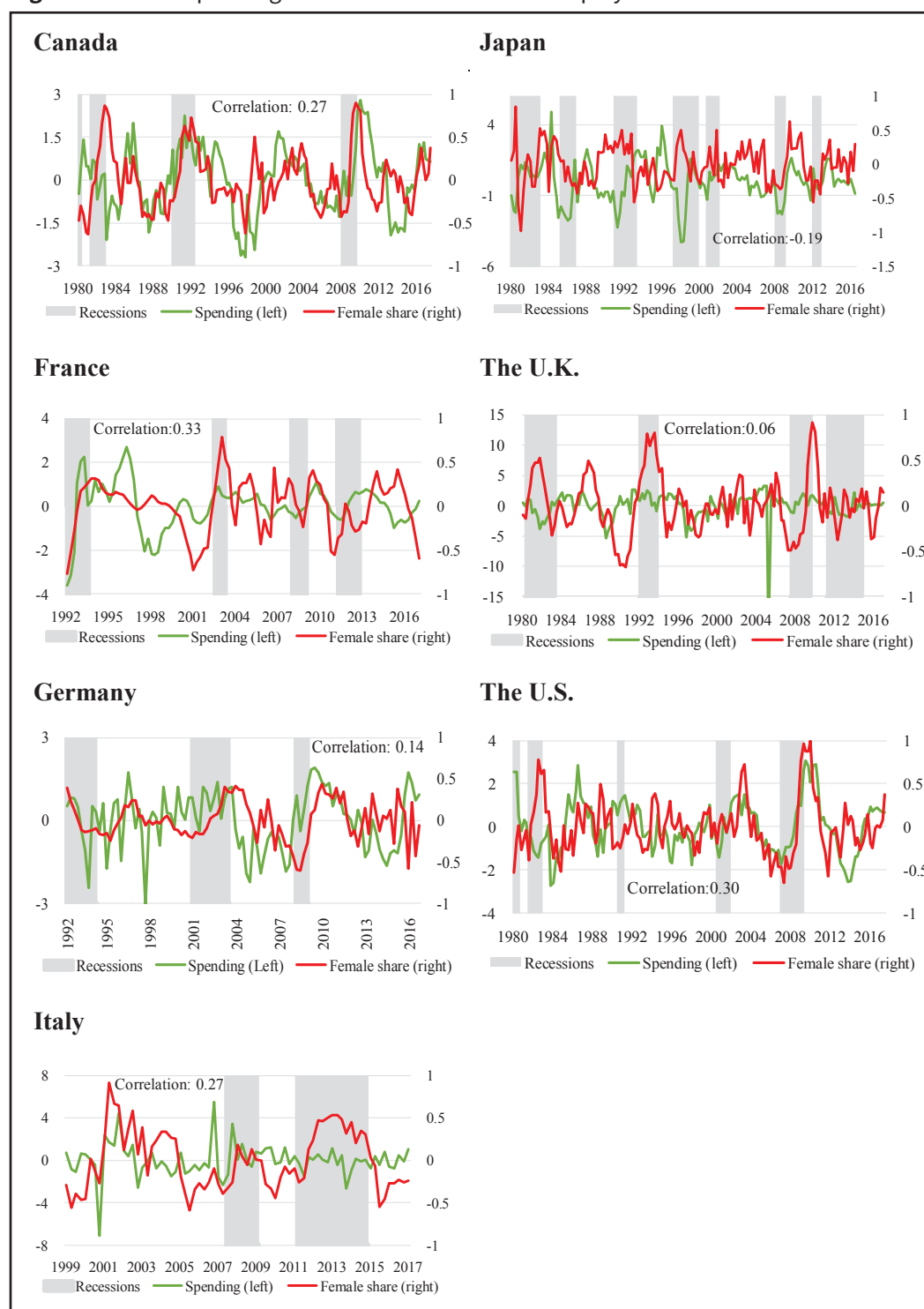
Source: OECD (2016).

female-friendly sectors. For instance, for the U.S., Kochlar (2011) shows that in 2 years of economic recovery after the great recession, the sluggish recovery has favored men over women in all but 1 of the 16 major sectors of the economy reviewed. Moreover, he finds that this gender employment pattern contrasts with all other economic recoveries since 1970. Under these circumstances, a cyclical decline in female unemployment could become permanent, thus leading to loss of skills and reducing the likelihood of female workers being rehired.

- **Stylized fact 3.** *The female share of total employment tends to be countercyclical* (Figure 3). To examine the relationship between the gender employment gap and the business cycles, we first look at the cyclical component of the output gap and the female share of total employment. These series are computed by applying the Hodrick–Prescott (HP) filter to extract the cyclical components of real Gross Domestic Product (GDP) and the

**Figure 3** Output and female share of total employment.

female share of total employment. In all the G-7 countries except Japan, the female share of total employment tends to increase during recessions, thus leading to a narrowing of the gender employment gap during recessions (Figure 3). What explains this pattern? One plausible explanation is the higher cyclical exposure of male-friendly industries. For example, for the U.S, Hoynes et al. (2012) document that across recessions, men experience more cyclical employment fluctuations than women as the former group exhibits higher propensity to be employed in highly cyclical industries such as manufacturing and construction industries.

**Figure 4** Fiscal spending and female share of total employment.

- **Stylized fact 4.** The female share of total employment is positively correlated with government spending (Figure 4).

Looking at the historical developments of the female share of total employment and government spending in the G-7 countries, we find that both the female share of total employment and government spending tend to increase during recessions, while they decline during economic booms. In all the G-7 countries except Japan, they are positively correlated. This fact, however, does not suggest by itself any causality between government

spending and the female share of total employment. For instance, one could argue that what is behind the correlation between these two variables is the stylized fact 3, which is mostly driven by greater male-friendly industry exposure to the business cycle. Any empirical analysis to identify the impact of fiscal policies on the cyclical gender employment gap should, therefore, control industry cycles for robustness checks. For the U.S, industry effects alone cannot account for the female employment share over the business cycle (Bredemeier et al., 2017). In the next section, we econometrically examine the causality between fiscal spending shocks and the female share of employment.

### 3 Empirical Methodology and Data

To estimate a state-dependent impact of the government spending shock on the gender employment gap, we use the local projection method proposed by Jordà (2005). This method easily handles nonlinearity and is robust to omitted variables and misspecification.<sup>3</sup> The benchmark specification is as follows:

$$x_{t+h} = I_{t-1}[\alpha_{E,h} + \Psi_{E,h}(L)z_{t-1} + \beta_{E,h} shock_t] + (1 - I_{t-1})[\alpha_{R,h} + \Psi_{R,h}(L)z_{t-1} + \beta_{R,h} shock_t] + Trends + \varepsilon_{R,h}, \quad (1)$$

where  $x$  is the variable of interest,  $z$  is a vector of control variables,  $shock$  is the identified fiscal spending shock, and  $\Psi(L)$  is a polynomial in the lag operator. We identify the fiscal spending shock by employing the Blanchard and Perotti's (2002) method (which simply orders government spending first in a Cholesky decomposition).  $I$  is a dummy variable that indicates the state of the economy when the shock hits.<sup>4</sup> It takes the value of 1 for expansion ( $E$ ) and 0 for recession ( $R$ ). We use output gaps as our indicator of slack.<sup>5</sup> The model also includes constant and time trends up to the second order. Following Ramey and Zubairy (2018), we use the Newey-West correction for standard errors to eliminate the possibility of serial correlation in the error terms.

