Online Appendix to "Man-cessions, Fiscal Policy, and the Gender Composition of Employment"

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A Data and methodology

A.1 Aggregate data

Table A1: Data sources for aggregate variables

Series Title	Series ID	Source
Civilian Noninstitutional Population	CNP16OV	BLS
Civilian Employment-Population Ratio	EMRATIO	BLS
Government Current Expenditures: Interest Payments	A180RC1Q027SBEA	BEA
Gross Domestic Product	GDP	BEA
Gross Domestic Product: Implicit Price Deflator	GDPDEF	BEA
Net Government Saving	TGDEF	BEA
Current Tax Receipts	W054RC1Q027SBEA	BEA
Effective Federal Funds Rate	FEDFUNDS	BFED
Government Consumption Expenditures	A955RC1Q027SBEA	BEA
Gross Government Investment	A782RC1Q027SBEA	BEA

Notes: BLS: U.S. Bureau of Labor Statistics, BEA: U.S. Bureau of Economic Analysis, BFED: Board of Governors of the Federal Reserve System.

Table A2: Definition of aggregate variables

Variable	Definition	Description
Primary Deficit	$\frac{-\frac{(TGDEF+A180RC1Q027SBEA)}{(GDPDEF\cdot CNP16OV)}}{\text{mean}(GDP/(GDPDEF\cdot CNP16OV))}$	real primary government deficit per capita relative to average real GDP per capita
Output	$\log\left(\frac{(GDP)}{GDPDEF\cdot CNP16OV}\right)$	log real GDP per capita
Aggregate Employment	$\log(EMRATIO)$	log aggregate employment
Government Spending	$\log\left(\frac{(A955...)+(A782...)}{GDPDEF\cdot CNP16OV}\right)$	log real government spending per capita
Tax Receipts	$\log\left(\frac{W054RC1Q027SBEA}{GDPDEF\cdot CNP16OV}\right)$	log real government tax revenues per capita
Real interest rate	$\frac{FEDFUNDS}{100} - \log\left(\frac{GDPDEF(+1)}{GDPDEF}\right)\cdot 4$	annualized real interest rate

Notes: (+1) indicates a one-quarter lead.

A.2 Employment data by gender, industry, and occupation

To deal with re-classifications of occupations and industries, BLS applies conversion factors to construct consistent employment series based on the 2002 industry and occupational classifications. These series can be downloaded from `http://www.bls.gov/cps/constio198399.htm`.

Table A3: Data sources for disaggregated employment variables

Series Title	Series ID	Source
Employment by gender		
Employment Level - Men	LNU02000001	BLS
Employment Level - Women	LNU02000002	BLS
Employment by industry		
Mining	LNU02034561	BLS
Construction	LNU02034562	BLS
Manufacturing	LNU02034563	BLS
Wholesale and retail trade	LNU02034566	BLS
Transportation and utilities	LNU02034570	BLS
Information	LNU02034571	BLS
Financial activities	LNU02034572	BLS
Professional and business services	LNU02034573	BLS
Education and health services	LNU02034574	BLS
Leisure and hospitality	LNU02034575	BLS
Other services	LNU02034576	BLS
Public administration	LNU02034579	BLS
Employment by occupation		
Management, business, and financial operations occupations	LNU02032202	BLS
Professional and related occupations	LNU02032203	BLS
Service occupations	LNU02032204	BLS
Sales and related occupations	LNU02032206	BLS
Office and administrative support occupations	LNU02032207	BLS
Farming, fishing, and forestry occupations	LNU02032209	BLS
Construction and extraction occupations	LNU02032210	BLS
Installation, maintenance, and repair occupations	LNU02032211	BLS
Production occupations	LNU02032213	BLS
Transportation and material moving occupations	LNU02032214	BLS

Notes: BLS: U.S. Bureau of Labor Statistics. Seasonal adjustment: X-13-ARIMA.