All coefficients of the model other than deterministic trends vary according to the state of the economy. This means that the forecast of  $x_{t+h}$  is also allowed to be different according to the state of the economy when the shock hits. The coefficient  $\beta$  gives the response of  $x$  at time  $t+h$  to the shock occurred at time  $t$ . Thus, we can construct the impulse responses by estimating a set of  $\beta$  for each horizon  $h$ .

In our baseline specification,  $x$  is the female share of total employment  $f$ , with four control variables: real GDP ( $y$ ), real government spending ( $g$ ), real tax revenue ( $t$ ), and employment ( $e$ ).<sup>6</sup>

Quarterly data from the 1980s to 2017 for the G-7 countries (Canada, France, Germany, Italy, Japan, the U.K., and the U.S.) are used in our analysis. Data on GDP, government spending, and tax revenue are taken from the Organisation for Economic Cooperation and Development

<sup>3</sup> As discussed in the studies by Auerbach and Gorodnichenko (2013) and Jordà (2005), the local projection technique can easily adapt non-linearly and thus estimate state-dependent models and compute impulse response functions. Moreover, the method does not constrain the shape of the impulse response function; so, it is less sensitive to misspecification of the standard VAR models. The method conduces a more parsimonious specification because it does not require that all variables enter all equations.

<sup>4</sup> Following Ramey and Zubairy (2018), the data are separated into two states: booms and recessions by the dummy variable. We could separate data into the states by using the smooth transition function as in Auerbach and Gorodnichenko (2012). The results obtained by using the smooth transition function are broadly unchanged.

<sup>5</sup> In addition to output gaps, various variables, such as the growth rate and the unemployment rate, are used as a measure of economic slack. Our main results remain unchanged for a different measure of economic slack.

<sup>6</sup> We use this parsimonious model as our benchmark model. Although the local projection method has proven to be robust to misspecification and omitted variables, we conduct extensive robustness checks (see section 4).



(OECD) Economic Outlook and Eurostat, and total employment, and those of the female share of total employment are taken from the International Labour Organization (ILO) database of labor statistics and national statistics offices. We use a GDP deflator to convert nominal tax revenue to real values. The sample period varies across countries and spans the longest timeframe for which data are available. All series are seasonally adjusted by using the Census Bureau's X12 filter and logged. The detailed description of the data is presented in Appendix.

## 4 Empirical Findings

### 4.1 Basic results

We now present the main results of our analysis. Figure 5 shows the responses of the female share of total employment over time to an expansionary fiscal spending shock obtained from estimation of (1). Table 1 summarizes the impact at the peak and 8 quarters after the shock.

We first consider results from the linear model.<sup>7</sup> As such, we consider the case in which fiscal policy shock effects are invariant to the state of the economy. The second column of Figure 5 shows the impulse response function in the linear model. In this figure and subsequent figures, dashed lines indicate 95% confidence bands. We find positive responses of the female share of total employment to government spending shocks. These responses are statistically significant at peak. Our results for the U.S. are consistent with those of Bredemeier et al. (2017).

We now turn to see state-dependent impacts of fiscal spending shocks on gender equality in labor markets. Results are shown in Figure 5 (third and fourth column) and Table 1. During recessions, government spending shocks have positive impacts on gender equality. In all seven countries, the impacts at peak are statistically significant and are in favor of female employment. During booms, however, the impact on gender employment is less obvious. The impacts

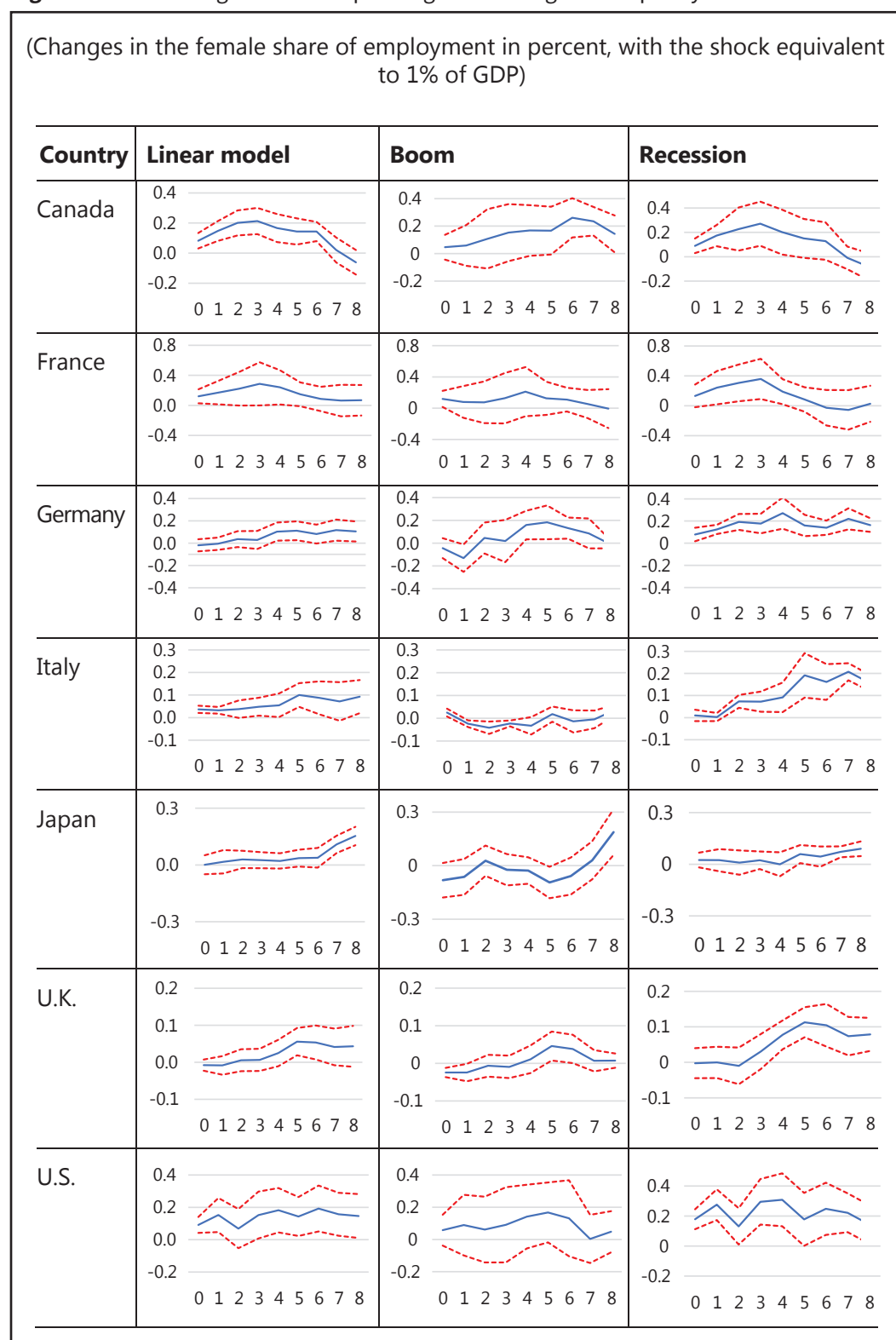
**Table 1** Effects of government spending shock on gender employment

(Changes in the female share of total employment, in percentage points)

Country	Boom				Recession			
	Peak		8th quarter		Peak		8th quarter	
<b>Canada</b>	0.26	*	(6)	0.14	*	0.27	*	(3) −0.08
<b>France</b>	0.21		(4)	−0.01		0.36	*	(3) 0.03
<b>Germany</b>	0.18	*	(5)	−0.01		0.27	*	(4) 0.16 *
<b>Italy</b>	0.09	*	(8)	0.09	*	0.52	*	(7) 0.39 *
<b>Japan</b>	0.18		(8)	0.18		0.09	*	(8) 0.09 *
<b>UK</b>	0.05	*	(5)	0.01		0.11	*	(5) 0.08 *
<b>US</b>	0.17		(5)	0.05		0.31	*	(4) 0.14 *

*Notes:* The figures reflect the estimated impact of an expansionary spending shock (equivalent to 1% of GDP) on the female share of employment (i) at its peak during 8 quarters after the shock and (ii) at the eighth quarter after the shock. The sign “\*” indicates significance at 5% level. The number in parenthesis indicates the peak quarter.

<sup>7</sup> This is a simple version of Eq. (1) without the indicator function. Thus, the specification of the linear model is  $x_{t+h} = \alpha_h + \Psi_h(L)z_{t-1} + \beta_h \text{shock}_t + \text{Trends} + \varepsilon_{t+h}$ .

**Figure 5** Effects of government spending shocks on gender equality.

Notes: 95% confidence intervals are shown in all cases.

on the female share of total employment during booms are not statistically significant in France and the U.S. In other G7 countries, the impacts are positive and statistically significant but are smaller than the impacts under recessions. Furthermore, the impacts are not sustained over time in most cases, with the female share declining over 2 years.

We also find that the impact of the shock is long lasting in most countries. For instance, in Germany, Italy, Japan, the U.K., and the U.S., the impacts are long lasting with an increasingly positive impact through the projected period (8 quarters). In Canada and France, however, the positive impact is deemed short lived and fades out 2 years after the spending shock.

**Robustness.** The results are robust in several directions<sup>8</sup>. Although the local projection method is robust to misspecification (Jordà, 2005), we consider different combinations of control variables (unemployment, employment, the labor force participation rate, and real wages, private consumption, and the interest rate).<sup>9</sup> Our main results broadly remain unchanged with the regressions using these variables.<sup>10</sup>

## 4.2 Impacts on employment, labor force, and unemployment by gender

To ensure that the improvement in the share of female employment is not due to the mechanical effect of men losing jobs more than women, we estimated the state-dependent impacts of the fiscal spending shock on female and male employment separately. Results are summarized in Table 2.<sup>11</sup>

During recessions, the positive fiscal spending shock tends to increase employment for both women and men, but the impact on male employment is less pronounced and generally less than that on female employment.

We also estimate the impact of the spending shocks on the labor force and unemployment by gender during recessions. The positive impacts on female labor force are statistically

**Table 2** Impacts of spending shocks on female and male unemployment, labor force, and employment during recessions.

(Percent changes, peak after the shock)

	Male						Female					
	Unemployment rate		Labor force		Employment		Unemployment rate		Labor force		Employment	
Canada	-0.2*	(2)	0.0	(7)	0.7	(7)	-0.4*	(1)	0.3*	(3)	1.7*	(6)
France	-1.0*	(7)	0.1	(3)	1.5*	(5)	-0.8*	(5)	0.3*	(2)	1.9*	(3)
Germany	-0.5*	(3)	0.0	(0)	-0.1	(6)	-0.3	(3)	-0.2*	(8)	0.2	(0)
Italy	-0.1*	(1)	-0.2*	(3)	0.1	(5)	-0.4*	(4)	0.3*	(8)	0.5*	(5)
Japan	-0.1*	(4)	0.1*	(7)	0.7*	(5)	-0.1*	(2)	0.1*	(8)	0.8*	(7)
UK	0.5*	(6)	0.1*	(7)	0.0	(0)	0.3*	(6)	0.1	(5)	0.5*	(7)
US	-1.4*	(5)	0.2*	(6)	1.6*	(8)	-1.1*	(5)	0.3*	(7)	1.9*	(8)

Notes: The sign “\*” indicates significance at 5% level. The number in parenthesis indicates the peak quarter.

<sup>8</sup> The results of robustness checks are presented in Appendix.

<sup>9</sup> As the impacts of fiscal policy shocks may be affected by the behavior of the monetary authorities, following Monacelli et al. (2010) and Brückner and Pappa (2012), we also incorporate the short-term interest rate to take into account the reaction of monetary policy to fiscal spending shock.

<sup>10</sup> The structure of the economy may affect the movement of the female share of total employment during the business cycles. For example, if female-friendly sectors are countercyclical, female employment could thrive during recessions without a spending shock. Thus, the impact of fiscal spending shocks on the gender employment gap could be biased without taking into account structure variables. To assess the robustness of our findings, we re-estimate Eq. (1) to control for structural variables such as the share of sectoral GDP (agriculture, industries, services) and the share of female-friendly sectors (e.g., public services, health care, and education) in the total employment. We find that our results are robust to the structural variables.

<sup>11</sup> In Appendix, the impulse responses of employment, unemployment, and labor force by gender during recessions are presented.

significant in five countries (compared with three for male labor force). Though female employment increases more than male's, the impacts on unemployment rate are broadly the same between male and female because of the base effect (female labor force increases more).

#### 4.3 Impacts of fiscal contractions and expansions

We have not considered possible asymmetry of fiscal spending shocks, while the impacts of fiscal contractions and expansions may not be symmetrical. To test asymmetric effects of fiscal policy shocks on the female share of total employment, we use the following specification:

$$x_{t+h} = D_t[\alpha_{P,h} + \Psi_{P,h}(L)z_{t-1} + \beta_{P,h} \text{shock}_t] + (1 - D_t)[\alpha_{N,h} + \Psi_{N,h}(L)z_{t-1} + \beta_{N,h} \text{shock}_t] + Trends + \varepsilon_{t+h},$$

where  $D_t$  is a dummy variable that indicates whether the shocks are positive ( $P$ ) or negative ( $N$ ).

Figure 6 shows the results. We find that the effects of positive and negative spending shocks on gender equality are broadly symmetric while there are variances across countries. In all G7 countries, a positive shock tends to increase the female share of total employment, while a negative shock would reduce the female share. In some countries (e.g., the U.K, Canada), the impacts of negative spending shocks are relatively large.