Table A4: Definition of disaggregated variables

Variable	Definition	Description
Actual male employment share	$\frac{LNU02000001^*}{LNU02000001^* + LNU02000002^*}$	male employment as a fraction of total employment
Prediction by industries	$\frac{\beta_m \cdot ind}{\beta_m \cdot ind + \beta_f \cdot ind}$	predicted male employment share based on fitted value of gender-specific employment regressions with industry-level employment as independent variables
Prediction by industries and occupations	$\frac{\gamma_m^i \cdot ind + \gamma_m^o \cdot occ}{\gamma_m^i \cdot ind + \gamma_m^o \cdot occ + \gamma_f^i \cdot ind + \gamma_f^o \cdot occ}$	predicted male employment share based on fitted value of gender-specific employment regressions with industry-level and occupational employment as independent variables

Notes: *ind* = [LNU02034561*, LNU02034562*, LNU02034563*, LNU02034566*, LNU02034570*, LNU02034571*, LNU02034572*, LNU02034573*, LNU02034574*, LNU02034575*, LNU02034576*, LNU02034579*], *occ* = [LNU02032202*, LNU02032203*, LNU02032204*, LNU02032206*, LNU02032207*, LNU02032209*, LNU02032210*, LNU02032211*, LNU02032213*, LNU02032214*]. β_g, γ_g^i, γ_g^o, $g = f, m$ are the vectors of estimated coefficients from gender-specific employment regressions as described in the main text. $*$ refers to seasonally adjusted series (X-13-ARIMA).

A.3 Methodology

The reduced form VAR reads

$$Y_t = c + \sum_{i=1}^{4} A_i Y_{t-i} + v_t \,,$$

where the vector Y_t includes the government's primary deficit (relative to the sample mean of GDP), government tax receipts, government spending, GDP (all in real per-capita terms), the real federal funds rate, aggregate employment, and the share of male employment in aggregate employment. The real interest rate, tax receipts, and public debt enter the VAR to control for the monetary policy stance and for the effects of the financing side of the government budget when identifying fiscal shocks (Perotti 1999, Rossi and Zubairy 2011, Ramey 2011). All variables are linearly detrended prior to the VAR analysis. c is a vector of constants, $A = [A_1, A_2, A_3, A_4]$ is the coefficient matrix, and v_t is the vector of reduced-form residuals. The reduced-form VAR is estimated with Bayesian techniques using a Minnesota prior. Specifically, for the variance-covariance matrix of the reduced-form shocks Σ, we use the estimate $\widehat{\Sigma}$ from an OLS estimation of the VAR. The prior means for all entries in c and A are zero. For constants, we set the prior variance of the coefficients to 100 and to $0.5 \cdot \frac{\sigma_{jj}}{L^2 \cdot \sigma_{ii}}$ for the impact of the L'th lag of variable j on variable i, where σ_{ii} and σ_{jj} are diagonal entries from the estimate of the variance-covariance matrix of the reduced-form shocks.

We identify a fiscal and a non-fiscal (business-cycle) shock using sign restrictions. We impose, following Pappa (2009), that an expansionary fiscal policy shock (which can be a spending increase or a tax cut or a combination of both) raises the primary deficit and output.[1] By contrast, non-fiscal (business-cycle) shocks affect the deficit and output in opposite directions. These identifying restrictions can be derived from mild assumptions: First, expansionary fiscal policy raises output and, second, the endogenous component of fiscal policy is not too procyclical (i.e., in non-fiscally induced booms, government spending does not rise endogenously by more than tax revenues). We impose the sign restrictions on impact and in the following quarter.

Formally, our identification proceeds as follows. We take draws $\widetilde{A}$ from the posterior distribution of the coefficient matrix A. For every draw, we calculate the Cholesky decomposition of the

[1] A similar identification of fiscal shocks has been used by, e.g., Enders, Müller, and Scholl (2011).

estimated covariance matrix $\widehat{\Sigma} = BB'$. We then take draws ω from the seventh-dimensional unit sphere by applying a QR decomposition of a 7×7 matrix of random numbers drawn from the standard normal distribution. We consider shocks $b = B\omega$ and the impulse response functions to b. If they satisfy the sign restrictions, we keep the draw $(\widetilde{A}, \omega)$ and save the impulse response functions. This procedure is repeated until 1000 responses to both fiscal and non-fiscal shocks are found for each of 1000 draws from the posterior distribution. For every $\widetilde{A}$, we determine the respective median responses at different horizons. This procedure gives us a distribution of responses to the two types of shocks, reflecting parameter uncertainty. We plot the 5th, 16th, 50th, 84th, and 95th percentiles of this distribution.