### 5 Possible Channels for Fiscal Policy to Influence Gender Employment Gap

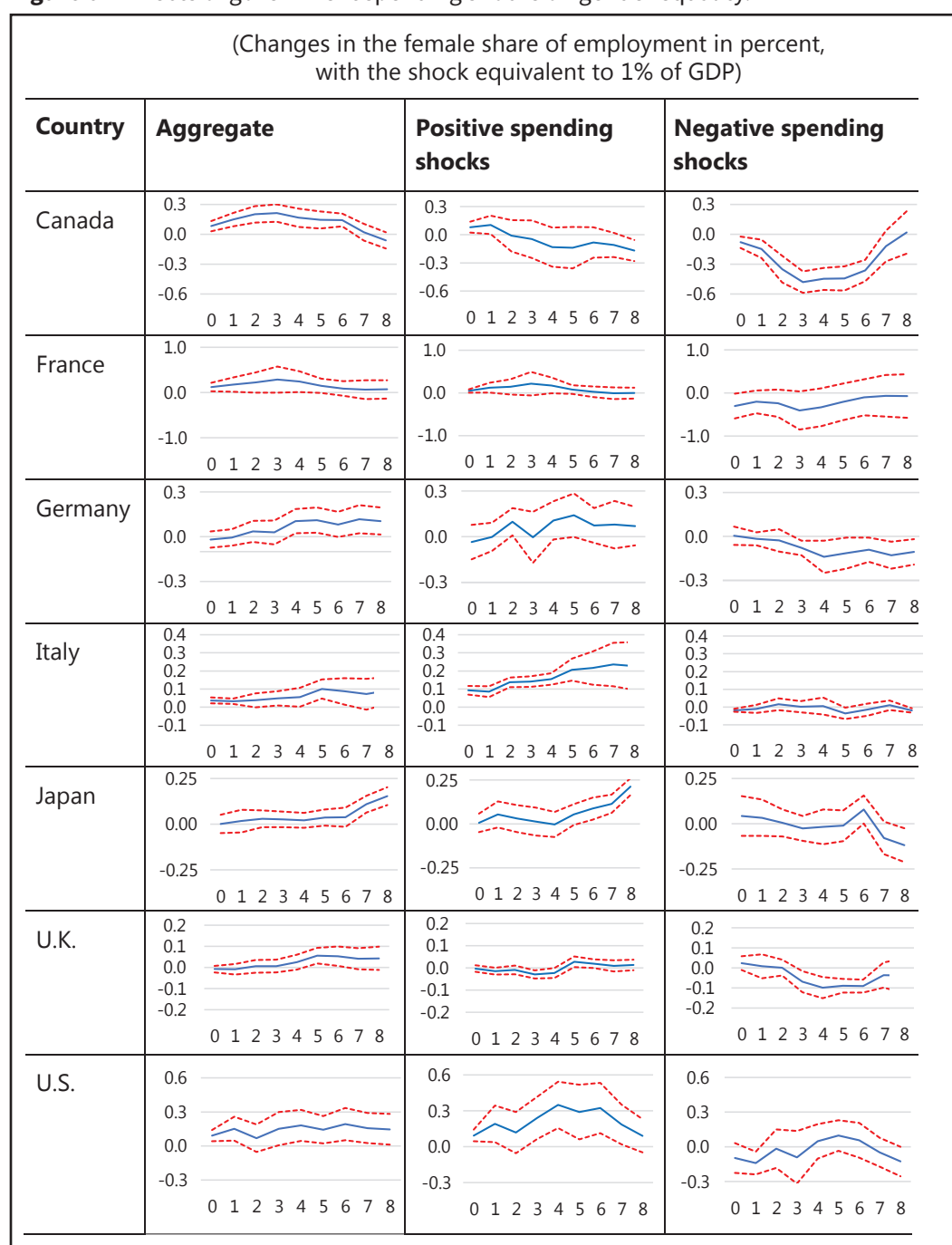
This section explores possible channels for fiscal spending shocks to influence gender employment equality. Fiscal spending shocks could influence gender employment equality through several channels.

First, fiscal spending shocks may stimulate female labor supply more in response to the loss in household income during recessions (*household income effect*).<sup>12</sup> The positive impacts of fiscal spending shocks on gender equality during recessions would be basically consistent with the long-standing theory of wages. If a married male worker involuntarily loses his job, the nonparticipating wife may enter the labor force to make up for the family income loss. As such, female labor supply may increase in response to lower husbands' income, leading to a negative correlation between husbands' income levels and wives' labor participation. The analytical results in the previous section (Table 2) are generally consistent with this theory, with female labor increasing more than that of males' during recessions.

Second, fiscal spending shocks, if associated with gender-oriented measures, could directly influence gender equality.<sup>13</sup> As discussed in IMF (2017a), there are many gender-oriented fiscal policies helping to improve gender equality (see Appendix for the details). On the

12 Douglas (1934), in his old book on "The Theory of Wages", pointed that "Where wages are low, they (women) will be driven into the market in much greater numbers in order to eke out the family income than where the earnings of their husbands are higher". Since then, this theory has been studied in many literatures, and one of the variances is the so-called "added worker effect". The literature of the added workers effect can be dated to the 1940s (Woytinsky, 1940). Despite this effect is well known in theoretical models, the existing empirical studies do not reach consensus on its magnitude or even its existence (see for example, Tano, 1993; Maloney, 1991; Lundberg, 1985). In the most recent literature, Bredtmann et al. (2017) finds evidence for the existence of an added worker effect, using data covering 28 European countries from 2004 to 2013, while they also reveal that the added worker effect varies over both the business cycle and the different welfare regimes within Europe.

13 The benefits of specific policy instruments for female employment have been examined in the literature (see, for example, Jaumotte (2003) and Kinoshita and Guo (2015)).

**Figure 6** Effects of government spending shocks on gender equality.

Notes: 95% confidence intervals are shown in all cases.

expenditure side, gender-related policies include improved family benefits, subsidized child care, other social benefits that increase the net return to women's work, and incentives for businesses to encourage the hiring of women. While some of these policies could be undertaken in a budget-neutral manner, other policies would have budgetary implications. The fiscal spending shocks associated with those policies—if they are properly designed and executed—would contribute to gender equality.

Third, fiscal spending shocks may create larger labor demand for female-friendly occupations. Bredemeier et al. (2017) shows that “pink-collar job” booms are the drivers of the

female-biased employment effects of fiscal policy.<sup>14</sup> Put differently, occupational dynamics explain the female-biased employment effects of fiscal policy. They argue that fiscal policy shocks cause employment in services, clerical, and retail sales occupations—the so-called “pink-collar” occupations—to grow disproportionately.

Fourth, fiscal spending shocks may stimulate larger demand for part-time employment during recessions. Fiscal spending shocks may facilitate part-time work, which female workers generally occupy. Part-time workers are often hired to meet temporary labor demand and tend to increase when full-time workers are reduced (employment buffers). The impact through this channel, however, may vary by country.

### 5.1 Testing robustness of potential channels

To verify these potential channels (third and fourth points above), we estimate additional impulse responses of the gender employment gap for the U.S. using the empirical approach in the study by Bredemeier et al. (2017).<sup>15</sup> Here, we focus on the U.S. due to the data availability and direct comparison with previous studies.

Based on the understanding on the potential channels above, we investigate the effects of industry, occupation, and employment type (full time vs part time).<sup>16</sup> To investigate the importance of industry effects, we estimate gender-specific regressions

$$e_{g,t} = \beta_g \cdot ind_t + \varepsilon_{g,t},$$

and to investigate the combined effects of industries and occupations, we estimate

$$e_{g,t} = \gamma_g^i \cdot ind_t + \gamma_g^o \cdot occ_t + \eta_{g,t}$$

and to investigate the combined effects of industries, occupations, and employment types, we estimate

$$e_{g,t} = \delta_g^i \cdot ind_t + \delta_g^o \cdot occ_t + \delta_g^t \cdot type_t + v_{g,t}$$

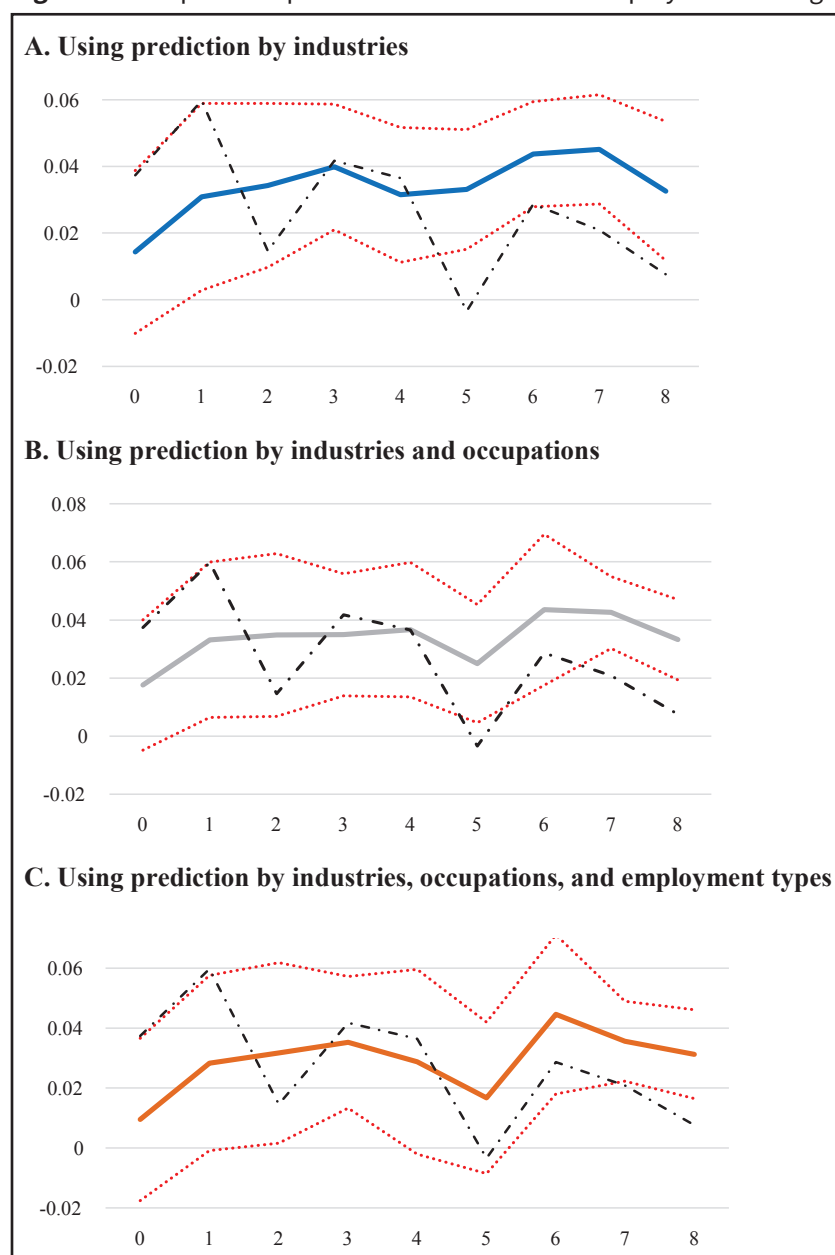
where  $e_{g,t}$  is gender-specific employment and  $ind_t$ ,  $occ_t$ , and  $type_t$  are vectors of industry-, occupational-, and type-specific employment level, respectively. The residuals,  $\varepsilon_{g,t}$ ,  $\eta_{g,t}$ , and  $v_{g,t}$  reflect fluctuations in gender-specific employment unrelated to industries, occupations and/or employment types. We use the predicted values of the regressions to calculate the female employment share implied by industry-specific and/or occupational employment.

The analytical results underscore the importance of gender dynamics in industries, occupations, and employment types for individual workers' employment possibilities. The results are shown in Figure 7. Figure 7 shows the impulse responses estimated by using local projection methods where we replaced actual by predicted female employment shares. The differences

<sup>14</sup> Bredemeier et al. (2017) argue that fiscal policy shocks cause employment in services, clerical, and retail sales occupations—the so-called “pink-collar” occupations—to grow disproportionately. It is also well known that labor supply elasticities differ between males and females. Most studies find that labor supply elasticities are usually large for married women and smaller and sometimes negative for men (see for example, Blundell and MaCurdy, 1999).

<sup>15</sup> Bredemeier et al. (2017) find that fiscal expansions stimulate predominantly female employment and argue that, based on this empirical approach, the finding can be understood as a consequence of differences in the industry-occupation mix of employment by gender.

<sup>16</sup> For this analysis, we replace the actual female employment share by the share predicted by employment in 12 major industries (excluding agriculture), 10 major occupation groups according to the 2002 Census classification, and/or two employment types (full time and part time).

**Figure 7** Response of predicted female share of employment during recessions.

*Notes:* The solid lines plot impulse responses obtained by using predicted female employment shares. The dash-dotted lines plot impulse responses obtained by using the actual female employment share. The dash lines denote 90% confidence bands. Correlations between impulse responses obtained by using predicted female employment shares and those obtained by using the actual female employment share are also presented.

between solid and dashed lines reflect dynamics in the gender composition of employment unrelated to industries, occupations, and/or employment types.

Figure 7A suggests that, while industry effects have some influence over female-male employment development, the gender-specific effects of fiscal shocks cannot be fully understood by industry effects alone. The actual female employment share falls more strongly than predicted by industry dynamics.

Taking into account occupations in addition to industries, the predicted decline in relative female employment is more pronounced. Figure 7B shows that occupations play an important



role for understanding gender-specific employment dynamics. These results are consistent with the findings by Bredemeier et al. (2017).

Adding employment types (Figure 7C), the predicted decline in relative male employment is further pronounced. Hence, our results show that, in particular for the fiscal spending shock, employment types (full time, part time) play an important role for understanding gender-specific employment dynamics.

## 6 Conclusion and Policy Implications

This paper examines how fiscal policy affects the gender employment gap over the business cycles in G7 countries. By using the local projection method, we find that in all G7 countries, positive fiscal spending shocks contribute to gender equality during recessions, increasing female employment more than that of males. During booms, however, the impact on gender employment is less obvious and generally smaller than during recessions. We also find that, during recessions, the impact of fiscal policy shocks on unemployment rates are broadly the same between male and female. This is because of the base effect (female labor force increases more than female employment). Furthermore, we find that the effects of positive and negative spending shocks on gender equality are broadly symmetric.

The study leads to two main policy implications. First, fiscal stimulus, particularly during recessions, can achieve the twin objectives of supporting aggregate demand and improving gender gaps. In contrast, given the symmetric nature of fiscal spending shocks, a fiscal contraction during recessions is bound to worsen the gender employment gap, thus calling for compensatory measures to protect female employment.