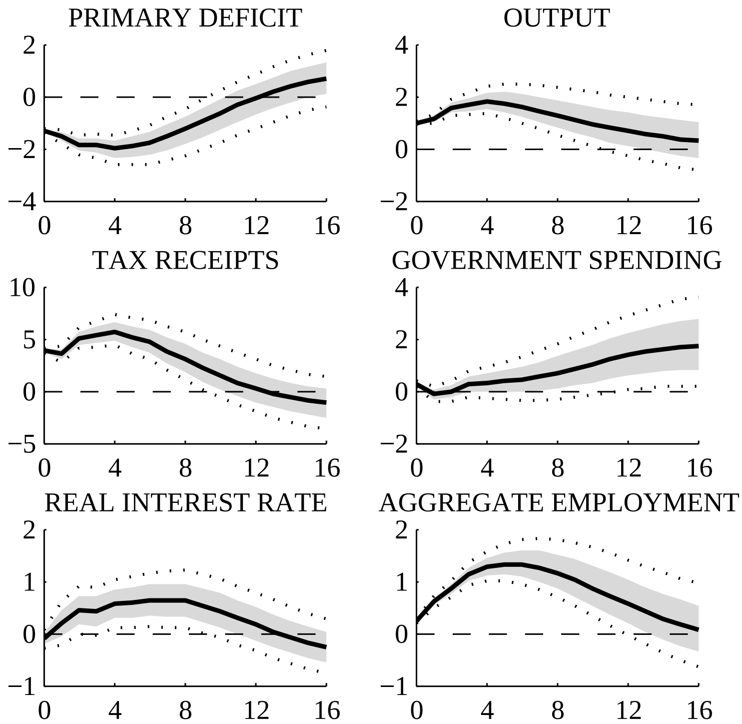
B Detailed estimation results

Figure B1 shows impulse responses of macroeconomic aggregates to fiscal and non-fiscal shocks. As shown in Figure B1(b), the fiscal shock is a deficit-financed combination of tax cuts and spending boost. This stimulus causes output and aggregate employment to rise. On impact, a \$1 rise in the deficit is associated with a \$0.6 increase in output. Monetary policy seems to accommodate fiscal policy as the real interest rate falls (in line with evidence provided by, e.g., Mountford and Uhlig 2009 and Ramey 2016).

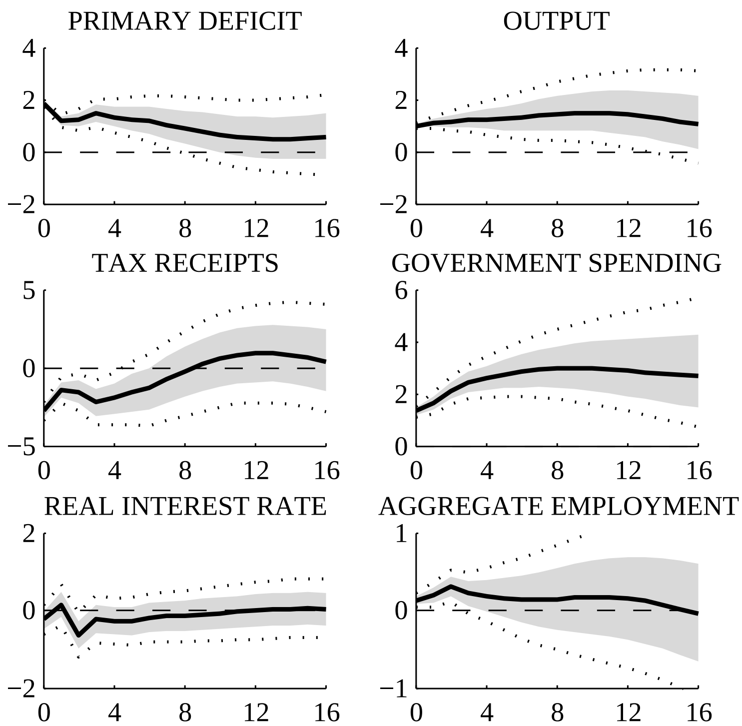
Positive non-fiscal shocks cause output, employment, interest rates, and tax receipts to rise and the deficit to fall, see Figure B1(a). The rise in economic activity also triggers a delayed increase in government spending.