More broadly, these findings also suggest the need for cautious assessment for specific gender-oriented policy instruments. The outcome of policies to improve gender equality depends, at least in the short term, on whether the economy is in a recession or under a boom. Therefore, the assessment on the short-term impact of those measures should take into account the state of the economy.

For future research, a number of open questions could be addressed. First, government spending could be disaggregated to study the differentiated impact of each component (e.g., nonwage consumption, wages, transfers, investment) on the gender employment gap. Second tax shocks could also be considered to find out how their impact differs from that of spending. Third, it would be useful to examine the impacts of fiscal shocks on other gender gaps (e.g., gender wage gaps, managerial positions). Fourth, it would also be important to deepen our understanding of the transmission channels of the fiscal shocks, based on theoretical models. Finally, one could investigate how market institutions determine the outcomes of the fiscal shocks on gender gaps on labor markets.<sup>17</sup>

### Declarations

#### Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

<sup>17</sup> Labor market regulations (e.g., ease of firing and hiring) could affect the impact of the fiscal shocks on gender gaps in labor markets.



### Competing interests

The authors declare that they have no competing interests.

### Funding

NA.

### Authors' contributions

HM mainly conducted an empirical analyses and JH and BA were major contributors in writing the manuscript. All authors read and approved the final manuscript.

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## Appendix I. Statistical Summary

We collect quarterly data on GDP, government spending, tax revenues, and the female share of total employment from various sources, such as the Eurostat, ILO, OECD, and national statistics offices. The sample period varies across countries and spans the longest timeframe for which data is available. Specifically, the sample periods are 1980:1-2016:3 for Canada, 1992:1-2017:1 for France, 1992:2-2016:4 for Germany, 1999:1-2017:1 for Italy, 1980:1-2016:3 for Japan, 1971:1-2017:1 for the United Kingdom, and 1964:1-2016:4 for the United States. All series are seasonally adjusted and logged. Except for the female share of total employment, all series are in real terms. GDP deflator is used to convert nominal values to real values. Table AI. 1 summarizes statistics.

**Table AI.1** Summary Statistics

Country	Sample period	Mean (standard deviation)			
		GDP	Government Spending	Tax revenues	Female Share of Total Employment Ratio
Canada	1980:1-2016:3	12.08 (0.12)	11.48 (0.09)	11.56 (0.11)	-0.79 (0.05)
France	1992:1-2017:1	5.66 (0.05)	5.04 (0.10)	5.31 (0.11)	-0.77 (0.03)
Germany	1992:2-2016:4	12.39 (0.04)	11.71 (0.04)	11.13 (0.05)	-0.81 (0.04)
Italy	1999:1-2017:1	5.60 (0.01)	5.28 (0.02)	5.11 (0.02)	-0.91 (0.03)
Japan	1980:1-2016:3	14.62 (0.09)	14.03 (0.08)	13.94 (0.08)	-0.89 (0.03)
The UK	1980:1-2017:1	12.12 (0.11)	11.48 (0.09)	11.50 (0.11)	-0.80 (0.05)
The US	1980:1-2016:4	4.04 (0.13)	3.38 (0.08)	3.38 (0.13)	-0.78 (0.03)

## Appendix II. Gender-Related Fiscal Policies<sup>18</sup>

As summarized in IMF (2017a), all the G-7 countries have implemented a range of tax and expenditure policies aimed at increasing female labor supply. Table AII. 1 summarizes key gender-related fiscal policies implemented by the G-7 countries:

- *On the expenditure side*, all the G-7 countries have implemented various laws or regulations designed to increase women's workforce participation, provide enhanced support for child or dependent care, and achieve equal pay for equal work.
- *On the revenue side*, most countries have moved to individual income taxation. Some countries have retained a system of joint taxation, but adapted it through tax credits, or deductions, or other tax preferences for households with two earners, or by leaving an option for individual taxation.<sup>19</sup> For low-income families, there are various tax reliefs, such as the earned income tax credit, for example in the U.S., or a combination of tax and transfers in the U.K. and other G-7 countries.

**Table AII.1.** Key Gender-Related Fiscal Policies Implemented by G7 Countries

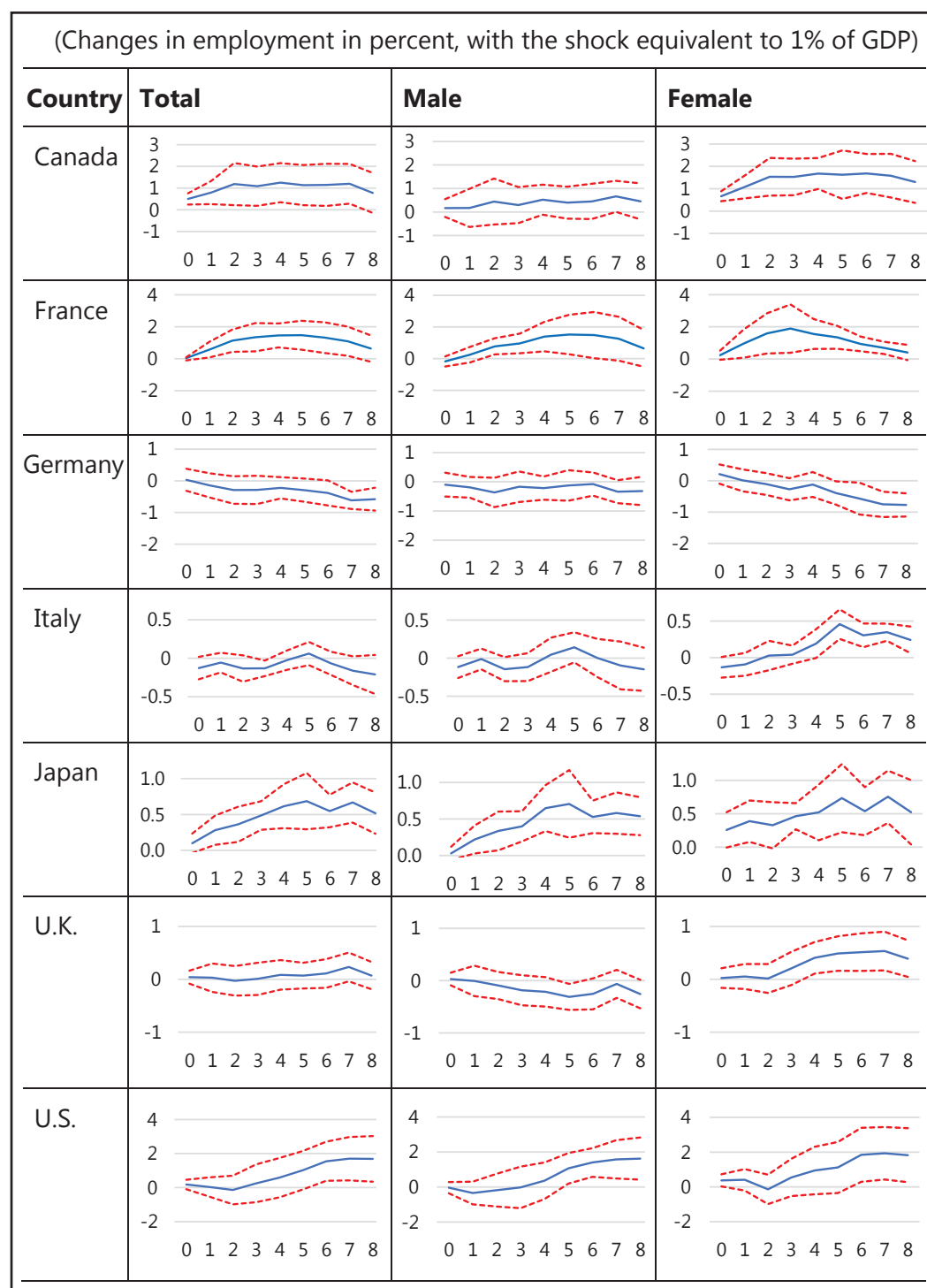
Policy Measure	Country Practices
<b>Tax Policies</b>	
Individual income tax	Canada, Italy, Japan, and UK
Tax relief for single or working parents	Most or all G7
Targeted in-work tax credits or benefits	France, Japan
<b>Expenditure Policies</b>	
Gender-responsive public employment	All G7
Quotas in managerial positions	France, Germany
Public sector equal pay	Canada, France, Germany-Laender, Italy
Work-life balance	Canada, France, Italy, Japan
Women in low-income support	France, Germany, Italy, Japan
Education, STEM, elimination of stereotypes	All G7
Health prevention and age-related issues	All G7
Child care support	Canada, Japan, UK, Italy, Germany
Paid parental leave	Canada, France, Germany, Italy, Japan
Gender-related social security reforms	Canada, France, Italy, UK
Pensions linked to the number of children	Germany
Programs to counter domestic violence	All G7
Gender-responsive foreign aid and cooperation	Canada, France, Japan