Figure B1: Impulse responses.

(a) Business-cycle shock



(b) Fiscal shock



Notes: Solid lines are median responses, shaded areas (dotted lines) show 16th-84th (5th-95th) percentiles of 10,000 estimated responses. Horizontal axes show quarters. Responses are scaled to a median impact response of output of 1%.

C Robustness

Here, we discuss a series of robustness checks for our baseline result that fiscal expansions stimulate predominantly female employment.

C.1 First differences

As an alternative to linear detrending, we express all variables in year-on-year growth rates. Figure C1 shows that our results are robust to this alternative way of handling trends in the data.

C.2 Tax shocks and spending shocks

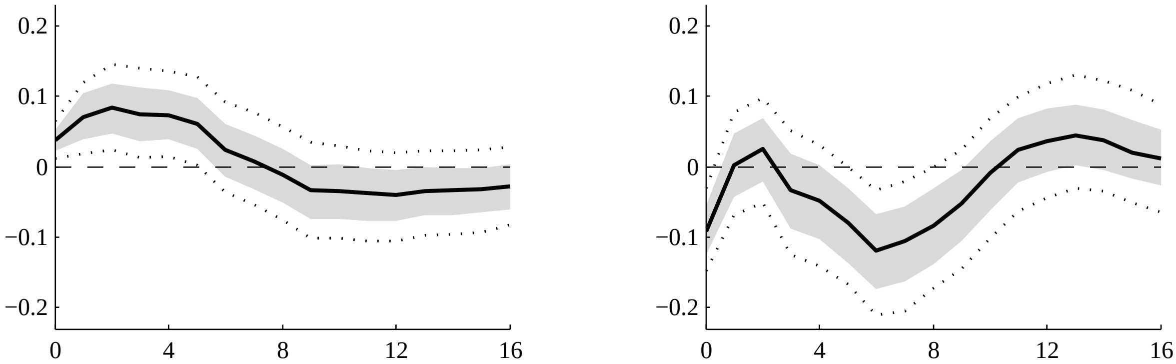
Here, we present results for a specification where we decompose the fiscal shock into government spending shocks and tax shocks, respectively. Following, Canova and Pappa (2007) we impose that a government spending shock raises spending and tax revenues, whereas an expansionary tax shock reduces tax revenues. In all other respects, the specification is as in the baseline VAR. In particular, we impose that both fiscal shocks induce a positive co-movement of GDP and the deficit. The panels in Figure C2 show the responses to a government spending shock and to an expansionary tax shock, respectively. While the decline in the male employment share is more pronounced in response to government spending expansions, the most important result is that the male employment share decreases after both types of fiscal stimuli. The results for the non-fiscal shock are very similar to the baseline VAR, see Figure 1 in the main text, and are therefore not shown (after a non-fiscal shock, tax receipts increase and government spending does not change significantly).

C.3 Cholesky identification

Figure C3 shows that the male employment share declines in response to fiscal stimulus, as in our baseline identification, also when we employ an alternative identification scheme for government spending shocks. Figures C3(a) and C3(b) show results when identification is achieved through a Cholesky decomposition of the variance-covariance matrix of the reduced-form VAR residuals with government spending ordered first. This implies that fiscal spending shocks are identified by assuming that government spending is exogenous within the quarter, for example due to insti-

Figure C1: Response of the male employment share (year-on-year growth).