Sources: Beijing reports, OECD (2016), recent developments.

<sup>18</sup> This appendix is based on the assessments in IMF (2017a).

<sup>19</sup> Taxation based on the family rather than individuals can create a disincentive for the second earner to work, as he/she is taxed at a higher marginal rate (IMF, 2017a).

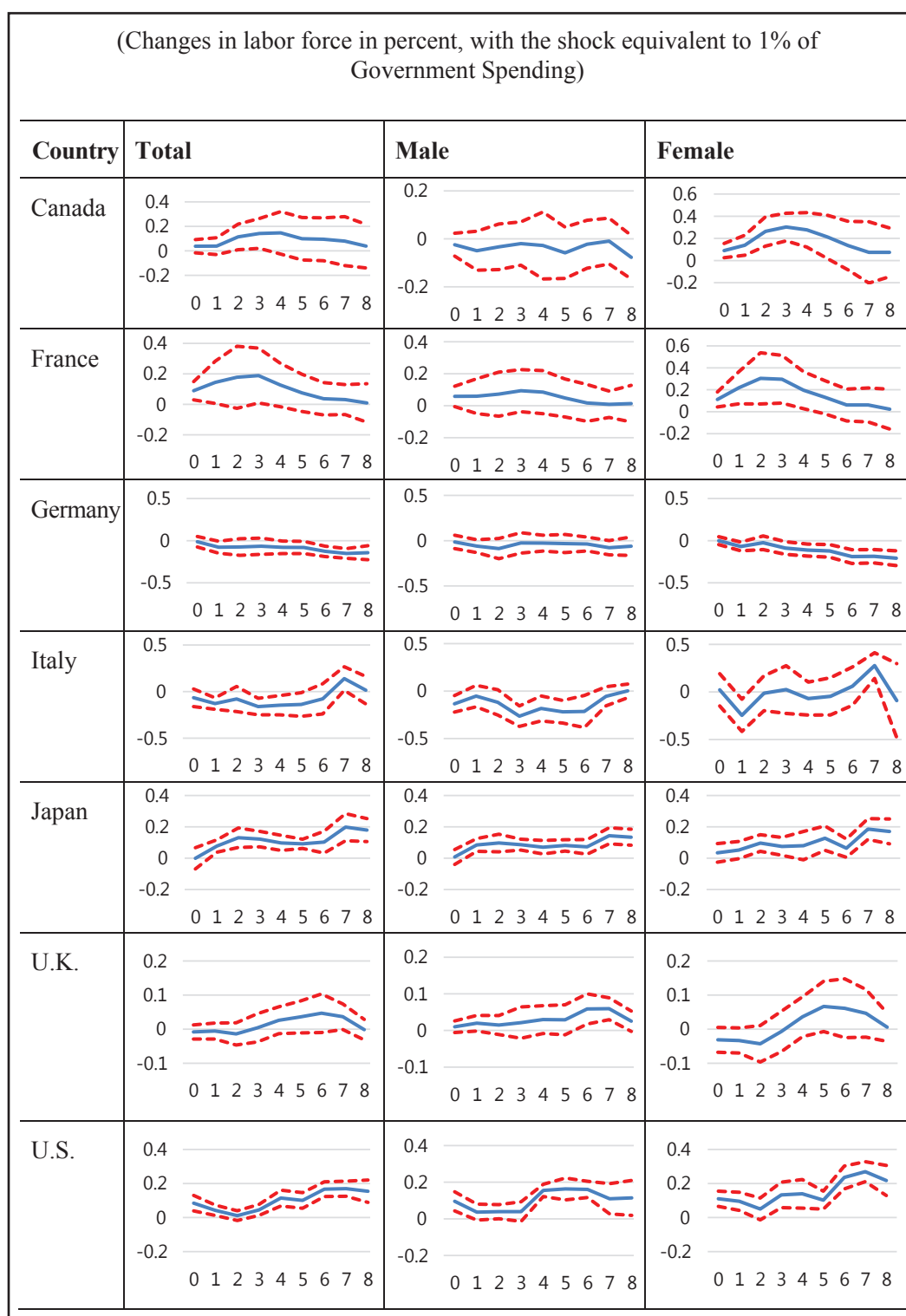
## Appendix III. Effects of Government Spending Shocks on Employment during Recessions



Notes: 95% percent confidence intervals are shown in all cases.

Source: Authors' calculations.

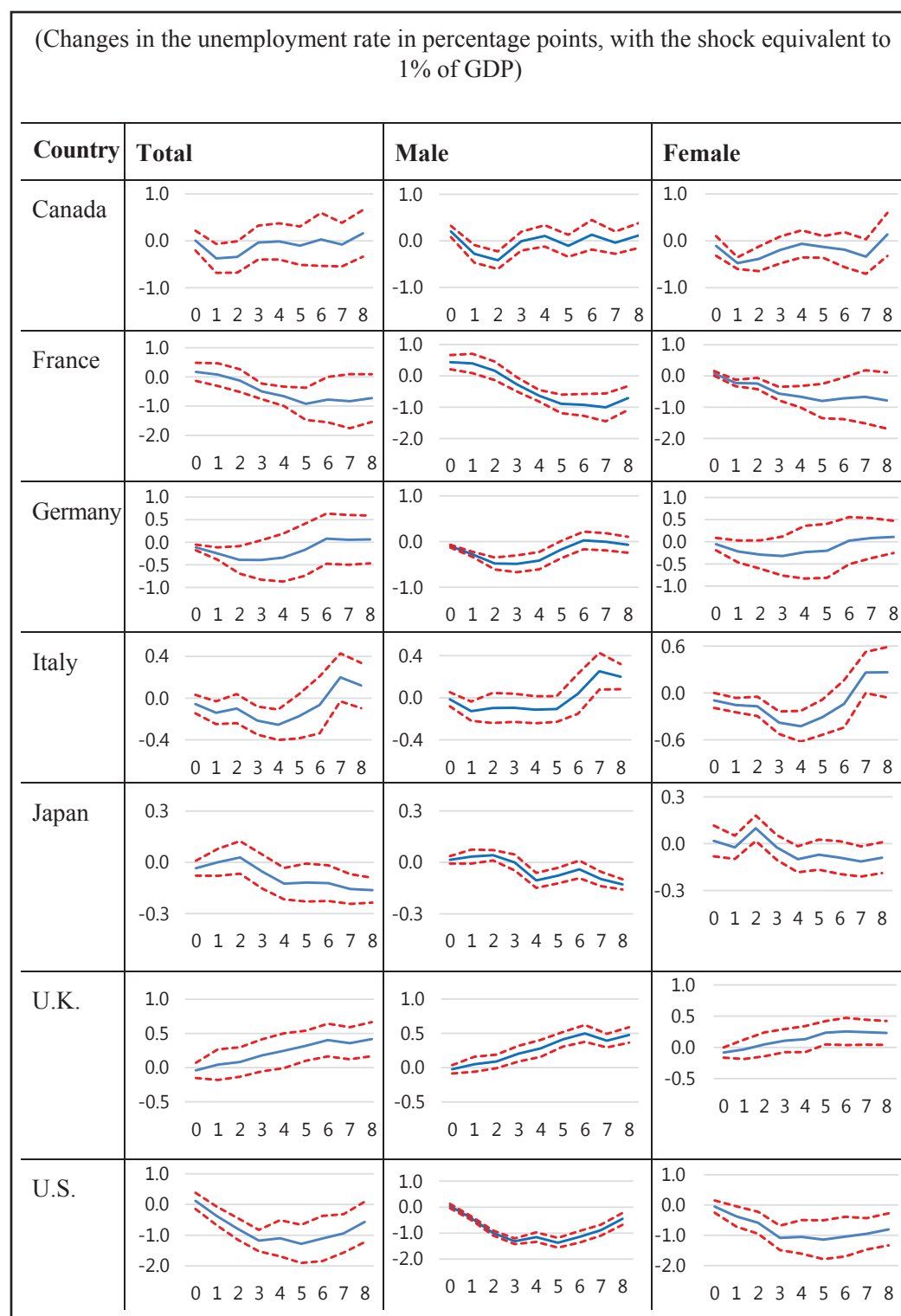
## Appendix IV. Effects of Government Spending Shocks on Labor Force during Recessions



Notes: 95% confidence intervals are shown in all cases.

Source: Authors' calculations.

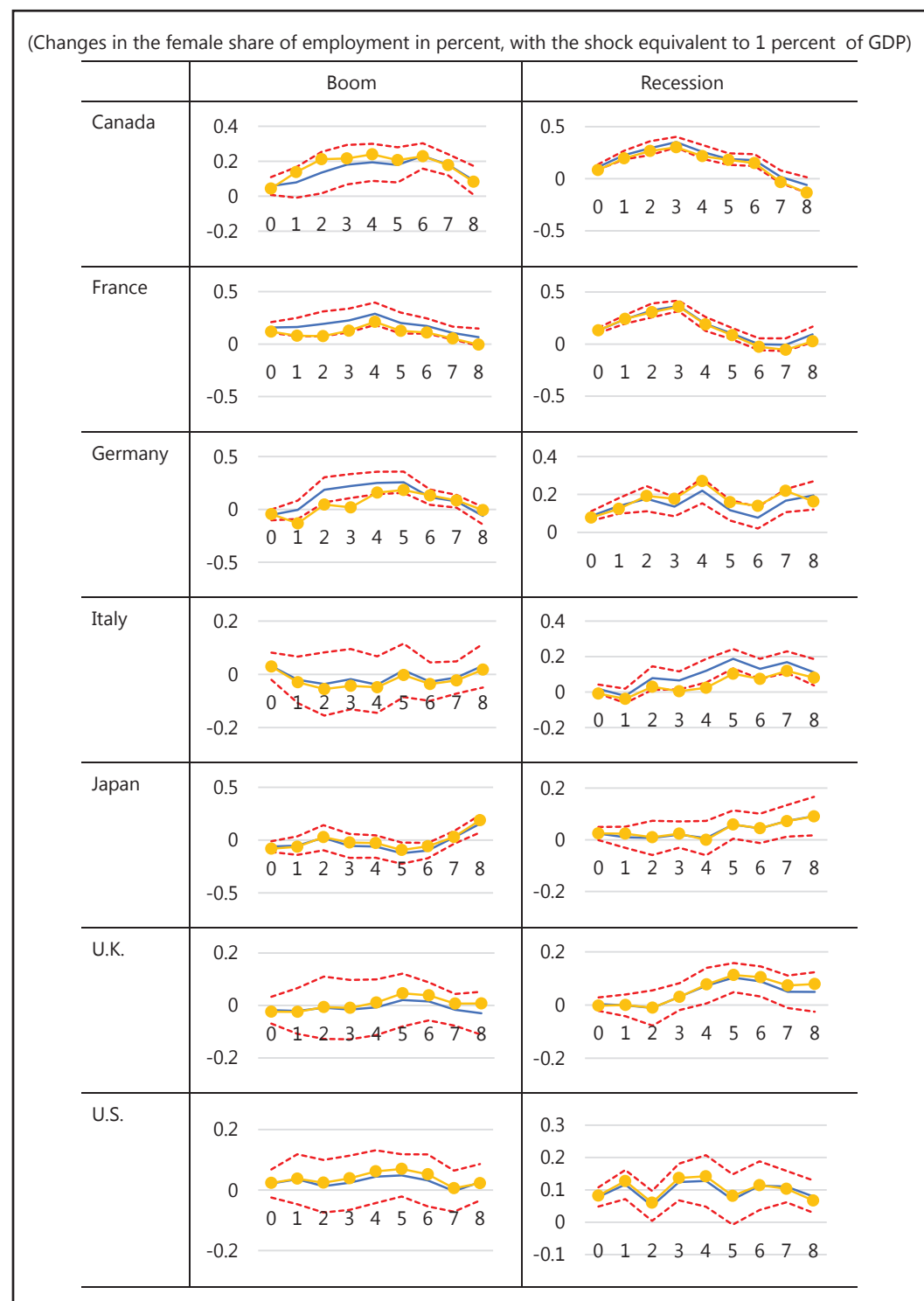
## Appendix V. Effects of Government Spending Shocks on Unemployment Rates during Recessions



Notes: 95% confidence intervals are shown in all cases.

Source: Authors' calculations.

## Appendix VI. Robustness Check: Effects of Government Spending Shocks on Gender Equality



*Note:* Dashed lines indicate 95 percent confidence intervals and lines with circles present impulse responses functions in the baseline case.