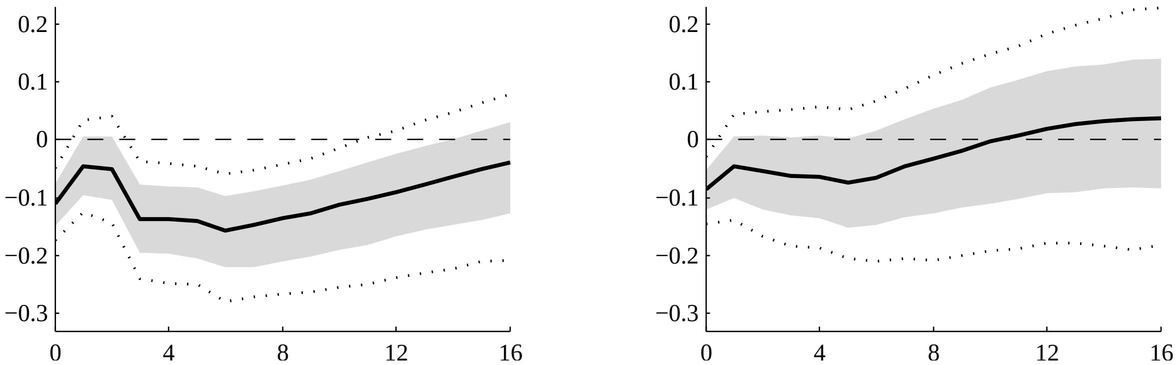
(a) Business-cycle shock (b) Fiscal shock



Notes: Solid lines are median responses and shaded areas (dotted lines) show 16th-84th (5th-95th) percentiles of 10.000 estimated responses. Horizontal axes show quarters. Responses are scaled to a median impact response of output of 1%.

Figure C2: Response of the male employment share (spending and tax shocks).

(a) Spending shock (b) Tax shock

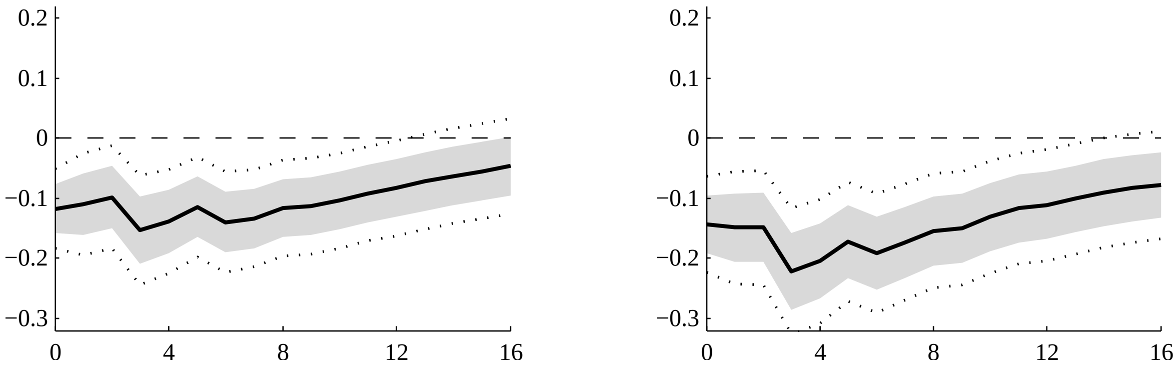


Notes: Solid lines are median responses and shaded areas (dotted lines) show 16th-84th (5th-95th) percentiles of 10.000 estimated responses. Horizontal axes show quarters. Responses are scaled to a median impact response of output of 1%.

Figure C3: Response of the male employment share (Cholesky identification).

(a) Spending shock

(b) Spending shock, controlling for fiscal foresight



Notes: Solid lines are median responses and shaded areas (dotted lines) show 16th-84th (5th-95th) percentiles of 10.000 estimated responses. Horizontal axes show quarters. Responses are scaled to a median impact response of output of 1%.

tutional delays in the political and administrative process (Blanchard and Perotti 2002). Figure C3(a) shows the estimated response of the male employment share when we apply this identification for our baseline VAR described in the main text. Ramey (2011) criticizes this identifying assumption and argues that it delivers biased results if government spending shocks are anticipated by private agents. To control for anticipation effects, we also estimate a VAR where we add as an additional variable forecasts from the Survey of Professional Forecasters made at time t for the growth rate of real government purchases for time $t+1$ to the set of variables included in the VAR. Results of this specification are shown in Figure C3(b).

C.4 Cross-sectional evidence

We complement our time-series analysis of fiscal shocks using cross-sectional evidence. The aim of this exercise is to corroborate whether our main finding, the disproportionate increase in female employment relative to men's employment following fiscal shocks, is confirmed when looking at a specific discretionary fiscal-policy impulse. Given that the observation of a man-cession has received particular attention in the context of the Great Recession in the U.S., a natural case study is to investigate the gender-specific employment effects of the American Recovery and Reinvestment Act (ARRA), the major fiscal stimulus package implemented during this time.

Chodorow-Reich, Feiveson, Liscow, and Woolston (2012) have examined the aggregate em-

Table C1: Cross-sectional evidence on the effects of state medicaid relief in the ARRA stimulus package.

Dependent variable: Change in relative female employment		
Total FMAP payout per person 16+ ($100,000)	5.12	6.44
	(0.16)	(0.09)
Vote share Kerry 2004, %/1000	0.77	1.94
	(0.77)	(0.42)
Union share, %/1000	-6.44	-8.84
	(0.42)	(0.28)
GDP per person 16+, million dollars	-0.70	0.18
	(0.66)	(0.26)
manufacturing employment, %/1000	11.06	11.67
	(0.12)	(0.10)
State population 16+, billions	-0.72	-0.60
	(0.03)	(0.06)
Lagged dependent variable	–	-0.22
		(0.41)
Region fixed effects	yes	yes
Number of observations	51	51

Notes: p-values in parentheses. Dependent variable is the change in the seasonally adjusted female to male employment ratio between December 2008 to July 2009. FMAP = Federal Medical Assistance Percentages. Lagged dependent variable is the change in this ratio between May and December 2008. All other right-hand side variables are taken directly from Chodorow-Reich et al. (2012).

ployment effects of a specific component of the ARRA package. In particular, they exploit cross-sectional variation across U.S. states in the degree to which the federal government took over medicaid obligations to give state governments budgetary room for discretionary fiscal policy. As discussed by Chodorow-Reich et al. (2012), states have used the funds for both expansionary spending and tax policies. They estimate a regression model relating state fiscal relief to total employment growth, controlling for a set of factors capturing differential employment trends at the state level. To address causality, they instrument state fiscal relief with pre-recession medicaid spending. Their main finding is that the expansionary fiscal policy measures allowed through ARRA medicaid relief had significantly positive effects on total employment at the state level.

We now consider the gender dimension of this fiscally induced employment growth. Specifically, we examine whether this particular fiscal expansion had a significant influence on the female to male employment ratio at the state level. To do so, we re-estimate the two-stage least-squares regression model from Chodorow-Reich et al. (2012) using the same identification approach and the same set of explanatory variables.[2] Yet, instead of total employment growth, we consider the change in the female to male employment ratio as the dependent variable. The latter variable is constructed using employment data from the CPS MORG files, which allow a disaggregation by gender and federal state.

Table C1 shows the second-stage estimation results, where the outcome variable is the change in the female to male employment ratio. Our main interest is on the effect of the total payout that a state received through the ARRA Federal Medical Assistance Percentages (FMAP) program (instrumented by pre-recession medicaid expenditures). In both specifications, we find that state fiscal relief and the associated expansionary fiscal-policy measures have triggered an increase in the female to male employment ratio, see the first row of Table C1. In the specification with the full set of control variables (second column), which is the counterpart to Chodorow-Reich et al. (2012)'s preferred specification, this effect is statistically significant at the 10% level. In summary, we conclude that the disproportionate increase in female employment after fiscal shocks is not only observed when such shocks are identified from time-series fluctuations but also when identification is based on cross-sectional variation across U.S. federal states.

[2] We use the same data as Chodorow-Reich et al. (2012) which are provided online.

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